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UKRAINE NATIONAL ELECTRICITY REGULATORY COMMISSION
NATURAL GAS AND OIL REPORT

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Final Report

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CONTENTS

Table of Contents

Executive Summary

Chapter 1 Natural Gas Action Plan

1 1 National Electricity Regulatory Commission Natural Gas Regulation Action Plan 1-2

Chapter 2 Legal Requirements

2 1 Introduction 2-2
2 2 Overall Considerations 2-2
2 3 Specific Consideration 2-7

Chapter 3 Unbundling

3 1 Overall Rationale for "Unbundling" 3-2
3 2 Definition 3-3
3 3 The Importance of Unbundling in the New Management Era 3-5
3 4 International Experience with "Unbundling" 3-7
3 4 1 Canada and the U S 3-7
3 4 2 Argentina 3-11
3 4 3 Mexico 3-13
3 4 4 Colombia 3-15
3 4 5 The Latin American Experience Overall 3-17
3 4 6 Britain 3-19
3 4 7 The Potential for Unbundling in Europe 3-22
3 5 Special Considerations for Ukraine 3-24
Addendum 3-25
3A 1 Introduction 3-25
3A 2 Traditional Economic Thinking 3-25
3A 3 Traditional Policy and Economic Management 3-26
3A 4 New Economic Thinking 3-28
3A 5 New Economic Policy and Regulatory Objectives 3-29
3A 6 Principles for the New Management Era 3-30

Chapter 4 Oversight of Gas Marketing and Supply

4 1 Introduction 4-2
4 2 NERC Oversight 4-2

4 3	Policy and Regulatory Considerations	4-3
4 4	Energy Mix	4-4
4 5	Gas Trading	4-9
4 6	Key Components for Creating a Competitive Gas Market	4-11
4 7	Gas Auctions	4-16
Chapter 5	**Distribution**	
5 1	Introduction	5-2
5 2	Pricing	5-2
5 3	Collections	5-10
5 4	Customer Classes	5-10
5 5	Subsidies	5-12
Chapter 6	**Transportation**	
6 1	Introduction	6-2
6 2	Transportation Tariffs	6-3
	6 2 1 Transportation Tariffs for Domestic Gas	6-3
	6 2 2 Transit Tariffs	6-4
	6 2 3 Transit versus Domestic Transportation	6-6
6 3	Storage	6-7
	6 3 1 Introduction	6-7
	6 3 2 Storage Facilities in Ukraine	6-8
	6 3 3 Storage in the United States and United Kingdom	6-9
6 4	Recommendations	6-12
Chapter 7	**Audit Procedures**	
7 1	Introduction	7-2
7 2	Audit and Fixed Assets and Financial Contributions	7-2
	7 2 1 Safety inspection of fixed assets	7-2
	7 2 2 Inspection of operation on fixed assets	7-3
	7 2 3 Inspection of Repair Expenses	7-3
	7 2 4 Are the Records of Non-material Assets Accurate?	7-4
	7 2 5 Inspection of Accountancy Accuracy of Financial Investments	7-4
	7 2 6 Inspection of Correctness of the Consumption of Material Values	7-5
	7 2 7 Inspection of Consumption of Material Resources	7-5
7 3	Audit of Production Costs	7-5
	7 3 1General Methodological Approaches	7-5
	7 3 2 Inspection of Production Costs by Items of Calculation	7-7
	7 3 3 Audit of Expenses by Economic Groups of Elements	7-7
7 4	Audit of Payment Transactions	7-8
	7 4 1 Payment Transactions with Accountable Entities	7-8
	7 4 2 Payment Transactions with Suppliers	7-8
	7 4 3 Payment Transactions with Buyers	7-8
	7 4 4 Payment Transactions with Different Debtors and Creditors	7-9

	7 4 5 Payments of Labor Costs	7-9
7 5	Audit of Financial Performance	7-9
	7 5 1 Audit of Accuracy of Profit Formation	7-9
	7 5 2 Profit Spending	7-10
Chapter 8	**Oil Pipelines**	
8 1	Introduction	8-2
8 2	Tariffs	8-7
8 3	Tariff Practices	8-9
8 4	Tariff Concepts and Issues	8-12
8 5	Cost-based Methodology	8-17
8 6	Specific Tariff Practices	8-20
8 7	Recommendations for Ukraine	8-22
Appendix A	Memorandum from Elliot Tanos to NERC Commissioners, "Natural Gas Balancing Requirements," dated July 28, 1998	
Appendix B	Memorandum from Elliot Tanos to NERC Commissioners, "Natural Gas Tariff Structures," dated July 29, 1998	

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This report is prepared in satisfaction of a portion of the requirements of Delivery Order 18 that Hagler Bailly provide assistance to the National Electricity Regulatory Commission (NERC) in the regulation of the natural gas sector in Ukraine The report satisfies those requirements as shown in the following table

NERC Natural Gas Deliverable or Statement of Work Item	Report Section
Deliverable No 1 Policy assessments to aid in the design of Commission policy	Appendices A, B
Deliverable No 2 Position paper on appropriate level of NERC oversight on gas marketing and gas supply	Chapters 3, 4
Deliverable No 3 Action plan to aid in the restructuring of the gas industry	Chapters 1, 2
Deliverable No 4 Action plan to monitor and enforce transportation and distribution regulations	Chapters 1, 5, 6
Deliverable No 5 Action plan to	Chapter 8
Statement of Work item I E (4)B Assist in the initial design of audit procedures related to gas transportation and distribution system costs	Chapter 7
Statement of Work item I E (5) [D]evelop and present position paper on the unbundling of gas production, transportation and distribution facilities	Chapter 3

Chapter 1 presents a two-part action plan The action plan proposes a schedule for NERC to take in its regulatory activities

- to restructure the natural gas industry, and
- to monitor and enforce transportation and distribution regulations

Chapter 2 presents the minimum requirements for legislation with respect to natural gas The most notable recommendation made by this Chapter is that NERC should receive authority to regulate upstream activities in the natural gas sector Because, as is pointed out later, a competitive production sector is crucial to the successful reformation of the Ukrainian natural gas sector, it is essential that the production sector receive enlightened, progressive regulation that is in step with the regulation of the downstream sectors Separation regulation is often justified on the grounds that "the upstream and downstream sectors are different" and on the

basis of an assertion that it is standard throughout the world to regulate the sectors separately It is true that the two sectors are different, but this is immaterial, and it is simply not true that combining the regulation of the two sectors in one agency is rare Chapter 2 presents a number of examples of successfully combined regulation — and of bifurcated regulation that has caused severe problems with restructuring

Chapter 3 provides a lengthy exposition of the desirability of, and requirements for, unbundling in the natural gas industry The world over, the natural gas industry, similar to the electric industry, is being restructured into its constituent parts of production, transportation, distribution and supply The fundamental rationale beneath this restructuring is that the distribution and transportation sectors are natural monopolies, while the production and supply sectors are naturally competitive By unbundling the industry, so that each function is separately provided, natural gas users can obtain the benefits of competition in production and supply, unhindered by anti-competitive behavior by the transportation and distribution sectors Therefore, a crucial component of this model is that the production and supply sectors are competitive

Chapter 4 points out, however, that in Ukraine today the production and supply sectors are not competitive The domestic production market is dominated by Ukrgazprom and Russian Gazprom, and the supply industry as a whole is dominated by Gazprom This situation is not irremediable, it is possible to develop competition into the Ukrainian natural gas sector -- but odds are only if steps are taken to introduce competition in production in Ukraine

Chapter 5 covers the distribution sector A healthy distribution sector is crucial to the overall health of the natural gas industry Fundamental requirements for the development of a healthy distribution sector are

- The introduction of fully compensatory retail tariffs for all customers, today, however, prices are set below the cost of service for residential and communal services customers

- Complete payment by all customers, in cash, today, however, collections are extremely low, and barter and offsets are prevalent

Chapter 6 discusses the transportation sector The Ukrainian pipeline system is dominated by the transportation of Russian gas to Western Europe There are numerous issues to resolve, such as whether to charge domestic customers the same price as Gazprom is charged for its transit gas, and whether to regulate the transportation fee for transit gas at all and if so how Domestic transportation is more prosaic, concerned with more standard questions such as the methodology to use in setting the transportation fee Because transportation is literally central to the industry, all of these questions must be resolved in order for the natural gas sector to be healthy

Chapter 7 provides suggested guidelines for procedures for NERC to follow in auditing gas transportation and distribution costs These audits can take several forms, including audits of filings made by regulated companies to change their prices and periodic management audits of the operations of regulated companies

Chapter 8 contains a report on the regulation of oil pipelines and associated action plan Sections 8 2-8 6 are taken with only slight modifications from "Pipeline Tariff Methodologies," a report prepared for Hagler Bailly in Kazakhstan in 1997 by Purvin & Gertz

CHAPTER 1
NATURAL GAS ACTION PLAN

NATIONAL ELECTRICITY REGULATORY COMMISSION NATURAL GAS REGULATION ACTION PLAN

		1998	1999			
		Q4	Q1	Q2	Q3	Q4
1 Natural Gas Steering Committee						
	Form and operate steering committee					
	Form and operate task forces					
2 Legislative Structure						
2 1 Oil and Gas Law	Enact legislation establishing NERC as the regulator for both the upstream and the downstream natural gas sectors					
2 2 Production Sharing Agreement	Enact Production Sharing Agreement					
3 NERC Staffing and Administrative Requirements						
3 1 Staffing	Appoint new Commissioners					
	Hire new staff in main and local offices					
	Train new staff through cross-training by electricity personnel					
	Conduct study tours for NERC staff					
3 2 License fees	Calculate license fees					
	Begin to charge license fees					
4 Licenses						
	Investigate licensing in other countries					
	Draft licenses					
	Revise licenses					
	Issue final licenses					

Hagler Bailly

NATIONAL ELECTRICITY REGULATORY COMMISSION NATURAL GAS REGULATION ACTION PLAN

		1998	1999			
		Q4	Q1	Q2	Q3	Q4
5 Natural Gas Pricing Policies						
5 1 Domestic Production	Evaluate conditions precedent to liberalization of the price for domestically produced gas					
	Draft pricing regulations					
	Deregulate price for new production					
	Deregulate price for existing production					
	Implement new subsidy mechanism for residential customers					
5 2 Pipeline Transmission and Storage	Issue data request to Ukrgazprom					
	Obtain data					
	Determine total system costs including rehabilitation, modernization and expansion costs, and debt					
	Define distinct transmission zones for entire pipeline					
	Determine domestic transportation charges					
	Determine transit transportation charges					
	Determine storage charges					
	Design new reporting forms					
	Issue new reporting forms					
	Require transmission company(ies) to begin move to International Accounting Standards					

NATIONAL ELECTRICITY REGULATORY COMMISSION NATURAL GAS REGULATION ACTION PLAN

		1998	1999			
		Q4	Q1	Q2	Q3	Q4
5 3 Local Distribution Companies	Issue data request to LDCs					
	Obtain data					
	Determine total system costs including rehabilitation, modernization and expansion costs, and debt					
	Design new tariff setting methodology					
	Conduct pilot tariff study for a large LDC					
	Hold open public hearings on pricing					
	Establish new customer classes					
	Begin new pricing regime					
	Design new reporting forms					
	Issue new reporting forms					
	Require LDCs to begin move to International Accounting Standards					
	Implement new subsidy mechanism for residential customers					
6 Special provisions						
6 1 Credit, collection and termination procedures	Issue draft procedures					
	Issue final procedures					
6 2 Transportation regulations, including open access, balancing and other terms and conditions	Form working groups					
	Issue draft procedures					
	Issue final procedures					

NATIONAL ELECTRICITY REGULATORY COMMISSION NATURAL GAS REGULATION ACTION PLAN

		1998	1999			
		Q4	Q1	Q2	Q3	Q4
6 3 Metering for transportation	Design requirements					
	Purchase and install meters					
Gas Code for LDCs	Form working groups					
	Issue draft procedures					
	Issue final procedures					
6 4 Naftogaz of Ukraine	Disaggregate Naftogaz by market segment					
6 5 LDC and pipeline expansion and connection policies	Issue draft procedures					
	Issue final procedures					
6 6 Residential metering	Design requirements					
	Purchase and install meters					

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CHAPTER 2
LEGAL REQUIREMENTS

MINIMUM STATUTORY REQUIREMENTS FOR THE DEVELOPMENT OF UKRAINE'S NATURAL GAS SECTOR

2 1 INTRODUCTION

An initial step to Ukraine's natural gas industry restructuring and modernization is the passage of statutes that reinforce key principles for market development and outline authority and responsibilities Two defining principles that must to be established in law are

- Facilitating efficient commercial relationships, including private investment in and operation of assets required for natural gas resource development and use
- Establishing proper oversight of these activities in order to provide consumer, environmental and safety protections and market development

The remainder of this chapter recommends provisions to include in any natural gas law in order to ensure that these principles are satisfied

2.2 OVERALL CONSIDERATIONS

In general, any legal/institutional basis for natural gas market development should incorporate the following

- Establishment of clear property rights and contractual responsibilities
- Allowances for dispute resolution and legal recourse
- Allowances for private participation in oil and gas activities
- Allowances for concepts such as nondiscriminatory open access and unbundling of transportation and natural gas sales and service functions with respect to transportation and distribution activities
- Specifications for transparent finance and accounting practices
- Specifications for environmental protection and safety

The main considerations are implementation and detail Thus, provisions established by law should be accompanied by development of standard administrative rules and procedures implemented by the key agencies and commissions

The minimum requirements should include the following broad provisions

NERC Authority

Ukraine's National Electricity Regulatory Commission (NERC) was created by presidential decree to oversee electricity restructuring and market development This decree was later expanded to include authority for the natural gas sector Although NERC's authority was established by presidential decree, its authority, mission, responsibilities and requirements to function with regard to natural gas should be affirmed by law

Legal provisions in an oil and gas statute should grant clear regulatory authority to Ukraine's NERC as an independent body with a mission statement that includes facilitation of market development and oversight of domestic oil and gas production, pipeline transportation and distribution and other segments of Ukraine's natural gas industry where appropriate

The existence of NERC is consistent with authority granted to independent agencies in other countries A key consideration for Ukraine is movement toward the independent agency concept in Europe

Statutory provisions should include all of those necessary for NERC to function its mission statement and objectives, organization and staffing, funding sources, general procedures (ability to collect information, to conduct hearings and investigations, to enforce decisions, conduct inspections, and so on) and a code of ethics NERC's Commissioners and Chairman should be appointed by the President but approved by the Rada

Standard Rules and Procedures

NERC should develop rules and procedures for standard practices on the basis of authority granted to it by law

Once statutory provisions are enacted by the Rada, NERC should develop the administrative rules and standards that allow implementation and enforcement This allows establishment of clear administrative procedures and more detail than the parliament is likely to be able to provide

International experience is comparable From enabling statutes independent regulators develop detailed, related rules and procedures that affect those areas of natural gas market

operation that require regulatory oversight This approach is also consistent with that of restructuring Ukraine's electricity sector

Delegation of Upstream Authority[1]

Legal provisions should grant NERC authority over upstream activity Most recently the Republic of Moldova took a similar action with respect to their National Agency for Energy Regulation

A key consideration for natural gas market development is appropriate regulatory oversight along the entire value chain Providing NERC oversight of upstream exploration and production will allow the agency clear authority to clearly handle production related problems that also affect pipeline operations Several examples support adoption of this approach in Ukraine To put Ukraine in perspective, we should note that Ukraine's estimated remaining proven gas reserves in 1996 were 1,160 billion cubic meters or bcm[2] (placing it just behind the Netherlands at 1,765 bcm[3], among Western Europe's producers) When it comes to production, Ukraine's 17 6 bcm in 1995 compares to 20 4 bcm for Germany, 20 1 bcm for Italy, 30 3 bcm for Norway, 75 3 for the U K and 84 4 bcm for the Netherlands In North America, the state of Kansas produced about 22 7 bcm, Oklahoma produced around 56 6 bcm, the province of Alberta in Canada produced about 155 7 bcm and Texas produced about 198 2 bcm [4]

- Agencies that have always had oversight for both upstream and downstream activities Examples Texas Railroad Commission, Norwegian Petroleum Directorate

The Texas Railroad Commission (TRC), one of the older independent regulatory bodies in the world, was granted authority by the Texas Legislature to oversee oil and gas pipeline operations (with pipelines designated as common carriers) in 1917 and jurisdiction over oil and gas production in 1919 The decision to place give the TRC responsibility for upstream activities was to provide a clear authority for enforcement of laws pertaining to the

[1] This section was prepared using several sources *Competition and Liberalization in European Gas Markets*, Jonathan Stern Royal Institute of International Affairs 1998 Statutes and administrative procedures for the TRC AEUB OCC and KCC Basic regulations for ENARGAS and information gathered on other Latin American markets for various studies (see *Position Paper on Unbundling the Natural Gas System in Ukraine*)

[2] *Energy Policies of Ukraine*, International Energy Agency, 1996

[3] *Competition and Liberalization in European Gas Markets*

[4] All data from the U S Energy Information Administration

17

conservation[5] and efficient extraction of oil, to reduce waste, to guarantee coordinated production by competing operators and to balance production and pipeline interests The TRC also has jurisdiction over all natural gas distribution systems in the state of Texas

In Norway, pipeline operations are defined as petroleum activities and are thus regulated by the petroleum law The Norwegian Petroleum Directorate (NPD) has the responsibility for all supervisory activities on the behalf of the Norwegian government NPD also issues rules and regulations The Law as such is handled by the Ministry of Oil and Energy On matters of petroleum resource management (licencing, field planning, reservoir management, petroleum taxes) NPD reports to the Ministry of Oil and Energy On matters of Safety the NPD reports to the Ministry of Local Affairs (responsible for safety for all industry-sectors in Norway) Thus, NPD has integrated responsibility towards the oil and gas industries NPD coordinates input from other governmental agencies NPD handles all supervisory activities toward and contact with the oil companies and issues consents The system is based on "internal control" and it is the operator who is held responsible NPD has the power to stop activities if need be In Norway, the general view is that it is very important to have only one integrated governmental agency like NPD The reservoirs, wells, production facilities, processes and pipeline transportation to terminals or to interconnects for end use are considered an integrated industry system

- Agencies that have shifted to combining upstream and downstream oversight Examples Alberta Energy Utility Board, Oklahoma Corporation Commission and Kansas Corporation Commission

A trend has emerged to combine oversight of oil and gas production and pipeline activities into single regulatory commissions These actions are usually taken to increase regulatory efficiencies and improve communication between field and pipeline operations

The Alberta Energy Utilities Board (AEUB) was formed in 1995 by the merger of the Alberta Energy Conservation Board and the Alberta Public Utilities Board The AEUB has oversight for most oil and gas exploration and production activities (drilling, field maintenance, environmental and safety protocol) Geological and geophysical data reporting requirements are managed by the Alberta Department of Energy which also handles bidding

[5] Explanatory note In Canada and the U S the use of the term "conservation implies those practices, rules and procedures that are designed to ensure efficient production of oil and gas resources and minimize waste Conservation rules generally incorporate production allocations that take into account estimated reserves production flows and reservoir characteristics and are a means of coordinating extraction of oil and gas by multiple producers from a single pool Some U S states are signatories to various agreements that require harmonious conservation practices At times, disputes have arisen between the states and federal government on whether conservation rules constitute a form of prorationing," allowing states to control oil and gas prices via production allocation

for exploration rights The public utilities department of AEUB has oversight for oil and gas pipelines and distributions systems operating within the province [6]

In 1996, the Oklahoma Legislature created by law a Conservation Division within the Oklahoma Corporation Commission OCC) to assume all duties of the previously free-standing Conservation Commission The Legislature assigned all jurisdiction for oil and gas production to the OCC This includes issuance of permits to drill, conservation practices for oil and gas production, environmental and safety protocols The Public Utility Division has authority for all pipeline operations within the state of Oklahoma

Also in 1996, the Kansas Legislature formed a Conservation Division within the Kansas Corporation Commission (KCC) and gave the KCC sole authority over oil and gas production in the state Unlike the TRC, AEUB and OCC, the KCC does not regulate distribution systems since all natural gas utilities in Kansas are owned by municipal governments

- Potential combinations of upstream and downstream authority Example The Office of Gas Supply or Ofgas (Britain)

As part of a review of changes to be made to Britain's Ofgas, serious consideration is being given to establishing authority within Ofgas for natural gas production This is because pricing of natural gas as it comes ashore from North Sea fields and enters pipeline terminals has serious implications for end user costs throughout Britain Offshore oil and gas regulation is provided by the British Department of Trade and Industry, and there are considerable overlaps in regulatory authority between the two entities Ofgas as the established independent regulator is projected to receive this jurisdiction

- Examples of situations where division of authority is posing specific problems Example Argentina and other Latin America

The UK experience with overlaps and conflicts between separate regulatory authorities for upstream and downstream is shared throughout Latin America In Latin America the situation is worse because national integrated oil companies remain in existence and exert considerable market power (see *Position Paper on "Unbundling' the Natural Gas System in*

[6] An interesting difference exists between the TRC and the AEUB which otherwise are strongly compatible agencies in terms of mission, scope and operation AEUB regulates the electric power sector, while in Texas that authority is granted to a separate Public Utility Commission created in 1975 (The OCC and KCC also regulate electricity) Increasing discussion in Texas involves the combination of these two agencies in order to improve regulatory efficiency but perhaps more importantly, to reflect the growing linkages between natural gas and electric power and combinations between gas and electricity operations among private energy companies

Ukraine) In Argentina, where the national oil company YPF (Yacimientos Petroliferos Fiscales) has been successfully privatized, it continues to dominate natural gas production and marketing The independent regulator Ente Nacional Regulador del Gas (ENARGAS) does not have oversight for natural gas (and oil) production and has few options available to stimulate competition in natural gas production or to encourage efficient practices These responsibilities are with the Ministry of Economy and Public Works and Services Likewise control of oil and gas production in other Latin American countries is at the ministerial level and thus is extremely politicized Without the additional steps taken to reduce the role of national oil companies in the region and empower the independent regulators, sharp gaps are appearing between developments in natural gas transportation and distribution and upstream operations

Administratively, the authority granted to NERC with regard to oil and gas production would mean the creation of a division and professional staff to oversee oil and gas field operations, conduct inspections and establish sound practices for competitive production

Adequacy of Downstream Provisions

In statute and administrative rules and procedures, authority and requirements for downstream (pipeline transportation, distribution and other) should be clarified The principles of open access and unbundling should be stated explicitly

- NERC's authority to enforce nondiscriminatory open access and unbundling should be clearly stated in statute
- NERC's approach to implementing nondiscriminatory open access and unbundling should be clearly stated in its administrative rules and procedures

2.3 Specific Considerations

Certain specific considerations should be included in statute with subsequent detail in NERC's administrative rules and procedures

Definition of Licenses for Exploration and Production

- Distinguish licenses for operation of concessions and permits for the drilling of exploration and development wells within concessions
- Clarify jurisdiction for concession license awards One possible arrangement is for the State Committee for Geology to conduct bids or auctions and awards licenses with NERC regulating operating activity (awarding drilling permits and regulating field

activities) A second possibility is to establish a new licensing authority, in order to guarantee neutrality and fairness Removing the authority to grant licenses from NERC will eliminate potential conflicts of interest in NERC's role as regulator for operations

- Develop code ethical conduct and administrative rules and procedures for the licensing authority relative to production agreements, licensee rights and responsibilities, management of geologic information, taxes, royalties, finance, accounting procedures Consider adoption of Association of International Petroleum Negotiators (AIPN) standards for production agreements and contracts and international standards for accounting practices and also for tax/royalty regime to ensure competitiveness

- Develop administrative rules and procedures for NERC's regulatory activities requirements for issuance of drilling permits, oversight of field activities, inspections and other monitoring requirements, reporting requirements for producers, and so on

Licensee Obligations Regarding Environmental Protection

- Separate NERC's authority from that of environmental protection (Ministry of Environmental Protection and Nuclear Safety)

- NERC's requirements should be compatible NERC should have oversight of activities like water disposal and quality of effluents, drilling fluids disposal, etc in accordance with rules and procedures of the established environmental authority and incorporate environmental inspections in with safety and other field inspection criteria Similarly, NERC should be able to inspect for and enforce environmental violations for pipelines and distribution systems

Control of Geologic Information Property Rights

- Designate authority for reporting (same authority as for issuance of concession licenses)

- Specify period of proprietary control of information

Management of Oil and Gas Inspections

- Grant authority to NERC for upstream (producing field), transportation and distribution inspections

Development of Underground Storage

- Clarify that ownership rights established with licensing and extraction extend to oil and gas injected into and removed from storage In some countries where the state controls oil and gas resources but where rights to development are extended to private operators there have been issues associated with injection and removal

State Reservation of Pipeline Ownership

- There should be no language in statute or administrative rules that establishes a right for the Government of Ukraine to take majority ownership in pipelines or distribution systems

Clarification of Transportation Rights

- Establish principles of nondiscriminatory open access and unbundling

- Establish concepts of firm and interruptible contracts for seniority of rights and for release of unutilized capacity (secondary market development)

Tariff Design

- Specify that the tariff methodology, for transportation, distribution and storage must reflect apportionment of costs in accordance with use and type of service

- Establish the nondiscrimination principle for tariff design

Publication of Tariffs and Other Information

- Specify time requirements for publication of tariffs and information on available pipeline capacity

Criteria for Right to Refuse Transportation Service

- Specify those situations in which nondiscriminatory open access may not apply (for example, natural gas to be shipped does not meet standards for pipeline quality)

Management of Natural Gas Imports and Exports

- Grant authority to NERC

A possibility is for this function to reside with NERC as with Canada's National Energy Board, allowing coordination with regard to capacity constraints, development of new transportation capacity, pipeline quality requirements and so on

Management of Natural Gas Distribution Systems

- Specify that NERC has authority for regulating local distribution companies (LDCs)
- Alternatively, individual oblasts may have oversight as delegated by the NERC or other rights and responsibilities as designated by NERC

23

CHAPTER 3
UNBUNDLING

UNBUNDLING

3.1 Overall Rationale for "Unbundling"

Although in every natural gas consuming country or region natural gas plays a distinct role as a local fuel -- because it is not easily transported worldwide -- several "international norms" are emerging with respect to policy and regulatory management, as well as strategic development These norms reflect the global movements of investment capital required to extract natural gas resources and build the infrastructure necessary to bring natural gas to markets Generally, investors in any country or region are seeking common attributes as they evaluate the potential of markets

- Opportunities to participate in the production of natural gas
- Opportunities to participate in the development and operation of transportation, distribution and other infrastructure facilities for the utilization of natural gas
- Opportunities to participate in the development of direct, end use energy markets for natural gas as well as the conversion of natural gas into higher value products, such as electricity and intermediate or final industrial goods (for which natural gas is used as feedstock)

It happens that the requirements in terms of market structures and policy and regulatory management necessary to achieve these investment opportunities coincide with generally accepted principles for improving the efficiency and equity of domestic natural gas markets

- Competition in all segments of the natural gas value chain to the extent possible
- Transparent price discovery for all transactions
- Property rights and sanctity of contracts
- Clear, transparent, consistent, predictable regulatory practices

"Unbundling" -- the separation of pipeline transportation functions from the supply of natural gas and the services associated with gas supply -- has come to play a critical role in facilitating competition in an industry characterized by "natural monopoly" attributes It is a critical component of the open access approach Indeed, a former regulator deemed

unbundling the "essential step" to building markets for natural gas [1] Moreover, the concept of unbundling has become an international one, used widely in regulatory and policy terminology

Ukraine, at present, has a somewhat unique situation in that it serves as a transit country for the supply of natural gas produced in Russia to end use markets elsewhere in Europe However, the basic considerations for market development in Ukraine are similar to every other situation around the world in which natural gas is becoming more important

- The domestic natural gas system must be restructured both to facilitate existing uses as well as to attract investment capital
- Methods must be devised to introduce competition and efficiently manage those aspects of the system where natural monopoly features remain in place
- Flexibility must be increased in order to allow proper pricing for the natural gas resource itself as well as for the infrastructure systems and associated services that are required

Implementation of unbundling in the Ukrainian natural gas system will establish operational conditions that are consistent with European approaches and accelerate domestic natural gas market developments

3 2 DEFINITIONS

Unbundling is defined in two ways

- Functional The utilization of natural gas nearly always involves the shipment of natural gas in pipelines Several functions are involved One is the actual transportation of natural gas molecules The others involve the actions or services associated with the transportation of molecules Traditional, merchant pipeline services combine all of the functions With unbundling, the transportation function is separated from other, associated services that are then provided independently of the pipeline operator
- Contractual The second definition of unbundling involved the process of contracting A traditional, merchant pipeline service combines all of the functions -- the transportation of molecules plus all of the services associated with transportation --

[1]Quote from Roland Priddle, former chairman of the National Energy Board, Canada

26

into one contract Unbundling involves separate contracts for transportation and the various combinations of services that can be procured to ensure successful and efficient shipment of gas molecules

A large array of services associated with the transportation of gas molecules can be provided separately These include (but are not restricted to) the following

- Gas sales Sales to meet load requirements
- Shipping Arranging (contracting for) transportation
- Storage Seasonal storage, injection and withdrawal (may be separate charges)
- Peaking Short term sales of gas to meet unanticipated needs
- Balancing Short term, interruptible arrangement to cover a temporary imbalance
- Meter and meter reading Measurement of gas flows and usage
- Electronic trading Trading systems that either electronically match buyers with sellers or facilitate direct negotiation for legally binding transactions
- Administration Assistance with the administrative aspects of natural gas transfers, such as nominations for pipeline capacity and confirmations, metering for transfers and gas contract control
- Compression May be provided as a separate service
- Risk management Services that relate to reducing the risk of price changes to gas buyers and sellers, for example exchange of futures contracts for physical delivery of molecules (It is likely that a natural gas futures contract will soon emerge on the London International Petroleum Exchange, or IPE Once established, other futures contracts and risk management mechanisms will evolve throughout Europe coincident with liberalization Ukraine's gas restructuring should be accomplished with an eye toward how Ukraine can participate in this process)

Importantly, the concept of unbundling is not limited to the natural gas industry It has come increasingly into use to stimulate competition in the electric power industries, telecommunications and for other shipping network industries like trucking The fundamentals of the concept are simple (though they may be complex in implementation) While integration in industries like natural gas may reflect, and yield some benefits in terms of, economies of scale or scope, it is more likely that many more opportunities are missed to

generate savings and efficiencies This is because the costs of internal transfers within integrated systems are not transparent, nor are they very easily measured The dismantling of integrated systems -- even if separated functions are re-packaged or "re-bundled" -- affords opportunities for savings and efficiencies with the introduction of new market entrants, as well as the flexibility of choice that can be important in developing healthy markets

3 3 THE IMPORTANCE OF UNBUNDLING IN THE NEW MANAGEMENT ERA

The idea of unbundling and the application of this concept rose out of fundamental changes in thinking about the economics of natural gas industry systems and the search for ways to introduce market forces in the provision of natural gas The Appendix at the end of this paper reviews that history and describes the new management era for natural gas

Reasons for Adopting Unbundling

Nearly every country that has engaged in extensive restructuring of its natural gas sector has introduced unbundling as a key component There are several reasons for wide adoption of this approach

- Reduction of monopoly power Most important is that unbundling reduces and limits the ability of vertically integrated enterprises or pipeline operators to exert market power With unbundling, the accounts of the former merchant pipeline (or LDC) are separated from those of the new affiliated entity that provides unbundled services In this way, the pipeline is not able to discriminate in favor of the new affiliated company, and the affiliated company must compete with all other potential providers of unbundled services

- Price discovery and savings Unbundling enables natural gas consumers to distinguish individual costs associated with natural gas supply and service It also allows the benefits of competitive price formation for gas (either from production or from more efficient providers of services) to flow through to consumers

- Information flows Related to the above, unbundling allows information on regional variations in production and transportation costs to flow through to consumers

- Multiple transactions Unbundling facilitates potential efficiencies to be derived as new types of transactions and combinations of transactions occur in the marketplace Transactions can occur directly between producers and consumer, through third parties or involve the affiliate of the former merchant pipeline

- Options for "re-bundling" A flexible approach may allow "re-bundling" in a very few restricted cases where other alternatives are not available, but the result is that services are packaged more efficiently

Issues in Implementing Unbundling

There are several issues for regulators related to implementing unbundling

- Adequate competition upstream The main purpose of unbundling is to distribute the benefits of competitive production and wellhead pricing for natural gas throughout the market place Therefore, the effectiveness of unbundling policies is diminished if market power exists upstream This is usually the case in countries where state-owned enterprises dominate exploration and production activities In these situations, consumers are denied the benefits of competitive wellhead pricing for natural gas Thus, a key consideration in these situations is how to instill competition upstream

- Meeting technical requirements In order to implement unbundling, certain technical requirements must be satisfied These include metering, balancing, billing and so on In countries where these requirements are not met, for example where gas use is not metered, unbundling cannot be implemented In that case, these functions must be established as part of the transition program Where these functions already exist, it must be possible to separate them so that they can be provided by the market

- Market design and regulatory management The key task for regulators is accomplishing the separation of functions -- transportation and natural gas sales and associated services In order to prevent resumption of market power, regulators typically choose to implement unbundling with the creation of strong functional barriers involving legal and accounting practices Where re-bundling is allowed, regulators typically clearly define the cases and situations in which re-bundling can occur and provide strong oversight

- Adequate competition in the provision of unbundled services The effectiveness of unbundling policies depends upon the presence of alternative providers of unbundled services, or the ease with which alternative providers are able to enter a market Problems with entry are usually found in countries where the dominant state enterprises are vertically integrated and act as merchants or where merchant pipelines are state-owned or controlled In these cases, the regulators must be able to control the power of dominant enterprises or the governments must undertake deep enough restructuring to limit the power of these enterprises

- Depth of market If the market is constrained in some way such that growth in the number and types of natural gas customers is limited, then unbundling will be less

effective In these cases, regulators or governments must take actions to remove the constraints to natural gas market development

- Tariff methodologies Sound and transparent tariff methodologies and tariffs that correctly account for pipeline (or LDC) costs and system use, allow reasonable market-based returns and provide appropriate market incentives are essential

- Capacity information Transparency in capacity availability on pipeline or LDC systems is essential

- Secondary market Holders of pipeline or LDC system capacity must be able to release unutilized capacity into a secondary market Otherwise, the number and type of transactions that can be attained with unbundling will be constrained

3 4 INTERNATIONAL EXPERIENCE WITH "UNBUNDLING"[2]

A number of brief descriptions of experience in other countries and regions with unbundling illustrates both the advantages of unbundling and regulatory and industry challenges associated with implementation

3 4 1 Canada and the U S

Canada and the U S have the greatest amount of experience with unbundling

- Regulatory actions followed, rather than led, market developments Natural gas industry restructuring and the implementation of unbundling took place between the early 1980s-1992, the year in which restructuring was finalized in the U S The main difference between natural gas restructuring in Canada and the U S and what has

[2] This section was compiled using several sources "The Economics of Natural Gas in Mexico -- Revisited," Michot Foss Francisco Garcia H William A Johnson *The Energy Journal* special edition North American Energy After Free Trade September 1993 *Review of Worldwide Natural Gas Regulatory Regimes* prepared by the University of Houston Energy Institute for the Energy Efficiency and Market Reform Program conducted by Hagler Bailly Consulting for the U S Agency for International Development on behalf of the National Electric Regulatory Commission of Ukraine October 1997 *Natural Gas Markets in Colombia* Jorge Mercado, University of Houston Energy Institute working paper, summer 1997 "Worldwide Transitions Energy Sector Reform and Market Development," Michot Foss, *Natural Resources and Environment*, ABA Section, Natural Resources, Energy and Environmental Law, Spring 1998 *Competition and Liberalization in European Gas Markets A Diversity of Models*, Jonathan Stern, Royal Institute of International Affairs, 1998 *Electricity and Natural Gas Marketization in the EU*, Vanessa Baird, University of Houston Energy Institute, August 1998 Various documents from the U S Energy Information Administration, Ente Nacional Regulador del Gas-Argentina National Petroleum Agency-Brazil

taken place in other countries is that regulators in North America were responding to and supporting market initiatives Proposals from new market entrants to provide unbundled services provided incentives to regulators to create programs that facilitated these developments

- Regulators established clear separation of functions In the orders and rulings put forth by the National Energy Board-Canada (NEB) and the U S Federal Energy Regulatory Commission (FERC) to formalize unbundling, clear functional and legal separation of accounts was required The term commonly used is "Chinese wall" to reflect the divisions that merchant pipelines had to implement -- of revenue streams, personnel and marketing programs in addition to legal and accounting departments Typically, pipeline companies created legal entities for the operation and maintenance of pipeline assets, and separate marketing affiliates that are not subject to regulation that are able to provide unbundled services Within the corporate structure, there can be no communication between the two entities that could lead to discriminatory treatment of the pipeline company in favor of its marketing affiliate Regulators in both Canada and the U S stipulated that information on availability of pipeline capacity, pipeline transportation charges and release of unutilized capacity to the secondary market be transparent and made available on electronic bulletin boards in order to ensure nondiscriminatory open access and unbundling As a further step, regulators required that common standards be used so that electronic bulletin boards could not be used to weaken the "Chinese wall "

- The number of providers of unbundled services grew rapidly In addition to the competitive provision of unbundled services available through the marketing affiliates created by pipeline companies, a large number of independent third party marketing and brokering firms have been established Other competitors include producers of natural gas, financial houses that have traditionally participated in commodity risk management (and have extended this expertise to market and package services for natural gas users), large natural gas customers and some government agencies (for example, the State of Texas markets some of the natural gas produced on state lands to other state government agencies, managing the procurement of unbundled services) It has been estimated for the U S that in 1980, prior to natural gas industry restructuring and unbundling, approximately 339,000 transactions took place By 1991, with restructuring and unbundling well underway, the number of transactions grew to an estimated 10,757,000, generating additional value and revenues in the marketplace, creating savings for consumers and tax proceeds for governments

Results and Issues

The major objectives of restructuring in Canada and the U S have been met Open access and unbundling have been implemented with no service disruptions Overall, end use prices

31

have declined as competition was asserted An array of new products and services have been developed and new enterprises have been formed to serve the needs of customers New natural gas resources have been developed and brought on line

The key issues related to restructuring and moving forward are these

- Allocating the costs of transition Because of the size, maturity and structure of the natural gas industries in Canada and the U S during restructuring, substantial costs were involved in the transition to market-based operations For the U S , these costs approached $6 billion, the bulk of which were attributable to long-term take-or-pay contracts[3] held by pipeline companies with natural gas producers (on the supply end of the chain) and LDCs (on the delivery end of the chain) Regulators spread these costs throughout the industry and customer base Some pipelines that had entered into very risky contracts were forced into financial reorganization in addition to the required regulatory restructuring LDCs were most successful at passing on the costs of transition to their customers because state and provincial regulators did not force open access and unbundling in distribution

- Distribution remains less competitive Related to the above, the situation for competition in the distribution segment is quite uneven In Canada, provincial regulators and the LDCs themselves have been much more aggressive in experimenting with open access and unbundling than state regulators and LDCs in the U S Indeed, portions of Canada offer the most competitive pricing for natural gas in the world In the U S , because prices to residential and small customers continued to rise after restructuring was completed, regulators at the state level have become much more active in requiring more competitive practices for distribution For the past three years, prices in the distribution segment have dropped and many more retail customers across the states have choices and options for their natural gas service than before

- Facilitating market-based rates in the most competitive markets In many parts of Canada and the U S , there is sufficient market depth so that tariffs can be based on the market rather than established purely by regulatory design The shift toward market-based rates has been much more compatible with pricing for unbundled services yielding additional benefits to consumers

[3] Long-term, take-or-pay (TOP) contracts were traditionally used in Canada and the U S by the merchant pipelines The pipeline companies would contract for gas from producers, and then engage in separate contracts for the delivery of the gas to LDCs The producer contracts obligated the pipelines to take specified volumes of gas In situations where these contract terms were abrogated, strong penalties were enforced At the other end, LDCs "minimum bill" requirements to take specified deliveries of gas The introduction of open access during the 1980s necessitated the abrogation of all of these contracts

- Evolution of market centers and hubs A key feature of the restructured natural gas systems in Canada and the U S has been the evolution of market centers and hubs These are geographic concentrations of natural gas supply and transportation capacity that provide logical points for price discovery, contracting, risk management, load management and many other activities Market centers and hubs have arisen as market solutions to price discovery and packaging service needs with respect to unbundling In addition to the array of services listed previously that can be offered separately with unbundling, market centers and hubs can add the following

  - Wheeling Transfer of gas from one interconnected pipeline to another through a header (hub), by displacement (including exchanges) or by physical transfer over the transmission of a market center pipeline

  - Parking Short-term transaction in which the market center holds the shipper's gas for redelivery at a later date Parking may involve storage or displacement or variations in line pack

  - Loaning Short-term advance of gas by a market center to a shipper that is repaid in kind by the shipper a short time later May also be referred to as "advancing," "drafting," "reverse parking" or "imbalance resolution "

  - Hub-to-hub transfers Arranging simultaneous receipt of a customer's gas into a connection associated with one center and an instantaneous delivery at a distant connection associated with another center, a form of "exchange" transaction

All of these services are available on an unbundled basis Market centers and hubs have become central elements in the open access-unbundling era of management Ownership and operation of market center and hub facilities is heavily decentralized, although it is typical for a single company to arise as operator Access to market centers and hubs is widely available, in keeping with the regulatory framework, and pricing of services is quite competitive With respect to risk management services, the existing natural gas futures contracts administered by the New York Mercantile Exchange are based at hubs or market centers The Henry Hub contract is located in south Louisiana on the U S Gulf Coast This is the largest hub (most of the natural gas marketed and traded in the U S is delivered through the hub) and thus the most widely used natural gas contract for risk management The major aggregating pipeline for Henry Hub is operated by Texaco The Permian Basin contract is set at the Permian Basin pool facility in West Texas, one of the largest cash markets for gas in the U S , which is managed by El Paso Natural Gas Company The Alberta (Canada) contract is set at Nova Gas Transmission Ltd 's pooling point in that

33

province, the largest single pooling point for gas in North America There are many implications for Ukraine from the market center-hub concept and other natural gas markets are evolving in this direction as well (see below)

- Incentives for producers While natural gas production has remained competitive, increasingly so, in fact, a new concern is whether producers in some parts of Canada and the U S can withstand the market volatility to which they are subject Canadian producers are especially vulnerable because of transportation bottlenecks within the province of Alberta Regulators among all the producing provinces and states, and their federal jurisdictions, are encouraging market growth by rationalizing certification requirements for new pipelines and regulatory requirements at the field level Market adjustments are already underway as traders and suppliers are seeking ways to access low cost gas in remote basins and providers of risk management services are developing new products targeted to producers

3 4 2 Argentina

In the early 1990s Argentina advanced its overall economic reform program into restructuring the energy sector, including natural gas Argentina has the most substantial infrastructure for natural gas in Latin America and the most extensive use of natural gas across all customer classes and applications Argentina first privatized Gas del Estado (GDE) through the 1992 Gas Law, which controlled the Argentine natural gas transportation and distribution grids From the GDE privatization, there are now two main transportation companies, Transportadora del Gas Norte (TGN) and Transportadora del Gas Sur (TGS), both owned and operated by consortia of Argentine, U S , Canadian and European companies, and eight investor-owned distribution systems, also with combinations of Argentine and foreign direct investment Yacimientos Petroliferos Fiscales-Argentina (YPF), Argentina's national oil company was privatized in 1992-1993 in the largest public stock offering ever made on the New York Stock Exchange

- Establishment of ENARGAS Ente Nacional Regulador del Gas (ENARGAS) was created in 1993 to serve as the national regulator for natural gas pipelines and distribution and to create an open, transparent and competitive environment for investment in Argentina's privatized natural gas sector

- Basic regulations The basic regulations put forth by ENARGAS specify nondiscriminatory open access and separation of transportation from the sales and services of natural gas (unbundling) Pipeline transportation charges (tariffs) are posted on the Internet Third party marketing is encouraged but developments have been constrained by YPF's market power A British-style price cap formula is used for tariffs for both transportation and distribution

Results and Issues

Argentina has clearly become the natural gas market leader in Latin America since introduction of its regulatory program It has also served as the role model for the region with regard to regulatory management and market development In addition to all of the options now available to customers through the regulatory scheme, new investment has taken hold and companies operating in the Argentine gas sector are leading investment activity elsewhere in the region End user prices of natural gas have become more competitive and industrial enterprises in particular have reaped benefits from unbundling Several issues remain

- Shortcomings of privatization and regulatory design Although the YPF privatization created a critical pathway for private investment in Argentina's natural gas sector, the allocation of natural gas producing fields as part of the privatization process left YPF with considerable market power The company still controls around 65 percent of marketed natural gas production in Argentina This has made it difficult for third party marketing to evolve as it should given the regulatory design, and the slow pace of growth of third party marketing has limited the competitive options for unbundling While ENARGAS is the strongest and most independent of the Latin American national regulatory commissions, it does not have oversight of natural gas production and can therefore exert little influence on YPF (Upstream activities are managed by Argentina's Ministry of Energy and Ports More information on the issue of YPF's status in Argentina and implications for ENARGAS is included in a separate report, *Minimum Requirements for the Development of Ukraine's Natural Gas Sector*) However, an advantage inherent in Argentina's gas sector over other Latin American countries is the presence of many indigenous companies who are experienced with natural gas production and increasingly so with marketing and providing services Multinational firms that entered the Argentine market, lured by its size and prospects, are also an important presence Eventually, a number of companies will be able to challenge YPF's position making for a much more diverse and flexible marketplace

- Market development Argentina is best positioned in Latin America, once participation in natural gas production becomes more diversified, to establish market centers and hubs as well as to introduce futures contracts and other mechanisms for risk management This will expand the range of service options available to both providers and customers In addition to domestic production, natural gas from Bolivia and Peru can enter Argentina's northern markets, thus creating many opportunities for arbitrage based on an array of price differentials across many basins and transportation systems Both Bolivia and Argentina are competing to serve as the hub for the lower South American market (often referred to as the "Southern Cone"to reflect the Mercosur trade pact of Brazil, Argentina, Uruguay, Paraguay and Chile as

35

an associate member) Argentina's advanced regulatory system and open access-unbundling approach should place companies there in a strong strategic position Unlike the North American Free Trade Agreement (below) the Mercosur is an even weaker instrument for energy Market events are likely to overwhelm the lack of attention to energy in the trade pact, but this raises the possibility of future negotiations among the member countries to re-affirm the open access-unbundling principles for trade

3 4 3 Mexico

Although Mexico geographically is part of North America it is culturally, politically and socially part of Latin America After Venezuela, Mexico has the largest reserves of oil and gas in the region but provides a mid-point comparison to Argentina and Colombia with respect to maturity of natural gas system and natural gas market development In 1938 the Mexican government nationalized private (Mexican and foreign) interests in oil exploration and production The Mexican constitution is the most restrictive in Latin America with regard to reserving these activities to Petroleos Mexicanos (Pemex), the national oil company In spite of Mexico's abundant gas reserves which, like Venezuela's, are largely associated with oil and therefore quite low cost, and in spite of demand in the U S , Mexico has never developed a sustained export program This is largely due to disputes between Mexico and the U S on pricing, many centered on transportation costs to be charged for a pipeline built specifically to export gas in the 1970s, and nationalist interests against the export of natural gas The result was that nearly 30 percent of Mexico's natural gas production was wasted through flaring or venting, while most of the remainder of production was dedicated for petrochemical feedstock In 1995 Mexico launched a program to attract private investment into its natural gas sector and begin to develop domestic markets for gas, in response to both financial and environmental imperatives

- Creation of the CRE The Comision Reguladora de Energia (CRE) was created in 1993 as part of Mexico's then Ministry of Energy, Mines and Parastatal Industries (SEMIP) to administer changes in Mexico's electricity law that allows private investment In 1995 Mexico took two major actions One was to alter the Regulatory Law of Article 27 in Mexico's constitution so that natural gas transportation, distribution and storage were removed from the activities reserved for Pemex The second action was to establish CRE as an independent regulatory authority Apart from actions designed to allow development of natural gas markets in Mexico independently of Pemex, Pemex itself was reorganized into four subsidiaries in 1991 -- Exploration and Production, Refining and Marketing, Secondary Petrochemicals (which Mexico has been trying, unsuccessfully thus far, to privatize) and Gas and Basic Petrochemicals The creation of the latter subsidiary (generally referred to as Pemex Gas) was an effort to strengthen commercial interest in natural gas within Mexico's leading company (Pemex remains Mexico's largest industrial enterprise)

- Basic regulations CRE has adopted the principles of nondiscriminatory open access and has a stated preference for third party marketing and unbundling (to offset Pemex's market power) CRE administers the auctions of state owned systems as well as certifies new systems Because the Mexican government did not diminish Pemex's control of natural gas supply, eliminating the possibility for competitive production and prices, the regulatory framework relies on the alternative of natural gas imports from the U S (and Canada, via backhaul[4]) as a substitute A first-hand sales price is set at the Houston Ship Channel and a formula for determining netbacks to Mexican customers Clearly, those customers with access to supplies of gas from the U S are the only ones to realize true, competitive prices However, a tariff on imported gas is charged with the current rate at five percent of cost In contrast to official language from Mexico, the U S and Canada, accelerated phase-out of the import tariff does not appear to be imminent (The North American Free Trade Agreement or NAFTA scheduled tariff phase out at one percent per year over ten years) Price caps are used for both transportation and distribution tariffs Transportation and distribution tariffs are posted in Mexico's Diario Official

Results and Issues

Since implementation of the regulatory framework considerable investment has been made in Mexico as companies from Canada, the U S and Europe have participated in auctions for previously state owned assets Nearly all of these assets are distribution systems with strong requirements for new investment and load growth Two major gas-fired electric power projects are underway One is a build-lease-transfer to Mexico's national electricity company with a gas pipeline owned by Pemex in a joint venture with a U S company The other is an independent power project that includes a long distance pipeline (also independently owned and operated) No effects of the regulatory scheme have emerged in natural gas prices, because prices are still established by the government and because LPG is the dominant residential fuel Industrial users are benefitting somewhat, mainly from improvements in Pemex's operations A large number of issues remain unresolved

- Role of Pemex The market power of Pemex remains the largest impediment to natural gas market development in Mexico Pemex's total control of domestic supply leaves any independent system operator, customer or third party marketer with few options but to contract for supply and many associated services from Pemex In

[4] Backhaul refers to the process of satisfying supply contracts for gas by means of displacement elsewhere in the pipeline system Actual molecules of gas from Canada would never be used to satisfied requirements in Mexico because of the high cost Rather gas from Canada is used to satisfy contract requirements elsewhere in the U S , displacing U S gas As this process continues along the pipeline system, displaced U S gas is ultimately used to satisfy contract requirements in Mexico

addition, Pemex retains control of many facilities critical to transportation and distribution operations A critical piece of Mexico's natural gas restructuring is implementation of open access on Pemex's national pipeline grid, an action that has not yet occurred and which Pemex is trying to forestall (Until open access is implemented, the competitive benefits of imported gas will be nil) Pemex is also adamantly opposed to lifting the natural gas import tariff Mexico's regulatory regime allows Pemex to price discount under certain circumstances, preserving a disadvantage for independent suppliers With the restructuring of Pemex, Pemex Gas has become one of the most commercially advanced parts of the company, improving service to customers and proceeding with many improvements to the Pemex system (such as electronic management of Pemex's pipeline and information systems and the introduction of trading and marketing operations) This has been good for many customers but will bolster Pemex's dominant position Debate has renewed on an old issue -- financial independence for Pemex and control of its funds for reinvestment in its core businesses Mexico depends heavily on revenues generated in its oil sector for general fiscal needs Mexico's Secretary of Energy (for the re-named Ministry of Energy) serves as chairman of the board of Pemex and final decisions on Pemex's budget and product prices are made within an executive committee that includes the president, his chief of staff and ministers of energy, finance and commerce as well as the director general of Pemex and his key deputies All of this is working to reduce the benefits of Mexico's regulatory initiatives

- Role of the CRE While the CRE has made considerable progress, it is hampered not only by the structure of Mexico's energy sector but by potential conflicts of interest associated with the CRE's duties in both privatizing assets and regulating their operation by new owners

- Role of the NAFTA Mexico has an important role to play in North American market development and supply/demand balances and many physical interconnections exist between Mexico's pipeline system and that of the U S , and between local distribution systems on both sides of the border Market analysts generally envision a highly integrated North American grid with open access and unbundling systemwide While the CRE has developed a regulatory regime that broadly parallels that of Canada and the U S , the NAFTA excludes any responsibility on Mexico's part to reciprocate on national treatment with respect to market access Mexico was also allowed to exclude itself from security provisions related to natural gas supply (that is, Mexico could withdraw gas supplies from the U S or Canada markets if it deemed them to be critical to national interests)

3 4 4 Colombia

In the 1980s Colombia allowed foreign investors to expand their presence in oil and gas exploration and production and in 1997 created a boost by improving production association contracts that extended license periods and reduced participation by Ecopetrol, the national oil company Colombia launched a gas "massification" program to expand the domestic market with a build-operate-transfer scheme for a major new pipeline and interconnects and the sale of state-owned distribution assets to private investors All natural gas produced in Colombia is for domestic applications In spite of the substantial political risks that plague Colombia, the regulatory program and process of building natural gas markets has continued unabated

- Establishment of CREG The Comision Reguladora de Energia y Gas (CREG) was established in 1994 to create regulatory frameworks for investment in both electricity and natural gas and to oversee investment

- Basic regulations The regulatory framework for gas established by CREG calls for nondiscriminatory open access and separation of transportation and natural gas sales and service Price caps are used for tariff design Tariffs are published in Colombia's federal register of codes

- Natural Gas Law of 1997 Ecopetrol remains the national oil company of Colombia In order to accelerate private development in natural gas, the law of 1997 separated Ecopetrol's gas businesses into a new entity, Ecogas Ecogas participates in natural gas production with private (multinational) companies and can participate in downstream activities as well There has been considerable speculation that Ecogas could eventually be privatized

Results and Issues

Of the Latin American markets, Colombia's faces the most extreme uncertainty as a consequence of political risk Guerilla activity continually disrupts operations and places personnel in danger Establishment of a regulatory framework has been critical to attract investors under these circumstances CREG's initial focus was on electricity Introduction of the massification program required an expansion of regulatory authority to gas As with Mexico, it is too early in the process for the regulatory framework to be reflected in end user prices However, investment has been flowing into auctioned distribution systems, new pipeline ventures and expanding natural gas production An advantage Colombia enjoys over Mexico is participation by many producers in resource development although Ecopetrol exerts significant influence The major issues follow

- Depth of market The CREG and Colombian government are committed to market development for gas, but the relatively immature stage of infrastructure and market are impeding developments Until a natural gas market exists that is deep enough it

29

will be difficult for Colombia to obtain the full extent of benefits of its regulatory framework and resource base

- Role of Ecopetrol Ecopetrol remains a politically strong entity and thus a barrier to many of the CREG's efforts Although the CREG is an independent agency, its close ties to Colombia's Ministry of Energy limits the commission's effectiveness against Ecopetrol and political interests aligned with the national company

- Market design CREG is anxious to set up the basic framework that will facilitate the development of natural gas market centers and hubs and increase the possibilities for unbundled services, trading, marketing and risk management It views these actions as opportunities to diminish Ecopetrol's market power The commission and ministry are preparing to explore these possibilities in detail with World Bank Assistance

3 4 5 The Latin American Experience Overall

Many lessons for Ukraine are evident in the Latin American experience, not only for the specific consideration of unbundling but for natural gas sector restructuring on the whole The Latin American experience has largely been positive, as the examples above illustrate Argentina, Mexico and Colombia span the range of options being pursued throughout the region, with Argentina considered most advanced, Mexico least advanced and Colombia representative of solid efforts in the middle of these extremes

- Establishment of regulatory regimes At this point, nearly every Latin American nation has an independent regulator with oversight of gas and sometimes also electricity The entry of Brazil into the natural gas restructuring process will add an important element since Brazil is likely to become Latin America's largest consuming nation, and a net consumer of gas at that The recently established National Petroleum Agency (ANP) also has responsibility for gas (and oil) production and is overseeing the privatization of producing fields that have, to this point, been the property of Petroleo Brasileiro S A (Petrobras), Brazil's national company Another important development is the hoped for restructuring of Venezuela's sector as part of a massification program similar to Colombia's

- Adherence to established principles With some deviation, reflecting regional and national interests and differences, the Latin American regulatory commissions have adopted the open access-unbundling approach with related considerations of price and tariff transparency and market-based incentives in tariff design

Results and Issues

A number of crucial issues linger on for Latin America

- Role of national (or former national) companies Without exception, the market power exerted by companies that remain positioned as vertically integrated national monopolies, and even those that have been fully or partially privatized, is the largest barrier to implementation of unbundling and natural gas restructuring in general The power of these organizations impedes competition in production and marketing, limiting or preventing the full benefits of open access and unbundling Political will to deepen restructuring and remove the influence of these companies will depend upon other economic and social considerations (and national interests, in the case of the larger producers) Where the needs of consumers have taken precedence, as in Argentina, the extent of restructuring is greater It is useful to note that Argentina's tax base with competitive production has surpassed by far what YPF could generate as a national monopoly Similarly, performance of Petroleos Venezuela (PDVSA) has vastly improved since Venezuela allowed private investment back into the oil sector in the 1992 apertura These examples are placing greater pressure on Mexico, but as yet to no avail Apart from the market power issue, the dominance of national companies negatively effects natural gas pricing from the field and throughout the marketplace For example, YPF can behave like a swing producer, often engineering pricing to suit its own objectives, wreaking havoc downstream of the field At the other extreme, Mexico's solution of relying on imports to generate competitive pricing is a poor substitute to competition within and across Mexico's rich producing fields and basins

- Regulatory regime The national regulators, while officially independent, continue to be subject to varying degrees of political influence This is strongest where national companies are most entrenched Another concern is where the regulator also plays a large role in privatization of systems The best regulatory performance has come where distance between regulator and privatization is greatest (Argentina and Colombia)

- Market depth Open access and unbundling are working best (Argentina) where the natural gas market is most developed in terms of potential competitors upstream, downstream (transportation, distribution) and in marketing/brokering Extent of gas use and number of customers are also factors Unlike Canada and the U S , most of the Latin American countries do not enjoy extensive natural gas market depth, and growth in natural gas use is constrained by the pervasive use of subsidies, including those for other fuels like liquefied petroleum gas (LPG) that compete with natural gas for domestic and some commercial applications Industrial and electric power applications offer the best opportunities for natural gas market development across the region as well as for market pricing

- Tariffs and management of pipeline capacity Issues have arisen in the application of price cap methodologies with respect to adequate returns for investment in

transportation and distribution systems Overall, Latin American regulators are attentive to tariff design issues and willing to experiment, keeping to the goals of stimulating competitive, market-base performance In most locations, market depth does not support a well-developed secondary market for capacity release

3 4 6 Britain

Besides North and South America, the other region of interest and useful analogies for Ukraine is, of course, Europe Several dynamics are influencing the European situation

- EC Gas Directive The natural gas directive was finally passed by the European Commission (EC) in December 1997 and approved by the European Parliament in June 1997 Although the directive opens the wholesale (bulk) market to competition, it does not mandate third party access or unbundling

- ECJ The weak position on open access and unbundling taken in the directive is likely to clash with precedents already established by the European Court of Justice (ECJ) that clearly support the essential role of unbundling in providing fair and open transportation Although the ECJ has declined to rule specifically on open access, the court is expected to continue to issue decisions that support the elements of open access, consistent with the court's stance on other industries (especially telecommunications)

- Energy Treaty The European Energy Charter Treaty, which came into force in April of this year following ratification by the required 30 countries, lays out strong conditions for competition, open access and nondiscrimination

- British experience Britain's experiment with natural gas sector restructuring has brought the open access-unbundling principles to Europe's shores and is driving much of the debate among other member countries and within the EC

Britain's natural gas sector evolved with the discovery and development of gas in the North Sea in the 1960s British Gas, a state owned, national vertically integrated monopoly controlled supply, transportation and distribution although resource development in the North Sea, including the British Sector, was competitive The Oil & Gas (Enterprises) Act of 1982 was passed to set out the aims and objectives of the privatization of British Gas The main issue was to break down the British Gas monopoly over supply, enabling the introduction of competition

- Creation of the Office of Gas Supply The 1986 Gas Act brought about fundamental changes necessary for the privatization program to proceed First, Ofgas, The Office of Gas Supply, was established as the regulatory body over the gas industry Its role

is to monitor gas industry privatization and ensure that customers' rights are recognized in every aspect Second, British Gas was reorganized into a public limited company (Plc) as a monopolist with secure markets only for the medium term BG Plc shares were released onto the stock market Major new private sector companies were created Some were established by oil and gas companies already active in the North Sea, others were ventures by the electricity companies and some are truly independent The Gas Act emphasized the need for vigorous competition among the new independent suppliers in order to undercut British Gas prices and provide options for consumers when choosing their suppliers The ultimate goal was to introduce competition in stages with the industrial sector first, followed by commercial and then residential users

- Basic regulations The view at Ofgas is that there are functions that are clearly monopolistic (pipelines, system operator and gas exchange) and those that are clearly not (gas production, meters, meter reading, storage, shipping, supply, connections) [5] Ofgas sets prices charged by British Gas where it still has a monopoly, monitors its levels of service, and protects the interests of gas consumers Under an amended Gas Act 1995, Ofgas is now responsible for securing competition in gas supply to domestic customers, and issues licenses to competing companies for the transportation, shipping and supply of gas, the fees for which provide the agency's operating budget The principal job is to ensure British Gas does not take unfair advantage of its monopoly powers This is done by limiting the prices the company can charge and setting standards for customer services In contrast to the NEB, FERC and state and provincial commissions in the U S and Canada, Ofgas uses price cap mechanisms (the model for much of what has been developed in Latin America) A transportation and storage price cap controls what TransCo, which is part of BG Plc and is the public gas transporter and operator of the pipeline system, can charge British Gas Trading and other users for transporting gas in its pipelines as well as for storage The pipeline system is operated on a contract carriage basis (suppliers arrange for transportation from beach[6] to final customer), but with the recognition that pipeline transportation is monopolistic A supply price cap limits the prices British Gas Trading, which is part of Centrica, can charge domestic consumers In addition to price and service regulation, Ofgas oversees conformance with the Network Code, established in 1996, which sets out the rights and responsibilities for both TransCo and all gas shippers using the existing grid for transportation and storage Under the code, shippers are liable for any imbalances in their daily shipments With the network code fully operational in 1998, tariff formulas for gas suppliers will no

[5] From a presentation by Clare Spottiswoode, director general, Ofgas

[6] Natural gas produced offshore enters the transportation system at several beach terminals Field prices are established at these points

longer apply Gas prices will be left to market forces, including those charged to Britain's 18 million small commercial and residential customers

Results and Issues

When all phases of restructuring are completed by the end of this year, Britain will have the most competitive market in the world from the end user perspective Since 1986, under Ofgas regulation, domestic gas prices have fallen in real terms by 24 percent Unbundling has vastly increased supply and service options With the opening of the Interconnector next year, pressure from Britain for liberalization in Europe will grow rapidly Issues in restructuring and for the future are below

- Transition costs Like U S and Canadian companies before restructuring, BG held contracts with North Sea gas producers for supply With falling gas prices as a consequence of competition, BG and its suppliers faced a situation in which the value of gas in the contract was higher than in the marketplace, rendering the contract unsustainable, while new competitors in the U K market were able to contract for the cheapest gas supplies Renegotiation of the TOP contracts was essential to implementation of restructuring, but the issues over reapportioning costs became politically difficult

- Price cap An issue in regulatory methodology is setting the level of the cap Determination of this value relative to performance of gas companies can be difficult, although it may bear less political conflict than defining a company's rate base for rate of return (or cost of service) regulation traditionally used in the U S and Canada

- Regulatory design While the Network Code strongly embraces the open access-unbundling principles, it is complex and likely to exert some impacts on market development Some of the areas of most concern are capacity nominations, implications for offshore producers from the varying costs for transportation entry at different beachheads, daily balancing requirements and mechanisms including developments for electronic information, determination of storage requirements and the extensive metering that will be required With respect to Ofgas itself, the agency was unusual in that there is only one commissioner Ofgas is currently being restructured so that there will be three commissioners There is also serious consideration being given to granting Ofgas regulatory oversight of natural gas production (see Chapter 2, *Minimum Statutory Requirements for the Development of Ukraine's Natural Gas Sector*)

- Market depth With the onset of competition and falling gas prices, suppliers in the U K face low and diminishing profit margins in their businesses, a reality in the U S , Canadian and Argentine markets as well In large part this is due to problems in

implementing domestic sector competition As in the U S and Canada, fear and uncertainty about reliability of gas service and ultimate cost of service, particularly to residential customers, is impacting full implementation of domestic competition However, with about one-third of natural gas used for direct home heating in all three countries, this leaves out a large portion of demand that would stabilize market development

- European context Increasing market mass as a result of additional experiments with restructuring on the continent would help to stabilize the British market, via additional points for trading and balancing flows

3 4 7 The Potential for Unbundling in Europe

Given the strong commitment established in Britain, but also the difficulties associated with privatizing BG and implementing the regulatory scheme, and the positions taken by the EC and ECJ, the outlook for Europe is strongly positive with respect to open (third party) access and unbundling A number of drivers exist in addition to those at the EC level and the British experience

- Developments in other member states Apart from the British experience, the other member countries being closely watched are Spain and Germany Spain is particularly interesting for Ukraine because there is effectively no domestic production This has caused Spain to pursue import option aggressively The country is now served by a recently opened pipeline to import additional gas from Algeria Spain has also made a significant commitment to liquefied natural gas (LNG) with three terminals Another parallel for Ukraine is Spain's industry structure Much of Spain's gas market was consolidated into a powerful monopoly, with the 1991 acquisition of Spain's two largest distribution companies by Repsol, which merged these operations with its own distribution companies to form Gas Natural, and Gas Natural's subsequent purchase of 91 percent of Enagas, Spain's monopoly transmission company, in 1994 In contrast, the new Spanish government in 1996 viewed liberalization as the most rapid course to satisfying EC requirements for European Monetary Union This apparent paradox has left Spain's major companies facing the increasing prospect of open access and unbundling A presidential decree mandated open access in 1996 and the Hydrocarbons Bill in 1997 took a more aggressive path for opening Spain's wholesale market than has the EC directive For Spain's major companies, though, these developments will allow them to push for liberalization elsewhere in the EC With their access to imported supplies they will be effective competitors Germany is key because it is the entry point for much of Russian gas Wintershall, a new competitor with growing influence due to the agreement it signed with Gazprom in 1990, demonstrated that the status quo enjoyed

by Germany's large established monopolies could be challenged The German Cartel Commission has played a key role in moderating monopoly influence

- Development of gas-on-gas competition New and more competitive production coming online, new pipeline outlets and new supply sources external to Western Europe (Algeria, the Middle East and Central Asia) are adding to the perception that supplies of gas are secure and thus market restructuring is desirable Open access-unbundling provides the means for price discovery from multiple supply sources and for prices to reflect multiple transportation and service options
- Customer-driven marketplace As in North and South America, industrial customers in Europe are the principle driving forces for natural gas (and electricity) restructuring as they seek savings, better values and flexible options

At the same time, however, the process is likely to move slowly because of a host of concerns

Issues for European Liberalization

- Status of Europe's monopolies The strength of merchant pipeline monopolies in Europe poses the biggest obstacle to implementation of open access and unbundling

- Regulatory design There is little consensus among EC member states at the current time regarding the appropriate strategy for restructuring, in particular whether independent regulatory agencies are the appropriate vehicles although there is steady movement in this direction For most member states, energy ministries are too strongly aligned with traditional monopolies to be effective in restructuring The EC insists that no EC level independent regulator will be created, but at the same time huge coordination issues exist given the individual approaches of member states

- Market design Regulatory methodology (for example, the price cap mechanism) and implementation of open access and unbundling (how best to carry out the division of functions) are the key issues

- Market depth Like Canada and the U S , and in contrast to most of Latin America, Europe is characterized by established gas markets and growing reliance on natural gas within those established markets as well as penetration into new markets, such as gas-fired electric power In addition, most customer classes accommodate market prices for natural gas Various subsidies are in place among the European countries that would have to be phased out, but they are neither as pervasive or as politically charged as subsidies in Latin America

46

3 5 Special Considerations for Ukraine

Ukraine has an established natural gas market, but one in which incentives are lacking for efficient use of natural gas and healthy market growth and development Although Ukraine has a unique position as a transit country for natural gas exports, many of the characteristics inherent in Ukraine's market are similar to those elsewhere This supports the introduction of open access and unbundling as effective solutions for competitive market-based advancement of the industry It is particularly critical that Ukraine adopt policies and regulatory approaches compatible with those emerging in Europe

Several specific issues can be identified for Ukraine with respect to open access and unbundling

- Structure of industry Most important is the structure of Ukraine's natural gas sector and the dominance of large monopoly enterprises that would be heavily affected by the implementation of open access and unbundling The ability of Ukraine's National Electricity Regulatory Commission (NERC) to implement open access and unbundling will be constrained unless it has clear authority to enforce separation of functions (This addressed in *Minimum Requirements for the Development of Ukraine's Natural Gas Sector*)

- Development of gas hub/market center Ukraine is strategically well-positioned to serve as a key market center and hub for Europe, given the convergence of pipelines and related facilities for transit of exported gas In long-term, the development of a hub with unbundled services, for example at Uzhorod, would also establish a logical point for trading and future risk management activity and services

- Evolution of domestic gas market As in other established natural gas markets, participation of the domestic sector is necessary in order to achieve balance and reduce volatility This means that impediments to efficient natural gas use and pricing for residential and small commercial users must be removed

- Market design and regulatory implementation Lessons from other countries and regions reinforce the need for clear separation of functions in order for the full benefits of open access and unbundling to be achieved and to reduce problems and conflicts in restructuring

- Market depth Lessons from other countries underscore the need for competitive natural gas production, participation by many providers of unbundled services and growth in overall natural gas use for open access and unbundling to be effective

47

ADDENDUM
ECONOMIC CONSIDERATIONS OF THE NATURAL GAS INDUSTRIES[7]

3A.1 INTRODUCTION

When it comes to a concept like unbundling, it is useful to note briefly that the natural gas industries have been treated in similar fashion the world over because of prevailing economics, or, perhaps more correctly, economic viewpoints Likewise, shifts in thinking about the economics of natural gas reflect broad, shared viewpoints with respect to markets generally and, specifically, with respect to ideas for restructuring to facilitate competition

3A.2 TRADITIONAL ECONOMIC THINKING

Traditional economic thinking with respect to the natural gas industries has several features

- With respect to the resource The ownership of natural gas resources is nearly always reserved to the state on behalf of its citizens The exception has been the United States, where extensive private ownership of natural gas resources is linked to the tradition of private ownership of surface lands (ownership of surface lands and subsurface resources may be different) There are certain exceptions in the U S , such as offshore deposits that are left to government control Importantly, within national governments outside of the U S , competition in natural gas production has generally been a matter debated from the perspective of strategic considerations for governments rather than from the economics inherent in natural gas production activities

- With respect to the shipment of natural gas in pipelines (ranging from long distance trunk lines or local distribution systems) Strict conditions for the natural monopoly concept have largely been accepted These are increasing returns to scale across the extent of the market and no contestability

[7] This section was compiled using several sources *U S Natural Gas in the 21st Century Adjusting to the New Reality* Michelle Michot Foss, unpublished manuscript 1995 'Latin American Opportunities How to Approach Them,' Michot Foss, *Natural Gas* August 1996 *North American Energy Integration The Prospects for Regulatory Coordination and Seamless Cross-Border Transactions of Natural Gas and Electricity*, University of Houston Energy Institute, May 1998 "Worldwide Transitions Energy Sector Reform and Market Development," Michot Foss, *Natural Resources and Environment*, ABA Section, Natural Resources, Energy and Environmental Law Spring 1998

48

3A.3 Traditional Policy and Economic Management

Traditional economic viewpoints led to the policy and regulatory systems in evidence around the world for much of this century, until the broad shifts in direction that began to emerge roughly 20 years ago

Sovereign interests with respect to natural gas resource production resulted in the dominance of state-owned enterprises engaged in exploration and production Often these enterprises also controlled natural gas transmission and sometimes distribution Where separate enterprises controlled transportation and/or distribution, they were usually also state-owned or heavily controlled or influenced by their national governments Ukraine falls generally into this pattern, as does all of Europe, Latin America and Asia

The obvious exceptions were Canada and the U S Although the provincial Crown governments in Canada managed natural gas resources, private development has been prevalent (the one experiment, quickly dismantled, was the creation of PetroCanada as a national company for exploration and production during the oil crises of the 1970s) Natural gas transportation and distribution have always been carried out by private, investor owned companies operating under franchises issued by government jurisdictions -- federal (for transportation across provinces) and provincial (for transportation within provinces and local distribution) In the U S , private development of natural gas resources has also been the preferred system U S government jurisdictions, federal and state, manage private development of resources in the public domain in much the same way as do provincial Crown governments in Canada Likewise, transportation and distribution has always been handled by private, investor owned companies Like Canada, the federal government in the U S oversees transportation of gas across state boundaries, and state regulatory commissions control transportation of gas within state boundaries and local distribution During the 1920s and 1930s, a tendency emerged in the U S for integrated holding companies to form, moving vertically up from the distribution businesses (where the natural gas industry originated in the 1800s) to transportation and ultimately to exploration and production The market power of these holding companies was such that federal laws were passed to dismantle them

The dilemma in Canada and the U S was oversight of private companies engaged in businesses considered to be "natural monopolies," transportation and distribution The dominance of the state in other parts of the world resulted in national governments being charged with direct responsibility for activities undertaken in the "public interest," the defining value accorded to the public utility segments of the natural gas industry The preference for private control and market-based activities in Canada and the U S meant that a trade off was necessary between conditions that would support infrastructure development (profitable returns to investors) and competitive pricing for natural gas services The

approach that was adopted, "regulated monopoly" as a substitute for competition, had specific features

- Exclusion of competition in exchange for service Companies engaged in the transportation or local distribution of natural gas did so through certificates (for pipelines) or franchises (for local distribution) that excluded competitors but bore obligations to serve all customers within the certificate or franchise boundary For example, a long-distance pipeline had to provide service to small communities along its route and a local distribution company (or LDC) had to provide service to every customer within a community, regardless of whether or not it was profitable to do so

- Cost of service tariffs A regulatory methodology was devised that accorded the private companies and their investors "just and reasonable" rates of return on assets used for the purpose of delivering natural gas and operating costs, which together constitute the "rate base " The rate of return that was allowed by regulators was considered to be close to what could be derived in a market, and the allocation of costs across all customers resulted in prices considered to be a fair substitute for what could be obtained in competitive markets

Regardless of the model prevalent in a country -- direct state provision of natural gas or the private provision of natural gas in Canada and the U S -- several assumptions were made

- Constant markets Both the planning processes for direct state provision as well as the process of awarding private certificates and franchises led implicitly to markets being established by planners and regulators, where competition was not easily introduced Certainly in situations where governments controlled the provision of natural gas, there were no possibilities for competitive benefits to be derived at all or for new markets to be easily established In Canada and the U S , once a pipeline was awarded a certificate the operator had every incentive to create barriers to the development of new pipelines serving the same customers Once an LDC franchise was established, there were no possibilities for alternative systems to be built

- Constant technologies Part of the dynamics influencing traditional thinking and approaches had to do with technologies available at the time The implicit assumption was that technologies were constant or would evolve only slowly reinforced the natural monopoly model

Policy approaches in all cases, state provision or regulated private provision of natural gas, carried certain distortions

- Inefficiencies in industry development Where state provision dominated an excess of labor over capital developed as a consequence of social and political objectives In

50

Canada and the U S and excess of capital over labor developed as regulated monopolies sought to increase revenues by increasing the asset base upon which they were allowed to earn returns

- Sacrifice of benefits of competition for economies of scope Most critical for the unbundling concept was that transportation and distribution and the provision of gas were treated together as natural monopoly activities Typically, in all countries, merchant service was used in which the operator of the pipeline or distribution system also supplied the natural gas This ignored two realities First, the economics of transportation systems and those of natural gas fields are quite different Long distance pipelines and distribution systems are characterized by declining long run average costs over the extent of the system and consequent technical economies of scale With very little incremental cost, a pipeline or LDC operator can add additional load, discouraging new operators from entering these markets In contrast, natural gas fields are more appropriately characterized by long run average costs that rise quickly as fields must be extended and new reserves of natural gas are found There are few technical advantages that one natural gas operator has over another (although coordination problems exist with multiple producers operating in one field or common pool) and barriers to entry for new operators are, as a result, relatively low Natural gas production is, in other words, best typified by the competitive market model while transportation and distribution systems are typically considered examples of market failure, in which the attributes of an industry are such that monopoly power is easily exerted The second reality is that economies of scope associated with merchant service do not necessarily leave consumers (and society) better off than competition in the supply of gas would The notion was that pipeline operators in particular had a technical advantage in procuring gas supplies and providing natural gas to customers because the pipeline is integral to utilization of the natural gas resource But this is often not the case Many pipeline companies performed very poorly in providing merchant service Government preferences of merchant service prevented more efficient companies from entering the industry, leaving consumers without the benefits of either economies of scope or competitive pricing

3A 4 New Economic Thinking

Natural gas supply shortages in the U S , the entry of Canada into the U S natural gas market as a result and transportation bottlenecks in both countries led to the rise of the unbundling concept as part of a broad restructuring effort In tandem, many other governments began to adopt market reforms to advance economic development Energy has been a target The "new" economic thinking that has emerged is that the competitive features of natural gas field production can more effectively be passed on to customers if transportation and

51

distribution systems are treated as common carriers However, the notion of pipelines, in particular, as common carriers is not "new " In the 1930s, during the passage of many of the laws that apply to the natural gas industries in the U S , the potential for pipelines to be treated as common carriers was hotly debated The influence of interests that benefitted from the natural monopoly treatment as well as the lack of compelling technological means for implementing common carriage terminated the debate

3A.5 New Policy and Regulatory Objectives

The key regulatory objectives that have accompanied new viewpoints on the natural gas industries are to minimize the monopoly component of natural gas delivery and to rely on "contestability" (or potential competition) as a substitute for pure competition when it cannot be achieved

- Minimize monopoly component The goal is to restrict regulation only to those aspects of natural gas delivery that have the potential for market or monopoly power to be exerted For production this means an effort to stimulate additional competition, facilitate the entry of new producers and provide regulatory oversight of production activities that is compatible with the competitive nature of the business For transportation and distribution this means unbundling and facilitating the development of new infrastructure that might lead to increased competition

- Rely on contestability if pure competition cannot be achieved Observers of regulated private monopoly markets long ago noted that if conditions warrant, new firms will enter the market or attempt to enter the market The potential for competition to occur was found to have a powerful moderating influence on monopolies, resulting in prices to consumers that were quite close to what might be experienced in truly competitive conditions For example, while the holder of a pipeline certificate in the U S is in a very strong position, if enough incentive exists for a competing operator to enter the market, or if it is easy for customers to connect to an alternative pipeline (the cost, distance and time required are relatively low), these dynamics are reflected in natural gas prices The idea of contestability thus contributed to the growing realization that market forces were more pervasive than previously understood, negating the need for extensive regulation in many instances

These two objectives are linked to fundamental changes in the assumptions underlying traditional thinking and approaches

- Technology is not constant An array of technologies in exploration and production for natural gas (and oil) have rapidly expanded the worldwide supply base, reduced geologic risk, increased drilling success rates and improved the efficiency of field

52

recovery Advances in pipeline technology since World War II have reduced engineering costs and risks and accelerated pipeline construction around the world New materials used in the pipeline industry increase the life and lower the operating and maintenance costs More efficient, energy saving compressors and electronic metering systems contribute to increased productivity and efficiency in transportation and distribution and expansion of service at a lower incremental cost Most important, perhaps, is the advance of information technologies that underlie many of the exploration and production technologies, allow remote management of pipeline and distribution systems, and facilitate market development through electronic trading and risk management

- Markets are not constant Natural gas markets are highly dynamic and thus not conducive to centralized planning or extensive regulatory oversight

3A.6 Principles for the New Management Era

The key policy and regulatory principles flowing from the experience in Canada and the U S with respect to transportation and distribution are as follows

- Unbundling Separate the natural gas commodity from the infrastructure The preferred option is complete separation of natural gas sales and related services from pipeline transportation with regulation only of the latter, accepting foregone economies of scope in exchange for the benefits of competition In Canada and the U S , because the federal governments have oversight for long distance pipelines that cross provincial and state boundaries, they were the jurisdictions that implemented unbundling Regulatory tribunals and commissions within provinces and states have oversight of pipelines that operate within provincial and state boundaries and LDCs, and thus implement unbundling in these segments of the natural gas industry system

- Access Contract carriage and nondiscriminatory open access

- Decentralization Allow unregulated third party marketing, creating opportunities for the most efficient providers of natural gas to enter the marketplace With unbundling and third party marketing, consumers have almost unlimited possibilities for procuring natural gas supplies and service

- Protection Allow risk management to hedge against commodity price volatility

Outside of Canada and the U S , these basic principles have been coupled with additional principles for more efficient, productive and effective natural gas industries

- Privatization Allow and encourage private development of natural gas resources and private ownership and operation of infrastructure

- Price rationalization Allow prices for natural gas supplies and service to reflect true costs but facilitate competition in order to provide savings for consumers

- Establish clear oversight of the natural gas industries Create lines of authority, typically with free-standing regulatory commissions that are independent of other government and political institutions

CHAPTER 4
OVERSIGHT OF GAS MARKETING AND SUPPLY

OVERSIGHT OF GAS MARKETING AND SUPPLY

4 1 INTRODUCTION

Earlier chapters established the importance of open access and unbundling as solutions to the development of competitive markets in Ukraine In principle, natural gas marketing and supply can be competitive, but industry restructuring must be carried out in a fashion that allows these activities to flourish In addition, where market power is evident with respect to marketing and supply, it may be appropriate for some regulatory oversight to be implemented

For natural gas marketing and supply to be competitive, certain conditions should be met

- Open access and unbundling must be enforced
- Natural gas production should be competitive
- Clear and transparent tariff methdologies must be developed and consistently applied to transportation and distribution operations
- Market information should be available and transparent This includes information such as available pipeline capacity and transportation rates

4.2 NERC OVERSIGHT

The National Electricity Regulatory Commission (NERC), since it has been charged with authority for the natural gas sector, will have two levels of responsibility

- The first level is facilitation of market development The NERC must implement regulatory policies and procedures that do not inhibit market development, but that limit market power by those organizations that may act to disrupt or delay the process
- The second level is appropriate oversight once market operations are well-established At some point, enough of a "critical mass" of competitive activity in Ukraine's natural gas market will accumulate so that regulatory oversight can be eased In many instances this is termed "light handed" regulation, meaning that most of the market functions well enough so that rigorous application of regulatory principles is no longer necessary Another description for this stage is "market facilitation," which reflects the role played by regulators to ensure that opportunities for competition continue to exist (for example, that no impediment has arisen to nondiscriminatory open access or unbundling)

Regulators in other countries have struggled to define what constitutes sufficient critical mass such that regulatory oversight can be eased Standard measures of competition or "market tests," such as the Herfindahl-Hirschmann Index (HHI), typically used by anti-competition commissions and agencies, can be used to track market concentration and monitor progress, and to target situations in which regulatory oversight is too strong or too weak

4 3 Policy and Regulatory Considerations

The structure of Ukraine's natural gas industry is such that attaining competitive natural gas marketing and supply functions will involve specific considerations

- Political reality of dealing with Gazprom Ukraine's special circumstance as a key transit corridor for Russia along with Ukraine's dependence on natural gas supplies from Russia for domestic use are realities that must be acknowledged The ability of NERC to indpendently enforce regulatory control over market and supply operations linked to Gazprom will be difficult at best, nor may they be desirable

- Competition in natural gas production Our chapter on unbundling emphasizes the importance of competitive production to Ukraine's market development The chapter on minimum statutory requirements delineates NERC's authority and specific conditions that should be provided for in statute in order to encourage competition For competitive marketing and supply activities to take hold, upstream reforms need to be in place As noted above, standard market tests can be used to monitor concentration

- Unbundling downstream The successful evolution of competitive supply and marketing will also depend upon enforcement of unbundling In particular, the technical aspects of unbundling will be critical For both transportation and distribution (to the extent that distribution will be unbundled), requirements for metering, balancing, management of pipeline access (the process by which shippers nominate for capacity), the ability for providers to aggregate supply is allowed will need to be in place These determine the ability of potential competitors to participate in the marketplace as well as enable remaining regulated entities to properly report on their activities to NERC

The structure of Ukraine's current and mid-term natural gas marketing and supply segments will dictate to a large extent the primary considerations for NERC and strategies for market restructuring A review of Ukraine's industry follows, with closing observations on key components for restructuring and NERC's program

51

4.4 ENERGY MIX

Exploration Gas Reserves

There are three major regions containing hydrocarbon deposits in Ukraine

Western Region (Trans-Carpathian, Pre-Carpathian, Volyn and Podillya provinces) The western region has been exploited since the last quarter of the 19th century 88 deposits of oil and gas were discovered in the region 41 contain oil and 47 contain gas and gas condensate Gas from the Western region is dry and low sulphur content

Eastern Region (Dnipro-Donets Basin) is considered to be the most important in terms of reserves and production This petroleum province covers a vast 75, 000 sq km The geological structure in the East is very uniform (paleozoic era formations contain 98 7% of all proven hydrocarbons reserves in Ukraine), lowering the cost of surveying and exploration Since 1935, 205 deposits were discovered in the Eastern region The north-western part of the region contains mainly oil, whereas in the south-east there is a mixture of oil, gas and condensate Formation depths 38% of gas reserves are located at depths of 3,500-4,500 m, and some 15% - at depths of 1,500-2,000 m

Southern Region (Black and Azov Sea shelves and coastal regions) The Southern region comprises 39 deposits (including 10 offshore), out of which 10 being oil, 22 – gas and 7 - gas condensate deposits The average depth onshore is 5, 000 metres, and offshore depths vary from 500 to 2,190 metres Since the beginning of the exploitation of this region 19 bcm of gas, 100 mln tons of oil and 200 mln tons of condensate have been produced

According to Ukrainian experts, Ukraine disposes of 5% of world mineral resources The total number of deposits of mineral resources is 20,000, out of which 7,667 fields have 94 types of industrial raw materials As of May 1995, oil and gas reserves of Ukraine consisted of 285 deposits, of which 242 are small (less than 10 mln TOE), 32 are medium (10-30 mln TOE) and only 11 are large (more than 30 mln TOE) The latter were heavily exploited during the Soviet period, and the newly-discovered deposits are ususally characterised by great depths (below 4, 000m) According the State Committee of Geology, the depletion of the discovered fields is 21 2% for oil and 24 9% for gas

Domestic Gas Production

Production output decreased sharply since the early 1970s, when production of crude oil peaked at 14 mln tonnes (1972) and natural gas - at 68 7 bcm (1975), mainly due to the depletion of the existing reserves and lack of new discoveries (No large deposit, with ABC1 type reserves exceeding 30 mln TOE, has been discovered since 1970 in Ukraine) The drop

in natural gas production was caused by lack of modern technologies, but insufficient funding for exploration and development

Domestic Production of Natural Gas

Year	1990	1991	1992	1993	1994	1995	1996	1997
Natural Gas Production, bcm	27 8	24 0	22 0	19 2	18 3	17 4	17 8	18 1

Source World Bank

Domestic gas production is dominated by Ukrgazprom

Producer	UKRAINE		Ukrgazprom		Ukrnafta		Chernomorn	
Year	1996	1997	1996	1997	1996	1997	1996	1997
Gas Production , bcm	17 8	18 1	13 8	14 4	3 2	3 0	0 75	0 68

Source State Committee of Oil and Gas

In 1998 UkrGasProm subsidiaries conducted exploration activity at 11 fields and 12 areas, increasing the total amount of gas reserves found in Ukraine by 2,6 bcm Gas transportation by UkrgGasProm in the first half of 1998 included transit of Russian gas to Europe in the amount of 54,9 bcm

ChornomorNaftoGas, the smallest of Ukrainian gas producers, accounting for less than 3% of the hydrocarbon production in Ukraine and focusing on offshore production on the Black and Azov Sea shelves

UkrNafta – the largest onshore oil producer, accounting for 85% of oil production, and 15% of indigenous gas production in Ukraine

UkrNafta was established in 1994 as a joint stock company The state is the major company shareholder holding 61% of the shares The remaining shares are owned by management and employees and private entities The current ownership structure of Ukrnafta is an issue of on-going debate between the State Property Fund, shareholders and the state

UkrNafta and its subsidiaries operate about 2,000 oil and gas wells at over 100 fields in eight regions of Western and Central Ukraine Ukrnafta is currently comprised of 36 subsidiaries and structural units, including

- 6 drilling units dealing with exploration and development (Dolynske, Nadvirnyanske, Ivano-Frankivske, Boryslavske, Okhtyrske, Prylutske),

- 6 subsidiaries producing oil and gas (Okhtyrka Naftogas, ChernihvNaftoGas, DolynaNaftoGas, PoltavaNaftoGas, NadvirnaNaftoGas, BoryslavNaftoGas),
- 3 gas processing plants (Hnidychivsky, Kachanivsky and Dolynsky) that process 70% of the natural gas produced by Ukrnafta, producing condensed gas (136,3 thousand tons), dry gas (61 bcf) and petrol (105,7 thousand tons) – all figures provided are from 1994

In 1995 there was a 23% drop in crude oil production in comparison with 1990 figures

Ukrnafta has established two joint ventures UkrCarpatoil Co Ltd (with Carpat Petroleum) and Cashtan Petroleum (with Ukran Oil Corporation) for the development of two depleted fields – Bytkivske and Lelyakivske fields

Prices and Costs for Domestic Gas

Data was not available concerning the cost differentiation between various regions and/or producers, but taking into account the large differences in the size of gas fields, one can assume rather high cost differences as well

Price and Cost Structure for Production SCOG data (1/96)

	Price for tcm	
	US $	%
Wholesale dispatch Price of the enterprise with VAT included	60 0	100
VAT	10 0	16 7
1 Wholesale Price without VAT	50 0	83 3
Rent	13 7	22 8
2 Price without VAT and rent	36 3	60 5
2 1 Cost, total	**10,2**	**17 0**
Including		

60

Own expenses incurred	3 6	6 0
Compulsory charges to the state budget	6 6	11 0
Including charges for GEW	5 3	8 8
2 2 Balance profit	**26 1**	**43 5**
Including		
2 2 1 Profit Tax	7 8	13 0
2 2 2 Profit share left at the disposal of the producer	18 3	30 5
Including		
A Charges paid to the budget, total	38 1	63 5
B Own expenses incurred, total	21 9	36 5

Changes in the Cost Structure of Gas Production (%)

Item	1990	1995
Charges for prospecting	35	64
Additional materials	0 7	0 3
Social needs, including wages and salaries (labour payments fund)	1 6	1 9
Amortisation of wells	32 9	2 8
Equipment maintenance	17 6	6 3
Gas preparation	6 5	4 6
Plant expenses	1 8	1 3
Total industrial expenses	3 6	4 1
Other expenses	0 3	14 7
Total Cost	100	100

Source UkrGasProm

Import of Natural Gas

61

Ukraine, with its average annual consumption of 80 bcm of natural gas is the world's largest importer and the third largest consumer of gas in Europe Only about 20% of Ukraine's gas demand is satisfied by domestic production Ukraine receives another 35-37% of its gas as payment in kind for the transport of Russian gas to Europe via Ukrainian pipeline system The remaining gas requirements are met through imports from Russia and Turkmenistan

Since 1993 the price of natural gas supplied to Ukraine from Russia was fixed at the inter-governmental level at US $ 80/tcm The price of imported Russian gas and the price Ukraine charges for transit are directly tied in the negotiations between Ukraine and Russia The transit fee to Russia has recently been reduced to $1 09/tcm per 100 km, from the existing level of $1 75/tcm per 100 cm The price of the import gas has correspondingly been reduced to $50/tcm

According to IEA, even at the initial levle of $1 75/tcm per 100 km, Ukraine earns less in transit fees than other neighboring countries transporting Russian gas – e g Slovakia and the Czech Republic charge US $ 1 95 Russia has always justified the lower transit price paid to Ukraine by the proximity of the market and the fact that they were subsidising the price of gas imported to Ukraine As the natural gas price in Europe is usually connected with prices on mazut, and thus, ultimately, with the oil price, this approach was feasible for Ukraine till 1997 But in the end of 1997, with oil prices going down worldwide, the price of natural gas started to decrease as well The dynamics of price change on of natural gas supplied from Russia to Western Europe was as follows

January 1998 - $ 96,

March 1998 - $ 91 5

as of 1 July 1998 - $ 77 (with Germany paying $ 70 9 for Russian gas at Ukrainian-Slovak border)

Because Ukraine is 1,200-1,300 km closer to Russia than any country of Western Europe, the price of Russian natural gas for Ukraine should be around US $ 50-60/tcm

Payments for gas

As of January 1998, the total debt of Ukrainian gas consumers to UkrgasProm (including the debts accumulated for the period of 1995 –1997) was UAH 7 5 bln , out of which UAH 3 bln is the debt of industrial consumers, and UAH 4 5 bln is the debt of budget organisations and the residential sector Attempts have been made to restructure the debt, but there are continued difficulties in meeting repayment schedules

4 5 GAS TRADING

Before 1996, UkrGasProm had sole responsibility for importing natural gas In December 1995, this right to import was taken from the company and distributed among private traders by the Decree of the Cabinet of Ministers of Ukraine

A rationale for removing Ukrgazprom from the gas import business, was to reduce the State's exposure to additional debt from Russian gas The State retained the right to establish the regulations that would govern the operations of the private traders Initially, the traders were granted exclusive frachises to serve certain administrative regions The table below provides a listing of gas traders together with the volume of imports and the respective franchise areas

1996 Gas Imports to Ukraine

Company	Source	Volume (bcm)	Franchise area
UES (United Energy Systems)	Russia	25 2	The license granted allowed to import 12 3 bcm of gas for industrial users in three oblasts (Dnipropetrocsk, Donetsk and Cherkassy) and another 12 9 bcm of gas to be distributed among residential and municipal consumers
Intergaz	Russia	3 8	Gas sales in six administrative regions (Khmelnytskyi, Zaporizhya, Kherson, Odessa, Vinnytsia, Rivne and Poltava)
Ukrgazprom	Russia	3 7	hernigiv and Kirovohrad regions plus industrial customers in Donetsk regions
Industrial customers	Russia	1 7	Direct import from Russia for own use
Other	Russia	3 7	Mainly for supply of gas to industrial customers around Ukraine
Olgas	Russia	1 5	Chernivsti, Volyn and Kiev
Itera	Turkmenistan	18 5	12 regions plus Kiev and Crimea

In 1997, the Cabinet of Ministers decided to significantly reduce the number of traders, allowing UkrGasprom to also reenter the gas import market In 1998, a new, more market-oriented scheme was adopted to allow gas traders that have been granted licenses, to sell their gas at market prices throughout Ukraine, instead of in one specific region

In 1998, 30 traders applied for licenses to import gas, only a portion of the applicants however recieved licenses However, the traders that did recieve licenses continued to be plagued by the non-payment problem It was anticipated that for this year, gas traders would supply a total of 20 bcm of gas in Ukraine For the first half of 1998, the amount supplied

was only 8 bcm, and for the second half the forecast is for no more than 6 bcm of gas to be supplied

Projected 1998 Gas Supply and Demand Balance

Supply	(bcm)	Demand	(bcm)
Domestic production	18	Households/budgetary	34
Imports	64	Industry/Power Sector	40
(including in kind for transit)	(30)	Losses	8
Transit	130	Transit	130
Total	212	Total	212

Source World Bank

All imported gas (including Turkmen gas) is currently supplied from Russia To secure future supplies and to reduce dependence on Russian gas, Ukraine signed agreements with Turkmenistan and Uzbekistan in 1998 The agreement with Turkmenistan guarantees Ukraine 20 bcm of gas per year until 2005 and resolves some of the outstanding payment issues between the countries by restructuring Ukraine's estimated US $ 600 mln debt to Turkmenistan The deal with Uzbekistan stipulates that Ukraine will receive additional 6 bcm of gas in 1998 from that republic

Still, there exists a huge potential for reducing the domestic demand for gas, thus helping to balance gas demand and supply According to EBRD estimates, Ukraine uses about six times more energy per unit of its GDP than OECD countries This results from numerous factors First, the price for gas and the existance of subsidies provides little incentive for energy saving Second, the outdated technologies applied in Ukrainian industry exacerbate these wasteful conditions Third, lack of accurate gas metering both in the residential and industrial sectors, as well as the use of consumption norms leads to overuse

4.6 Key Components for Creating a Competitive Gas Market

For the Ukrainian gas market to function on free market principles, it is necessary to provide equal opportunities to all the participants in terms of production, access to the pipe as well as to the end-users With state only or a limited number of other players present, there will be an ever-present danger of establishing cartels and cases of monopoly abuse It is especially true for Ukraine, which has a limited choice of gas supply sources Notwithstanding the expected increase of competition due to the possible increase of indigenous gas production and the substantial decrease of gas losses during transportation and lack of proper metering, gas market in Ukraine will remain monopolistic in the foreseeable future This situation is calling for a decisive and powerful regulator able to prevent anti-competitive behavior and protect interests of the ultimate consumers

As of today, independent gas traders play an important role by providing working capital, facilitating transactions along the supply chain, protecting Ukrainian state from the consequences of non-payments to RAO Gazprom for the Russian gas supplied and establishing basis for competition in this segment of industry

But with further strengthening of Ukrainian economy and, respectively, with the increase of profitability and competitiveness within its major industries, the gas traders will be replaced gradually by local producers and foreign suppliers (represented on their own or by Ukrainian partners) which will themselves make direct sales to large gas customers and privatised distribution companies acting as buyers

Competiveness of the Market

In order to have an unbundled industry work most effectively, it is necessary that the sector upstream of the pipeline be competitive Unbundling relies on competition between sellers of gas to enhance efficiency and reduce prices If that competition does not exist, then unbundling would not work and should not be employed In Ukraine, approximately 60 of the 80 bcm/year come from or through Russia in one form or the other If these supplies are not regulated carefully, Russia will act as a "dominant firm " A dominant firm is not a monopolist, but it has substantial pricing power and will tend to set prices as though it were a monopolist This tendency to act as a monopolist increases to the extent that it is difficult for other firms to enter the market or for existing firms to expand their output This is because a monopolist raises price by reducing output, the reduced supply leads to a higher price [1] Thus,

[1] This is the only way a monopolist can increase the price of a product over its competitive level, because in a market economy price is determined bysupply and demand If the monopolist does not reduce supply the supply and demand curves intersect in the same placeand any attempt to raise price would merely lead to unsold output

entry of other firms or expansion of output by existing firms would reduce the dominant firm's pricing power by increasing the total quantity sold, thereby reducing the price of gas [2]

The competitiveness of a market is often measured by the Herfindahl-Hirschmann Index (HHI) The HHI sums the squares of the market shares of each company in a market For example, in a market with two sellers, one with a 60% market share and the other with a 40% market share, the HHI would equal $5,200 = 60^2 + 40^2$, in a market with 10 sellers with equal market shares the HHI would equal $1,000 = 10 \times 10^2$ As can be seen, the more sellers there are with sizeable market shares, the lower the HHI In the U S , HHIs are used by the antitrust authorities to measure the effects of mergers on competition, and by the Federal Energy Regulatory Commission (FERC) [3] to measure the competitiveness of markets it regulates to help determine whether the market or company in a market can be regulated in a light-handed manner In analyzing mergers, the antitrust authorities generally will find a market to be competitive if the HHI is 1,800 or less Many practitioners, sometimes including FERC, believe a market can be regulated in a light-handed manner if the HHI is 2,500 or less The HHI, however, should not be followed slavishly, as it is an imperfect tool that should be used in conjunction with other analyses of markets to determine their current and potential competitiveness

The Ukraine gas market can be structured in ways that create a competitive market and ways that create an uncompetitive market To demonstrate this, below are several scenarios for the market

[2] The increased output by new or existing firms moves the supply curve to the right, and because demand curves are downward sloping the equilibrium price declines

[3] FERC regulates interstate commerce in the natural gas and electric industries in the United States

Scenario 1

All domestically produced gas and 10 bcm of the 30 bcm of in-kind gas go to residential and small commercial customers, 20 bcm of the in-kind gas are auctioned to 5 buyers, and the gas sold by Russia and sold by Turkmenistan or Uzbekistan and transported through Russia are considered to be separate supplies Under this scenario, the HHI for the industrial market is

SOURCE	MARKET SHARE	CONTRIBUTION TO HHI
Auctioned in-kind gas	5 companies with 4 bcm each, or 4/50 = 8% each	$5 \times 8^2 = 320$
Russian gas	20 bcm = 40%	$40^2 = 1{,}600$
Turkmeni or Uzbek gas	10 bcm = 20%	$20^2 = 400$
Total	**50 bcm = 100%**	**2,320**

With an HHI of 2,320, this market may be competitive, but bears further scrutiny

Scenario 2

This scenario is the same as Scenario 1, but changed so that the Russian gas and the gas through Russia are considered one source of supply These two sources can be considered to be just one source on the grounds that Russia can set the price of transportation at a level that makes it impossible for other countries to undercut Russia's profit-maximizing monopoly price

SOURCE	MARKET SHARE	CONTRIBUTION TO HHI
Auctioned in-kind gas	5 companies with 4 bcm each, or 4/50 = 8% each	$5 \times 8^2 = 320$
Russian and Turkmeni or Uzbek gas	30 bcm = 60%	$60^2 = 3{,}600$
Total	**50 bcm**	**3,920**

With an HHI of 3,920, this market clearly is not competitive No matter what is done with the auctioned gas, the HHI will be at least 3,600 owing to the gas from Russia

Scenario 3

This scenario is the same as Scenario 2, but changed so that all in-kind gas is auctioned and domestic gas is sold on the market rather than dedicated to residential and small commercial consumers

SOURCE	MARKET SHARE	CONTRIBUTION TO HHI
Domestic gas	2 companies, one with 16 bcm and the other with 4 bcm, or 20% and 5%	$20^2 + 5^2 = 425$
Auctioned in-kind gas	5 companies with 6 bcm each, or 6/80 = 7 5% each	$5 \times 7\ 5^2 = 281$
Russian and Turkmeni or Uzbek gas	30 bcm = 37 5%	$37\ 5^2 = 1{,}406$
Total	**80 bcm**	**2,112**

Thus, even with all gas coming from Russia being dominated by Russia so that it effectively comes from just one source, the gas market probably is competitive If the Russian gas and the gas coming through Russia are two different sources, then the HHI would fall to a mere 1,487, an extremely competitive market If the domestic gas increased to 40 bcm, and became more competitive by having more than two companies, then the Russian gas would fall to a mere 10 bcm, and the market would be extraordinarily competitive

The lessons that come from this exercise are

- If domestic gas can be freed to compete with gas coming from Russia, the gas market in Ukraine will probably be competitive, otherwise the situation is problematic *The benefits from this competition provided by domestic gas would be substantial but will not be provided unless the upstream regulator practices enlightened progressive regulation*

- It matters greatly whether the price of non-Russian gas at the border of Ukraine and Russia is effectively set by Russia If it is, then it is far more difficult to make the market competitive than if it is not

The gas market can be made more competitive if output from non-Russian sources of gas are increased In Ukraine, free entry or expanded output potentially can come from several different sources

- Domestic production Domestic production today is regulated in ways that provide little incentive to explore and develop new reserves or to optimize the production of existing reserves If provided appropriate incentives, domestic production would undoubtedly grow, probably substantially The World Bank estimates that domestic production could be increased to 30 bcm/year Others, such as British Petroleum, estimate that production could even be tripled to 50-60 bcm/year, although it obviously is impossible to predict with any certainty how much domestic production would be increased

- Imports through Russia from Turkmenistan or Uzbekistan These imports are somewhat problematic, as any effort by Turkmenistan or Uzbekistan to undercut the price charged by Russia might be offset by Russia through higher transportation charges on that gas to transport it through Russia

- In-kind payments by Russia for the transportation of Russian gas by Ukrgazprom to eastern and western Europe The amount of gas which Ukraine purchases through in-kind payments is currently negotiated between the governments of Ukraine and Russia, this amount is jointly determined with the price charged by Ukrgazprom for transportation and the price of the Russian gas A higher transportation price or a lower value of gas would yield higher in-kind payments, i e , a higher quantity of Russian gas

4 7 Gas Auctions

The first promising signs of changes are evolving in Ukraine with the auctions on gas sales being launched In July 1998, the second gas auction on indigenous gas sales was held successfully by UkrGasProm, with 500 mln c m of gas being sold in two equal shares to two buyers at US$36/ 1,000 cubic metres (the first auction, where the gas was offered at US

$49/1,000c m , failed due to the absence of buyers) In the third auction, which took place on September 1, no gas was sold

In order to reach maximum effect from conducting auctions, it is necessary to take into account both international experience in this area as well as the first lessons of Ukrainian auctions At the moment the following recommendations can be made to Ukrainian bodies responsible for organisation of such auctions

To monitor the situation in energy sector on a regular basis and to publish all relevant information on the dynamics of changes in gas consumption, pricing and sources of supply both in Ukraine and abroad, making it available to all interested sides

Making pricing policy in energy sector of Ukraine transparent and correlated with major international trends for the industry

Starting price for the gas offered should be lowered to realistic level, making it attractive enough to potential buyers to apply for participation

Rules regulating participation should be simplified and entry barriers eliminated in order to increase the number of potential participants

Foreign companies are to be allowed to offer their gas for sale at such auctions (at the moment the number of offerrents is limited to Ukrainian legal entities and physical persons)

To increase the volume of gas offered for sale, taking into account seasonal fluctuations in gas demand and supply

To announce the results of gas auctions in public

To require that financial guarantees (cash, commodity, LC) were provided both for the purchase and transportation of gas

To allow the purchasers to sell the gas acquired if they wish to do so

71

CHAPTER 5
DISTRIBUTION

DISTRIBUTION

5 1 INTRODUCTION

Natural gas local distribution companies (LDC's) in Ukraine sell to domestic, budgetary and communal customers at an average price of $4 45/tcm [11] This price is the same for all users within the LDC, it is set irrespective of customer class and volume of use In all cases, the price is below the cost of providing service

This uniform pricing policy is economically unjustified It does not reflect costs incurred by the LDC in serving the various customers By sending inappropriate price signals to consumers, it discourages efficient consumption of gas resources and creates economic distortions throughout the larger economy

5.2 PRICING

Prices paid by residential customers in Ukraine for natural gas are very low compared to other European countries The prices presented in the table below are based on residential uses of natural gas Although a cross-comparison of retail prices can never be exact due to the wide differences in input costs among countries, it is clear that Ukraine charges extremely low prices for gas

[1] "Ukraine Priority of Reforms for the Gas Industry,' prepared by Government of Ukraine, World Bank Joint Working Group, January 28,1997 The tariff for individual LDCs varies from $2 to $12/tcm

Country	Price Charged to Residential Customers 1997 ($/tcm)
Austria	383
France	380
Belgium	368
United Kingdom	301
United States	236
Poland	203
Hungary	148
Czech Republic	115
Slovak Republic	62
Ukraine	60 (1998 price=$66)

Cooking Only Customers

Approximately 80% of the households in Ukraine directly use natural gas exclusively for cooking 20% and 15% of households use it for water heating and space heating respectively The LDC's per unit costs to serve individual customers using gas for cooking only are very high relative to the costs to serve residential full use and commercial and industrial customers This is because the fixed operating and maintenance expenses and capital costs must be spread over the relative smaller volumes of use associated with cooking load

A USAID/World Bank funded study in Russia concluded that the long run marginal costs to distribute gas for cooking-only purposes was between $268 per tcm and $302 per tcm[2] These estimated marginal costs included the distribution companies operation and maintenance expenses and construction costs

District Heating Systems

Approximately 65% of Ukraine's 52 million people are served by district heating systems Heat is produced in either combined heat and power (CHP) plants owned by the oblenergos, or industrial enterprises, or in municipal boiler- houses (HOP) Natural gas fuels

[2] "Principles of Natural Gas Pricing in Russia" prepared by Hagler Bailly, Inc , Merklein & Associates July 1993

74

approximately 47 percent of the district heating systems 38% of the plants use coal in the production of heat [3]

The price charged for heat by heating plants is below cost of service in Ukraine At the current low prices it will not be possible for heat plants to cover costs—and thus fully reimburse natural gas suppliers-- unless they raise the price they charge for heat

Natural Gas Transportation by LDC

Some of the natural gas users that buy gas from marketing companies use the facilities of an LDC However, such customers may rarely or never pay the LDC for the use of those facilities [5] Even if a customer does pay for its use of the facilities, a distribution fee of $4 45/tcm is far too low The LDC must stand ready to provide transportation service continuously throughout even the most severe winter periods The cost to maintain the infrastructure for this service level exceeds $4 45/tcm, and these rates should be raised materially to cover the costs of providing this service A distribution charge of $4 45 per tcm represents only 6 7% of the total price of $66/tcm In the U S , LDC costs typically comprise 40% to 50% of the average system total price

The pricing of natural gas transportation service to the largest gas users is a complex issue Research is required on the actual load and cost profiles of these customers, as well as on the competitive market conditions in terms of alternative fuels and gas-on-gas competition

To attract the largest customers, LDC's in market economies often provide interruptible service to large customers Interruptible service, as its name implies, is service that may be interrupted under certain conditions Generally, under normal operating conditions, the LDC must provide the customer with a minimum of 3-4 hours notice of interruption In emergency situations the notice period may be less

In interruptible service, prices often linked to the alternative fuel burning capability of the customer This alternative fuel burning capability may be heavy fuel oil, or refined petroleum products or coal The natural gas price must be competitive with the price of the alternate fuel

[3] "Principles of Natural Gas Pricing in Russia" prepared by Hagler Bailly Inc , Merklein & Associates, July 1993

"Energy Policies of Ukraine 1996 Survey ' prepared by International Energy Agency, 1996

75

Interruptible service costs the customer less on a per unit basis than firm service From the point of view of the LDC, the LDC is not required to maintain facilities or acquire capacity and natural gas for the peak consumption periods Therefore, on a cost of service basis, a lower rate can be offered to these large customers From the point of view of the customer, it is receiving a lower grade of service than a firm customer -- whose service is never interrupted (barring force majeure conditions) -- and therefore demands a lower price

Moreover, the interruptible retail service allows the LDC to use its available capacity more efficiently Large industrial customers often have a better load factor than the system average Thus providing interruptible retail service helps the LDC to improve its system utilization and load factor

Revenue Requirements

For local distribution companies to break even, tariff rates must be sufficient to cover the full costs of providing service including operation and maintenance expenses, depreciation expenses, taxes, and a reasonable return on assets These expense and return components form the LDC's total revenue requirements

- Operation and Maintenance Expenses (O&M Expenses) This will include O&M expenses for gas mains and gas services, compressor stations, load dispatching expenses, regulator and meter expenses, customer accounting expenses for bill tabulation and preparation, customer records and collections expenses, and administrative expenses

- Uncollectible Accounts Expenses O&M expenses should also contain an account for uncollectible accounts expense to be charged against an established account defined as "Provision for Uncollectible Accounts "

- Depreciation Expense and Interest Expenses LDC's must quantify the level of their capital requirements and incorporate appropriate levels of depreciation expense and interest costs into their revenue requirements

To provide consistency and transparency in financial and account reporting, the Commission should require LDCs to systematically move to International Accounting Standards, and require that financial statements be audited by independent, qualified auditors

The method of defining and reporting 'profit' should also be rationalized A clear statement of profit, which excludes items that are normally considered expenses, is an important factor which the investment community examines, when analyzing the potential returns to investment in the sector

Rate of Return on Capital

The commission should select a fair rate of return on capital To assist with this effort, the Commission should request all LDCs to revalue assets Please see Hagler Bailly's recent paper entitled *Tariff Formulation Methodologies* for an extended discussion on rate of return concepts and methodologies

Capital Budgets

LDCs should identify the capital requirements for (a) normal maintenance and smaller facility capital requirements and (b) major capital projects Each LDC therefore defines the need for capital investment and sales volumes through which capital costs may be recovered Tariff rates then must be designed to provide the revenues necessary to meet these capital requirements

Depreciation expenses and a portion of the return on revalued assets are cost components that must be embedded in natural gas prices to allow the LDC to meet its capital requirements Eventually, LDC's should be required to quantify their capital requirements and to incorporate appropriate levels of depreciation expense and interest costs into the revenue requirement

Thus, the Ukrainian LDC's must seek to quantify the total revenue requirements for their respective systems, including operation and maintenance expenses, appropriate depreciation expenses, taxes and a return on revalued assets

Class Cost of Service

The total revenue requirements for western LDC's are known and readily available in the financial and annual reports of these companies However, because of the large fixed investment and the existence of significant level of common costs, the distinct costs to serve each customer class is not known, and must be estimated by conducting customer class cost of service studies The results of a class cost of service study conducted by a large municipally-owned natural gas distribution company in the United States is provided in the following table

			Customer Class					
			Residential		Commercial		Industrial	
		Total Utility	Non-Heat	Heat	Non-Heat	Heat	Non-Heat	Heat
		$/tcm	$/tcm	$/tcm	$/tcm	$/tcm	$/tcm	$/tcm
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Expense Category							
2	Operation and Maintenance							
3	Natural gas supply	131	121	137	122	137	127	138
4	Other O&M	72	211	82	59	52	27	44
5	Total O&M	203	332	219	180	189	154	181
6								
7	Capital Costs	34	55	39	30	35	23	33
8								
9	Other Net	(17)	(17)	(7)	(4)	(4)	(2)	(3)
10								
11	Total Revenue Requirements	232	371	250	205	220	175	212
12								
13	Revenues	232	267	248	251	250	247	248
14								
15	Revenue Surplus (Deficiency)	0	(104)	(2)	45	30	74	36

78

The LDC's total average unit cost to serve all customers is shown in column (2) The per unit cost to serve the residential, commercial and industrial customers (small, firm commercial and industrial customers) are shown in columns 3 through 8 For this particular utility the residential non-heat category includes cooking and water heating gas customers The residential heating category consists primarily of residential customers who use gas for space heating, water heating and cooking purposes

The primary lessons to draw from this table are

- Residential customers are the most expensive to serve
- Residential non-heating (particularly cooking) load is more expensive than other residential uses, especially space heating

This utility engaged in cross-subsidies, as the price charged to residential non-heating customers, while being higher than the price charged to any other customer class, was far below the actual cost of service (This utility subsequently raised the price charged to the residential non-heating customers)

Each element of the total utility cost found in column one of the table above has a great detail of sub-account detail that is analyzed in the process of conducting the cost of service study For this particular type of cost study, each sub-account of expense is allocated to the various customer classes, based on allocation factors that seek to assign costs to the various customer classes based on the classes responsibility for the LDC's incurrence of those costs, to extent possible For example, gas mains may be designed to meet the peak load on the coldest day of the year The various customer classes could then be assigned a proportional amount of the capital costs to install the main and a share of the main operation and maintenance expenses based on consumption during the peak day Once all of the LDC's costs are analyzed an allocated in a similar manner across all the customer classes, the costs are then aggregated by customer class to determine revenue requirements Once the customer class's revenue requirements have been estimated, this cost figure provides one parameter in the design of effective rates for that particular customer class

The reason for the high cost of service for residential non-heating customers was that the per unit operation and maintenance expenses to serve them (row 4, col 3) was almost three times as high as the system average cost Similarly, the capital costs shown on row 7 column 3 the residential non heating class are over 60% higher than the system average cost

Natural Gas Tariff Structure

The tariff form maintained by the LDC described above was a two-part tariff This tariff form consists of a fixed monthly charge ($ per customer per month) and a commodity charge ($ per tcm) To begin to address the cross-subsidy to the residential nonheating class, this LDC raised the level of the customer charge to the residential classes, and redistributed the LDC's total revenue requirements to all customer classes based upon the new structure of charges This served to increase the allocation of costs to the residential non-heating class, and had only minimal impact on the residential heating class The net effect was that the cross-subsidy to the residential non-heating class was materially reduced

The price levels for the residential customer classes in Ukraine must be increased based upon a well- publicized phase-in of rate increases over a period of years Additionally, to begin to address the cross-subsidy that now exists between and among the different types of customers, a two-part tariff structure should be introduced which consists of a fixed customer charge per month plus a commodity charge which varies with the customer's consumption

For example, if a fixed monthly customer charge of $1 00 per month were phased-in to the customer's bill, this would partially redress the cross-subsidy currently existing to residential cooking only customers, and would represent an increase of billed tariff revenue of roughly $190 million dollars, from this class of customers The initial introduction of the charge would impact all customers, but would have the highest percentage impact on the residential cooking only customer

Price Adjustment Clauses

Certain costs, such as natural gas supply costs, can fluctuate significantly To insure that the LDCs can continue to recover the actual expenses for such items, the LDCs in the U S often maintain automatic adjustment clauses in their tariff schedules

Through these mechanisms, the cost of gas is passed through to the customers, without the need for full rate hearings, but the pass through costs are subject to regulatory review and authorization

Inflation and exchange rate fluctuations are also items that must be acknowledged in designing rates, to ensure that the LDCs are actually recovering the cost of providing service to the customer classes

90

5 3 COLLECTIONS

Debts owed to Ukrgaz as of July 1, 1998 were the following

Customer class	Debt (US$ m)	Percentage of Total Debt
Residential customers	377	51 2
Unsubsidized	181	24 6
Budget subsidized	109	14 8
Privileged	86	11 7
Communal organizations	335	45 5
Budget Organizations	24	3 3
State budget	17	2 3
Local budget	7	1 0
Total	736	100 0

The average customer gas bill may be in the range of several dollars per month Nonetheless, the domestic class has accumulated $377 millions in debt, or $23 per customer

It will be necessary to develop a disciplined collection process at the LDC level Such a process must be clearly articulated and published in the LDC's tariff of rates and regulations The customer bills for residential cooking service are collectible, and non-paying customers should be shut off if they do not respond to an initial warning

5.4 CUSTOMER CLASSES

As previously mentioned, the load characteristics and cost of service requirements for distributing gas can vary significantly from one class of customers to another For example the per unit costs to serve the residential cooking customer will differ significantly from the costs of serving a metropolitan hospital or an electric generating plant The costs to serve very large customers will often reflect economies of scale and high load factors Both of these factors will serve to reduce the per unit cost of service

Customer classes are usually formed by grouping customers of similar load profiles and costs of service to the extent possible Other factors such as the customer's ability to use alternative fuels, such as various oil products, will also affect the particular customer classification

For this reason, LDC's commonly establish customer classes according to the general categories of residential, commercial and industrial, with subcategories for small and large commercial and industrial customers

Distinct customer classes based on more rational customer groupings must be established for the various LDC's in Ukraine In the first instance, this will allow greater matching of the cost of service with the class of service bearing a direct and positive revenue impact for the LDC's Second, appropriate customer classes will permit greater accuracy in forecasting demand and supply requirements for each customer class Load forecasts for distinct customer groups can be made more accurately with customers classified in terms of consumption patterns

The delineation of different classes of customers may initially present administrative difficulties for Ukrainian LDC's However, the LDC's must be required to move in this direction

The three existing customer classes (domestic, communal /municipal and budgetary) have essentially the same tariff structure This means that a residential cooking customer is charged the same rate as a water treatment plant or a state-financed enterprise The consumption characteristics and the per unit costs of serving these customers are dramatically different, however

Customer classes should be formed to group customers with similar consumption profiles and similar cost to serve Typical customer classes for US distribution companies are

- Residential (heating and non-heating customer classes differentiated based on customer charge levels)
- General Service
- Interruptible Service
- Transportation Service

Forecast of LDC Gas Sales

Establishing an effective process of ongoing review and forecasts of sales to customer classes is integral to the financial and operational integrity of the LDC's It is generally the starting point for determining the operational and capital requirements for the coming year and for the planning horizon The forecast of sales and number of customers by class also defines the units over which the costs will be spread and rate levels determined

LDC's should be required to provide NERC, on an annual basis, forecasts of the monthly supply and demand for natural gas The LDCs should maintain data bases of number of customers, revenues and sales(retail and transport) by customer class, together with other fundamental system information, to the extent that this information is not currently maintained Close informational linkages should be developed between the LDC, the pipeline, and the largest customers such as the power plants and boiler plants, as well as with the other utility sectors This exchange of information on supply and demand conditions would assist in the preparation of the supply and demand forecast

Because natural gas demand is so heavily influenced by weather, forecasts should be prepared on a weather normalized basis Multiple scenarios should be run to provide management with a range of possible outcomes

5.5 SUBSIDIES

Currently, natural gas service to residential customers is provided at discounted or subsidized prices to customers

- whose total utility bills for gas, electricity and the like exceeds 15% of the family's income
- that fall into categories such as military veterans, judges, and militia

The policy of subsidizing energy prices, common in the transition economies of Eastern Europe and the former Soviet Union, is regressive That is, while such programs do help the poor in providing them with lower cost energy, the programs directly benefit wealthy energy consumers

Not only do the wealthy consume more energy than the poor, they spend a larger portion of their income on energy Discounts from the tariff prices for natural gas services should be available only to those customers who cannot afford to pay for their bill, and who meet a certain threshold level of income Subsidies should be provided through a centralized system such as payments made by the central government, financed by taxes, or by a national levy on natural gas sales

Natural Gas Regulations

Regulations (and prices) that govern the business activities between the LDCs and their customers should be set forth in a published LDC tariff, that is available for public review The tariff could contain provisions such as the following

- Application of service
- Credit standards and policies
- Facility extension policy
- Billing and payment terms
- Measurement
- Meter tests
- Termination Policy
- Priorities of Service and Emergency Procedures

Discussion of Selected Provisions

Facility Extension Policy

LDC policies should be established that will encourage the efficient expansion of LDC's mains, services, etc , and discourage uneconomic connections

In the U S , LDCs often establish general economic tests to determine the level of capital investment that the LDC will undertake to connect a new customer The tests are identified in the LDCs tariff so that a consistent policy is understood by the customers An example of one such general economic test is the following

> The Company will undertake a capital investment in the total cost of new main and service facilities up to an amount equal to five times the added net base revenue anticipated from the customer The net base revenue is calculated by multiplying the non-fuel related revenue (excluding taxes) times the customer's estimated annual consumption The customer pays the costs of any required investment above this limit

LDCs often provide, own and maintain any meters or regulators required to provide service

Customer deposits are also often required for land developments, and special policies may be in place for interruptible customers

Emergency Procedures

84

Priorities of service should be established in the case of an emergency condition in which the LDC's gas supply is insufficient to supply all customers In this case the available gas needs to be allocated to all customers in accordance with the priorities of service that have been established Under this procedure, gas supply to customers in a higher priority category are not curtailed until all customers in the lower priority classification have been curtailed

Basic priority classification can include the following that are used by a metropolitan LDC in the U S

Highest Priority	1	Residential and firm (continuous service) critical commercial essential human needs
	2	Firm small commercial requirements and firm large commercial and industrial requirements for plant protection
	3	Firm small industrial requirement
	4	Firm large critical commercial and industrial requirements (not contained above)
	5	Firm large non-critical commercial and industrial requirements other than for boiler fuel use
	6	Firm large non-critical commercial and industrial requirements for boiler fuel use
Lowest Priority	7	Contractually interruptible customers

LDC Transportation Regulations

Regulations concerning the operation of LDC transportation service must also be established to assist in the administration of this service

The regulations must detail the nomination requirements, and balancing provisions and penalties, quality standards for gas delivered, standby service, liability, interruption of service, etc The terms of availability for LDC transportation, for example, volumetric size limitations must also be identified in the transportation regulations Please see the Appendix for a more detailed discussion on the balancing and billing requirements to administer a transportation service

Metering and Billing Systems

Appropriate metering and billing systems are absolutely necessary to appropriately administer transportation services All customers participating in the transportation service should be required to install the necessary metering equipment (preferably telemetering equipment)

85

LDCs should also undertake a meter installation program for the remaining customers (for cooking only customers- installation down to the apartment complex level)

Pilot Tariff Study/Initial Data Requirements

A pilot tariff study should be undertaken for a major LDC to demonstrate the methods that can be applied to rationalize the natural gas tariffs of the LDC's Such a study should necessarily include class cost of service studies to define the costs to serve well-defined customer classes The class costs of service study forms one basis for the establishment of rates, and can assist Ukrainian LDC's throughout the country in rationalizing their rate structures

The objective of this review is to outline the process that will lead to effective tariffs for the natural gas sector This tariff design process requires ongoing evaluation and design, and then re-evaluation and design Each iteration of the process allows the natural gas tariffs to become more sophisticated and respond more closely to cost and market conditions

The process commences with fundamental information that forms the foundation of effective tariff design This fundamental information includes

Customer Information

Name, address and account number, rate class, billing and collection history for each customer
Numbers of Customers by Customer Class
Numbers of Meters by Customer Class
Level of cash received by Customer class
Level of non-payment (uncollectible accounts) by Customer Class
Level of subsidies provided by Customer Class
Level of privileges provided by Customer Class

Usage and Revenue Data

Sales by customer class, by month
Revenues by customer class, by month
Sales and revenues from the largest customers, by month
Peak sendout by month (customer class information may need to be statistically estimated, without load studies)
Sales sendout by month

Engineering Information

86

System design parameters
Distribution Mains Designed on peak day, peak hour?

Accounting & Financial Information

Total enterprise operation and maintenance expenses by functional area
Manufactured gas (if on-site)
Purchased gas supply expenses
Storage expenses (if on-site)
Distribution expenses
Customer Accounting
Meter Reading
Customer Records & Collection expenses
Uncollectible accounts expenses
Customer Services & Information expenses
Administrative & General Expenses
Labor Expense, by functional area detailed above for operation and maintenance expense
Total taxes
Total depreciation expense (by functional area- see plant in service below)
Total natural gas plant in service (revalued plant in service)
By functional area Production Plant (if on-site)
Storage Plant (if on-site)
Distribution Plant
General Plant
Accumulated Provision for Depreciation (by functional area--see plant in service above)
Working Capital

The final section of this chapter provides some additional statistics on the subsector and regional consumption patterns in Ukraine

Gas Consumption

There has been a dynamic change in the national gas consumption pattern from the industrial sector to the residential sector The combined effects of a reductions in industrial output and a sharp rise in residential consumption has contributed to this change Currently there are approximately 16 million households that use gas In urban areas most households have access to gas service, whereas in rural areas 6% to 8% of the households are connected to the gas system

Residential and municipal consumption of gas accounts for 37% of Ukraine s overall domestic demand, or 31 9 bcm in 1995 This is up from 17% or 19 8 bcm in 1990 Evidently only 15% of Ukraine's residential consumption is metered, with most of the residential consumers billed on the bases of fixed normative usage levels

Gas Consumption by sectors in Ukraine (bcm)[7]

	1990	1991	1992	1993	1994	1995
Industry	55	51 5	53 5	41 1	31	30
Power Industry	33 9	30 9	25 4	20 5	19 7	14 4
Residential	19 8	24 4	26 5	30 2	30 7	31 9
Compressor Fuel	5 4	5 4	6 4	7 4	7 5	7 3
Losses	1	1 5	2 3	3	3 5	3 4
Total	115 1	114	114	102	92 4	85 4

Ukraine's industrial consumers include approximately 175 large industrial entities that are directly connected to the high-pressure pipelines of Ukrgazprom, and an additional 9,000 smaller facilities that are attached to the distribution systems of Ukrgaz and KievGas These facilities include both industrial enterprises and power stations

The major gas-consuming industries are the power industry (14 bcm per year), metallurgy (10 bcm) and the chemical industry (8 bcm)

The 1996 largest Ukrainian industrial consumers are listed below with their annual gas consumption

	Enterprise	Annual Gas Consumption (bcm)
1	Azov Stal	2 4
2	Cherkasy Azot	2 4
3	DniproAzot	2 4
4	Mykolaiv Alumina Plant	2 1
5	SeverodonetskAzot	2 0
6	Stirol Consortium	1 8
7	Mariupol Illich Metallurgy Plant	1 8
8	RivneAzot	1 0
9	SumyKhimProm	1 0
10	OdessaPortPlant	1 0

Regionally, gas consumption is concentrated in the industrially developed eastern regions that are the centers for the steel, chemical and metallury industries

CHAPTER 6
TRANSPORTATION

TRANSPORTATION

6 1 INTRODUCTION

Natural gas transportation is an area of critical importance for the energy policy of Ukraine Efforts to regulate this sector will hold the key to the growth of the natural gas industry in Ukraine, and by extension, the development of a favorable national energy balance

Regulation of natural gas transportation is a crucial area of energy policy for Ukraine in light of three factors

- The gas-intensive character of the Ukrainian economy
- The presence of substantial, undeveloped natural gas reserves (at least 1 12 trillion cubic meters) [1]
- Ukraine's position as the major transport route for Russian gas to Europe

Ukraine's role in the transit of gas from Russia must be regulated with great care, given the strategic and political implications of its gas trade with Russia The existing gas trade is not an exchange between equals, rather, Kiev is at a commercial disadvantage in its dealings with Moscow due to heavy import requirements and large debts for past deliveries As a result, Ukraine receives in-kind payment (i e gas) for transit, rather than cash

Gas transportation, and storage in particular, is an area where dramatic efficiency gains can be realized Improved regulation of these mid-stream functions would have a synergetic effect on other sectors of the gas industry In particular, the effective regulation and management of transportation systems should bring significant upstream benefits New investment in field development will depend on the guarantee of secure and economic access to pipelines Once these guarantees are in place, Ukraine will be in a position to increase production levels through outside investment and negotiate more equitable deals with Russia

Transportation is a natural monopoly Open access transportation, under which all shippers of gas (be they end users, producers, marketers or LDCs) have equal rights to ship gas over the pipeline, can under certain circumstances improve the efficiency of the natural gas sector by removing the monopoly status of transportation as a bar to the realization of competition in supply The desirability of and preconditions for open access transportation are covered in more detail in Chapters 3 and 4

[1] BP Statistical Review of World Energy, 1997

6 2 TRANSPORTATION TARIFFS

6 2 1 Transportation Tariffs for Domestic Gas

Domestically produced gas (along with gas received as in-kind payment for transit) is reserved for households, budgetary, and communal customers The current price for end-users has been set by the Ministry of Economy at $66/tcm Because this price is so low, Ukrgazprom receives no compensation whatsoever for transporting such gas to those consumers Since, obviously, Ukrgazprom incurs costs to transport this gas, the transportation is by definition provided at a price below Ukrgazprom's cost of service

The tariff for the transport of imported gas has been derived within this politically determined price framework It is designed to cover operating costs and allow for reasonable profits to Ukrgazprom and the distribution companies Average tariffs for transportation by Ukrgazprom amount to $8 72/tcm including VAT [2] A breakdown is provided below

Breakdown Of Internal Transportation Tariff Structure (1998, USD/tcm)

	Ukrgazprom
Operating expenses	0 30
Material and purchased energy	2 70
Own use and losses	0 19
Payroll	0 10
Social security	0 52
Other	
Depreciation	1 28
Investments	0 96
In-house needs	0 57
Profit tax	0 65
Tariff (exc VAT)	7 27
Tariff (inc VAT)	8 72

Source The Ministry of Economy, 1997

[2] International Energy Agency, *Natural Gas Transportation Organisation and Regulation* 1996

The transportation tariff for consumption in Ukraine is not distance-based However, significant charges (e g for compression) are incurred by Ukrgazprom for the transport of gas to customers located far from the Russian border Ultimately, these costs should be borne by the customer consumers in Lviv and Odessa should pay more than their counterparts in Kharkiv and Donetsk to reflect the higher costs of transit

6 2 2 Transit Tariffs

Currently 95% of all Russian gas exports transit Ukraine Over 110 bcm/year reaches markets in Slovakia (6 1 BCM), the Czech Republic (6 9 BCM), Hungary (5 5 BCM), Bulgaria (5 0 BCM), Romania (4 4 BCM), Germany (32 9 BCM), Italy (13 5 BCM), France (11 4 BCM), Austria (4 5 BCM), Switzerland (0 4 BCM) and Turkey (5 0 BCM) Another 25 BCM is routed through the Ukrainian trunklines to consumers in Southern Russia and Moldova [3]

Six major lines with a total length of 8,600 km enter Ukraine at Sumy and Novopskov and exit near Slovakia at Uzhgorod All transit gas is the property of Gazprom, Ukraine only provides transport and storage services If these services were priced at Western levels and paid for in hard currency, they could be a major source of income for Ukraine However, Ukraine's inability to fully pay for its gas imports substantially weakens its negotiating position with Russia Ukraine is unlikely to receive any cash until it resolves its debt to Russia for previous gas supplies

Transit fees are negotiated between the governments of Russia and Ukraine under an umbrella agreement covering all aspects of the gas trade both the price for gas charged by Russia to Ukraine and the price for transit of Russian gas charged by Ukraine to Russia In 1996, Ukrgazprom received the gas equivalent of $1 75/tcm per 100 km for border to border transit [4] Ukraine had been arguing for fees of up to $2 28/tcm, citing increased costs of compression due to higher electricity charges However, $1 75/tcm is likely close to covering costs and generating a reasonable rate of return, particularly given the age and lower construction and operating costs of Ukrainian pipelines

For 1998, Ukraine has agreed to transport gas for $1 09/tcm in exchange for a reduction in the price of transit gas it receives from Gazprom Ukrgazprom will now receive gas at $50/tcm compared to the $80/tcm charged in 1997 [5] Note that this change has no effect whatsoever on the amount of gas that Ukrgazprom receives from Russia The price of transit and the price of in-kind gas used as payment jointly determine the volume of gas $50/tcm is 5/8 of $80/tcm, Since 5/8 of $1 75/tcm equals $1 09/tcm, the change in the gas price perfectly

[3] International Energy Agency, *Natural Gas Transportation Organisation and Regulation* 1996
[4] International Energy Agency, *Natural Gas Transportation Organisation and Regulation* 1996
[5] British Petroleum Internal Memo, 19 June, 1998 Also cited in Kyiv Post, 1 September 1998

offsets the change in the transportation price, meaning there is no change in the volume of gas These changes could, of course, have impacts elsewhere, such as in the income taxes owed by Ukrgazprom (owing to a decline in its revenues)

Such deals underscore the strategic nature of the gas trade between Russia and Ukraine Both countries have an interest in maintaining the uninterrupted flow of gas through Ukraine First, Russia needs Ukraine in order to fulfill long-term contracts to sell gas to European consumers Equally, Russia wants to maintain Gazprom's presence in the Ukrainian market and ensure it access to Ukrainian gas storage facilities, which play a crucial role in balancing exports to Europe

Russia is finishing construction of a gas pipeline through Belarus and Poland to Europe which can carry up to 60 bcm of gas per year This will temper but not obviate its dependence on Ukraine as a transit route As can be seen below, transit volumes have been increasing steadily since the early 1990's despite declining overall Russian production since 1991 [6]

Russian Gas: Transit through Ukraine, 1991-1997 (BCM)

	1991	1992	1993	1994	1995	1996	1997
Transit through Ukraine	113 9	123 0	125 0	129 2	132 7	140 5	134 5
To Southern Russia and Moldova	14 2	30 0	30 0	29 2	27 5	22 5	24 0
Long-distance export	99 7	93 0	95 0	100 0	105 2	118 0	110 5

Source Ukrgazprom, 1997

Therefore, transporting 60 bcm/year through Belarus rather than through Ukraine would still leave Ukraine a transit throughput of 50 bcm/year This reduction would slash Ukraine's transit revenues, but still leave it with some market power over Russia Moreover, Russia may be able to expand its sales in Western Europe, which would raise the transit through Ukraine above 50 bcm/year

As long as Ukraine needs to import gas, Russia will remain the supplier of choice Alternative supply sources have serious shortcomings Iranian gas, the main potential alternative, could be shipped either via Russia or through Turkey and the Balkans to Europe

[6] BP Statistical Review of World Energy, June 1997

Construction is not even near to beginning, so that, in any event, at best this supply source is years away from fruition The Russian line would undoubtedly raise further disputes with Russia over prices and transit tariffs, and because it would come through Russia it would only very slightly reduce Ukraine dependence on Russia The Turkish-Balkan route would include a branch line through Ukraine, but would undermine Ukraine's position as the main transit route to European consumers

As of June 1998, Ukraine owed $610 million for Russian gas,[7] and $454 million to Turkmenistan for gas supplied in 1993 [8] The presence of such debts has played a major role in sensitive political decisions on the transfer of Ukraine's nuclear missiles to Russia and the division of the disputed Black Sea Fleet

6 2 3 Transit versus Domestic Transportation

There are strong arguments that transit gas should be regulated differently from gas transported to domestic consumers After all, the consumers of transit gas are outside the boundaries of Ukraine, a Russian company owns the gas being transported, and Ukrgazprom is a large sophisticated company that should be able to fend for itself These facts argue for a completely unregulated transit market Unfortunately, this is not so easy

There are two basic approaches to allowing the transit tariff to be unregulated First, the actual transit tariff could be ignored (not taken into account) in setting the price for gas transported for domestic use In this case, absent purely random happenstance, Ukrgazprom will either make excessive or insufficient profits That is, assuming away abstractions that for this purpose are immaterial, such as distance and load factor differences, the price charged for domestic transport will, in essence, equal the revenue requirement (total costs) divided by total throughput, including transit Only if the transit price equals the price used in that calculation will the pipeline's tariffs be set at a level designed to recover its costs

Second, the regulator could take the price for transit as a given, and subtract the revenues from transit charges from the total revenue requirement to obtain a revenue requirement to use in setting the domestic transportation tariff This, however, would provide a real incentive to Ukrgazprom to set too low a tariff for transit fees

The sum of the revenues received by Ukrgazprom probably should rise above the current revenues It is our understanding that there has been little investment in the pipeline in recent years, that there are a number of aging components to the pipeline, and that therefore a great deal of productive investment could be made When Ukrgazprom wants to make any

[7] Energobusiness Novosti, 31 August, 1998
[8] Intel News, 31 August, 1998

95

substantial capital investments, it should be required to document the cost and need for the investment

6.3 STORAGE

6 3 1 Introduction

Storage plays a key role in the Russian-Ukrainian gas trade Storage facilities near Ukraine's western border are an essential tool in maintaining the winter supply of gas to Europe Ukraine receives no direct benefits for the use of these facilities, nor is it compensated for the costs of their operation

The business of storage in Ukraine needs to be reworked as a profit center as opposed to a loss-making technical unit To this end, storage needs to be viewed as a separate accounting unit distinct from transportation All costs of operation must be transparent and itemized, to be passed on to the shipper with a premium assessed for specific functions and services

A menu of services for both peak and seasonal delivery needs to be developed for storage The experience of countries such as the U S and UK may be useful for Ukraine in developing a range of services (such as short-term gas loans, balancing, and peaking processes) on an appropriate cost basis

Gas storage facilities take a number of forms Most common are aquifers (including depleted oil and gas fields), salt caverns, and LNG units Other structures include mined caverns, disused mines, above-ground gasholders and linepack systems

Storage facilities in the U S are frequently categorized as being of two types market-area storage and field-area storage Market-area storage substitutes for transportation facilities from the field area to the market area, as the use of such storage helps reduce the size of the transportation line needed during peak season Both market-area storage and field-area storage, but especially the latter, allow the production of gas to proceed at the optimal pace, unconstrained by any need to match the time-pattern of the consumption of gas In active gas markets, both market-area storage and field-area storage facilitate arbitrage, as gas purchased off-peak tends to cost less than gas purchased during peak periods

Aquifers are used for storing seasonal supplies built up during periods of relatively low demand (typically March-October) They can hold large volumes of gas but have limited withdrawal rates Salt caverns and LNG units accommodate smaller volumes, but their stocks can be quickly injected into the transportation system to meet surges in demand, making them suited for peak supply provision

Geological conditions can heavily influence operating costs The economic viability of aquifers is largely determined by holding capacity, while for salt caverns, peak day withdrawal capacity is a major cost factor Another major cost element for salt caverns can be the supply of water needed to dissolve the salt and the disposal of the brine

6 3 2 Storage Facilities in Ukraine

Ukraine uses depleted oil and gas fields for gas storage, except for two aquifers at Olishevka and Chervonopartizany No salt caverns are currently being used The 12 facilities are concentrated in the west and northwest of the country, near the main gas trunkline [1]

Underground Storage Facilities in Ukraine

Underground storage facility	Estimated value ($000,000)	Maximum withdrawal rate, tcm/hr
Olishevka	145	104
Chervonopartizany	334	438
Solokhov	198	396
Bilshe-Volitsa	6,398	5,417
Ugersk	230	833
Dashsva	350	1,042
Opary	403	833
Bogorodchany	598	833
Proletarka	437	347
Kegichevka	302	321
Krasnopopovka	112	188
Vergunka	187	63
Total	**9,694**	-

Source *Evaluation of Ukraine's Gas Transportation Facilities*, Arthur D Little, 1995

The total working capacity of the storage facilities is 32 bcm, but only about one-half of this is used today Up to 200 million cubic meters can be drawn off daily [9] This means that storage can be withdrawn at a maximum rate for 160 days, roughly the length of the Ukrainian winter

[9] Government of Ukraine-World Bank Working Group, *Priority Reforms for the Gas Industry*

97

The gas storage system is firmly integrated into the transportation system Ukrainian units play a key role in the westward transportation of gas through and out of Ukraine In Ukraine, storage facilities are situated at strategic points (entry and exit zones) near the trunkline This storage helps limit the size of the pipeline needed to transport gas at peak and to enable the production of gas at a smoother rate

This set-up reflects the integrated nature of the former Soviet gas trade Storage units on the border with Russia (Olishevka, Chervonopartizany, Solokhov, Proletarka, Kegichevka, Krasnopopovka, Vergunka) supplement Ukrainian intake In the winter months particularly, they support flow through the secondary gas lines that transverse industrial eastern Ukraine The Western Ukrainian units (Bilshe-Volitsa, Ugersk, Dashsva, Opary, Bogorodchany) compensate for this off-flow by supplementing volumes destined for the border city of Uzhgorod, they ensure that Ukraine fulfills its export commitments In this sense, the system is self-balancing, weighing domestic needs and export requirements against the flow of Russian gas

This storage provides a service for which a separate charge should be levied Ukraine absorbs the day-to-day operational costs of storage, as well as buildup and draw-down costs during periods of high demand

Russia has a significant interest in maintaining Ukraine as both a customer and a transit route for its gas This is particularly true at a time when Russian domestic demand is low and European countries are bound to long-term contracts Since it secures Russian exports, storage capacity is a major source of additional leverage for Ukraine

Until now, storage tariffs have not been negotiated or separately charged Gazprom's use of storage facilities, notably in Western Ukraine, has been implicitly accounted for in broader negotiations on gas prices, transit fees, and payment conditions

It is necessary that Ukraine view storage as an economic as well as technical good To do this, it is necessary to separate the business of storage from the business of gas transportation, at least in terms of accounting and pricing practices The separation of storage and transportation activity on an ownership or structural level should remain low priority, however Even in a competitive gas transportation market, the opportunity for abuse is low and can easily be addressed by the regulator The costs associated with separation of storage and transportation activity would be high due to the difficulties of coordinating activity between separate companies

6 3 3 Storage in the United States and United Kingdom

In North America and Europe, gas use rises dramatically in winter, due to increased residential heating requirements Approximately 2 bcm/day of gas is consumed in the US during the coldest months [2]

Gas stored underground near consumer markets is used to meet this heightened demand The US gas industry estimates it needs 93 5 BCM (3 3 trillion cubic feet) in storage by early November to balance winter supply and demand [10] About 57 BCM is typically used to directly meet consumption needs [11] Storage, commensurately, is built up from March to October, then drawn down in accordance with system requirements

In the United States, the methodology used to derive storage tariffs is very similar to that used for transportation tariffs First, the overall cost of service is calculated, including the cost of providing storage Then the costs involved in the function of storage (as opposed to transportation) is identified Storage costs include the costs of injection and withdrawal, as well as compression use Subsequently the total storage cost of service is classified as fixed or variable costs The FERC tariff design methodology requires fixed costs to be divided equally between capacity/space and delivery components, as fixed costs are incurred in each function Variable costs are assigned to the injection and withdrawal component

Once they are classified, costs can be apportioned Capacity/space costs are based on capacity volumes, deliverability costs on maximum daily delivery volumes, and variable costs for injection and withdrawal on injection and withdrawal volumes When a transportation company prepares to build a storage facility, it specifies maximum capacity, which includes cushion gas (irrecoverable gas injected to displace water), working gas (the gas used for seasonal storage), and maximum daily and annual deliverability Once authorized by FERC, these levels are authorized design levels, used in the calculation of tariffs

An important trend in gas storage has been the expansion of high-deliverability (salt cavern) storage near expanding market centers The availability of stored gas was a key factor in meeting increased demand in the US during the extreme cold spells of January and February 1996 In 1995, two of the five underground sites brought in service were high-deliverability sites In addition, expansions were completed at 4 out of 17 already existing high-deliverability sites Although the two new sites represented only 30 percent of the added working gas capacity, they accounted for 65 percent (17 million cubic meters per day) of new daily withdrawal capacity The significance of these new additions is not merely the absolute volume, but rather that this type of storage can be quickly cycled Its inventory can be fully

[10] International Energy Agency, *Natural Gas Transportation Organisation and Regulation* 1996
[11] US Energy Information Administration, *Natural Gas 1996 Trends and Issues*

depleted and refilled as rapidly as once a month, while conventional storage may be cycled only about once during the five month heating season [12]

Equally noteworthy are changes in the utilization of high-deliverability storage Before 1993, this type of storage was often used and marketed in the same manner as conventional storage Operators leased storage capacity to customers who used it primarily as seasonal backup supply rather than as peaking or short-term swing supply From 1991 to 1996, the average cycling at these sites during the heating season increased from about 0 53 cycles to about 1 14 For those sites near major market centers, the average number of cycles during the 1995-1996 heating season was a significantly higher 1 45, reflecting the more intensive use of these facilities [13]

Most storage is provided on an unbundled, contract basis in the U S Previously, pipelines provided little contract storage, using most of their storage facilities to provide sales service bundled with transportation and storage services With the advent of open access transportation, however, competing sellers of gas need to use storage capacity and therefore all storage not needed for the physical operation of the pipeline is offered on a contract basis (both to the marketing company affiliated with the pipeline and to unaffiliated marketers) Accordingly, storage has become a popular commodity in the natural gas market It is offered by many operators and marketers as a multipurpose resource, such as to support short-term gas loans, gas balancing, and peaking services

As in the U S , deregulation of gas services in the UK has allowed storage services to develop as a commercial rather than a strictly technical good Specifically, mandated unbundling of services paved the way for storage to become a competitive business segment in its own right Storage proposals in the UK have since sought to develop services that facilitate competition in gas sales, maintain the safety and reliability of the transportation and storage system, and derive practical storage services and prices Prices are designed to send economically efficient price signals to shippers while allowing British Gas to fully recover costs and achieve a reasonable return on investment

The role of storage facilities in the UK is the same as in the U S to reduce the cost of serving uneven demand while ensuring security of supply *on an economic basis* Storage also serves as "swing volume," making up for variations in the rate of gas production Storage can also reduce costs by substituting for transport capacity Since storage is generally located downstream, near the point of final delivery, it also reduces the volume of transport capacity that must be reserved for peak loads

[12] US Energy Information Administration, *Natural Gas 1996 Trends and Issues*
[13] US Energy Information Administration, *Natural Gas 1996 Trends and Issues*

British Gas pricing system for storage uses proportionally-adjusted marginal costs The method employs Long-Run Marginal Cost (LRMC) as the optimal method for pricing, specifically its more practical and realistic Average Incremental Cost (AIC) version [14] Under the proportional adjustment, all prices calculated under the LRMC method are adjusted up or down so that the prices actually charged are not designed in a manner that would under- or over-recover the revenue requirement

6.4 RECOMMENDATIONS

Volumetric transportation tariffs should be replaced by tariffs based on capacity, distance and volume These prices should be sufficient to allow pipelines to make new investments and provide a return on invested capital

One way to calculate such rates would be to divide the pipeline system into zones Rates would be calculated by multiplying the delivered volume by the distance from the supplier to the customer delivery point This provides a distance-based ratio (bcm/km) per customer A weighted average is then deduced by dividing total of all customers' distance-based ratios by the total of all zones distance-based ratios This weighted average is then used to allocate costs to the respective zones and develop rates Customers that take delivery of gas in Zone 1 are charged the Zone 1 rates Customers that take delivery of gas in Zone 2 pay Zone 2 rates

For regulations to work, consistent standards for operations and transactions must be scrupulously observed These include capacity booking, nomination procedures, flowing-gas standards, and general business practices such as contracting and billing

Implementing a bid-driven, open-access system will be a major undertaking The program must be gradual to account for the competitive potential of the different regions and the technical requirements of implementing it, particularly in terms of measuring and controlling equipment

The objective must be to configure an open and seamless system integrating third-party contracts and nominations into the schedule of pipeline operations This is the rule in countries with developed and competitive systems, in Ukraine, however, one big, lagging monopoly must perform this assignment

Given the significant degree of centralization and the limited number of actors, providing effective open access should be relatively manageable in Ukraine Difficulties, including technical inadequacy and resistance from the monopoly, may arise for the same reasons,

[14] MMC (Monopolies and Mergers Commission) report, London, 1996

however For liberalization to succeed, however, it will be essential that political will on the part of elected and appointed officials be harnessed to support the reform process

NERC should obtain data from Ukrgazprom in order to analyze the effects of different tariff design methodologies Without collecting meaningful data from Ukrgazprom, it would be impossible for NERC to regulate the pipeline in a rational, transparent manner The data NERC should collect includes but is not limited to

Customer Information

Name, address and account number, rate class, billing and collection history for each customer

Numbers of Customers by Customer Class

Numbers of Meters by Customer Class

Collections, by Customer class (monthly)

- Cash payments
- Non-cash payments
- Non-payments

Usage and Revenue Data (monthly)

Sales by customer class

Revenues by customer class

Sales and revenues from the 50 largest customers

Peak sendout

Transportation revenues

Engineering Information

Load flow diagram showing for each segment of the pipeline, capacity and peak day and average throughput, and for each major interconnection point, capacity, peak day and average throughput

For each storage field monthly injections, withdrawals and gas in storage, working capacity, maximum injection and withdrawal rates

Accounting & Financial Information

Income statement (monthly)

Balance sheet (annual)

[1] VNIPTRANSGAZ, 1995
International Energy Agency, *Natural Gas Transportation Organisation and Regulation* 1996
[2] International Energy Agency, *Natural Gas Transportation Organisation and Regulation* 1996

CHAPTER 7
AUDIT PROCEDURES

AUDIT PROCEDURES

7.1 INTRODUCTION

Regulated natural gas companies will file rate cases with NERC to change the prices they charge NERC should audit these filings to ensure that the costs claimed by the companies are accurate and reasonable NERC may also want to consider performing in-depth audits of the records of regulated companies on a long-term periodic basis, such as every five years This Chapter provides guidelines to follow in such cases

In performing audits, NERC should concentrate on high-cost areas, such as natural gas purchase contracts NERC should also concentrate on those cost areas of a company which are high relative to similar companies For example, if a distribution company's labor costs in Hrn/tcm are 20 percent higher than the labor costs of similar distribution companies, then it would be worthwhile to investigate the reasons for that difference The difference may be reasonable, but may instead reveal an unacceptable level of inefficiency for which the company's customers should not be required to pay

7.2 AUDIT OF FIXED ASSETS AND FINANCIAL CONTRIBUTIONS

7 2 1 Safety inspection of fixed assets

Efficiency improvement heavily depends on safety and rational use of fixed assets The task of the inspection of the fixed assets is to check on

- Safety and technical condition
- Legitimacy and accuracy of documents on acquisitions, movement and depreciation
- Accuracy of depreciation charges, as well as their timeliness and completeness of inclusion in production costs
- Accuracy of presentation of acquisition, movement and depreciation transactions in financial accountancy
- Compliance with the planned deadline dates for repairs, their timeliness and quality

Original documentation on acquisition, movement, depreciation, repairs, depreciation charges is used to inspect records of fixed assets

While inspecting the state of records of fixed assets, it is obligatory to

- Ensure that analytical accountancy organization is accurate

- Ensure that the latest inventory was conducted accurately and to find out the results and whether they are included in accountancy

- Inspect accuracy of records on availability and movement of fixed assets

7 2 2 Inspection of operations on fixed assets

While doing inspection of operations on fixed assets acquisitions, it is necessary to verify expediency of their construction or purchase, timelines and accuracy of the draw-up of the documents, and the reality of their assessment

It is necessary to check rightness of assessment of fixed assets Original price, including construction or acquisition costs, design estimate documentation, delivery and installation costs, of acquired fixed assets should be recorded in accountancy Acquired fixed assets which have been in operation are booked at a purchase price plus delivery and installation costs, plus depreciation of these objects, which is registered in the invoice

Depreciation documentation of fixed assets should also be inspected Draw-up accuracy, legitimacy, and expediency should be checked in every single case Checking original documents, analytical and synthetic accountancy ascertain timeliness and accuracy of the documentation draw-up Legitimacy of liquidation can be ascertained in the depreciation documents

While inspecting, it is necessary to ascertain whether depreciation rates are applied correctly

7 2 3 Inspection of Repair Expenses

Draw-up accuracy of the plan and capital repair estimates is inspected Special attention should be paid to the reasonableness of the estimates Sometimes, these are drawn up after the completion of repairs, thus, the estimates are equalized to actual expenses In this case, the reasonableness of the actual expense should be investigated Estimates for capital repair of buildings should be dawn up on the basis of their technical inspection, approved by the director of the organization

While inspecting capital repairs of fixed assets, it is necessary to ascertain whether repair stipulated expenses have not been exceeded

If there is an increase to repair expenses done by the economic method, then it is necessary to check accuracy of formation of expense items

7 2 4 Are the Records of Non-material Assets Accurate?

Non-material assets are recorded in account 04, "Non-material assets," in the following succession

- Items, handed over by the founders towards their contributions into the statutory capital, -- at prices agreed upon by the parties,
- Items, purchased from other organizations and entities, -- at factual acquisition and set-up expenses
- Items, received free from other organizations, -- at prices set by professional assessment and which should be close to market value of these items

Booking as received of non-material assets should be done on the basis of necessary documents (acquisition acts, agreement accountancy documents)which prove the fact of hand-over and acceptance

7 2 5 Inspection of Accountancy Accuracy of Financial Investments

Financial investments include investments into state securities (bonds and debt certificates) securities and statutory capitals on other organizations, and loans to other organizations

Time-wise, investments are divided into long-term (over 1 year) and short-term In the statement of assets and liabilities, they are included into articles 'Long-term financial investments" and "Short-term financial investments "

Financial investments are not costs which go into the provision of regulatory service However, the reasonableness of the company's investments should be investigated, as it could affect the financial health of the company Examples of illegitimate investments include speculative activities in derivatives markets (as opposed to hedging arrangements which reduce a company's risk) and loans made to individuals or other companies on non-commercial terms

Financial investments are recorded at a sum of factual expenses for the investor

Investments into other organizations' stock are presented in the end-of-the-year financial statement at a market value, if the latter is below the value in the financial statement The difference between market and financial statement value is compensated out of reserves for equity devaluation, which are filled up from profits

7 2 6 Inspection of Correctness of the Consumption of Material Values

Attention should be paid to interrelation between the production program and the supply of material resources It should be ascertained if calculations for resource needs are in accordance with effective consumption norms of materials Effective and supporting information is also an object of auditing Data on every supplier is recorded in effective accountancy, which should be spot-checked for availability of assortment and date of supply information

7 2 7 Inspection of Consumption of Material Resources

The main sources for inspection are the consumption register, order-journal account #10 "Materials", balance or turnover register of resource movement, cards or books of storage accounting, primary documents on consumption of materials for production purposes Inspection of validity of the filed level of consumption can be done by means of experimental testing

General amount of production costs is significantly influenced by prices for materials and feedstock Pricing methods should be determined in accordance with accounting policies of the enterprise These include average-weighted price, First In First Out (FIFO) and Last In Last Out (LIFO) methods In the FIFO method, material resources are included into the cost according to the prices of the first purchases, and in LIFO method according to the latest purchases

7.3 Audit of Production Costs

7 3 1 General Methodological Approaches

Documentary proofs of accuracy of the cost calculation for ready to be shipped products (services) should be ascertained Audit should reveal any expenses which should be covered from special funds or net profit of the enterprise The audit should not cover all expenses, but rather a small sample If, to the contrary, economic entities depreciate costs, which according to effective legislation should relate to operating costs, at the expense of financial results, then the cost of production decreases too much

Audit should study organizational and technological peculiarities of the organization, character of its activities, production scale, production resources, development prospects and business partners

While inspecting accountancy of production costs, the auditor should ascertain

consistence of the chosen accountancy method for production costs and calculation of the product cost as well as its accordance to industrial and organizational peculiarities of the organization,

- Accuracy of cost differentiation by accounting periods
- Accuracy of pricing for consumed resources
- Validity of depreciation deviations of actual cost of material resources and value of material resources according to accounting prices
- Accuracy of depreciation charges on fixed assets, non-material assets and inclusion of depreciation costs into production costs or covering by net profit
- Validity of overheads and methods for their allocation
- Validity of inclusion of travel (especially international), expenses for advertising, audit fees and many others into production costs

It should be taken into consideration that, recently, there have been significant changes in depreciation of some costs, and the auditor has to have a perfect knowledge of instructional materials on accountancy of depreciating production costs

Auditing the constitution of costs in industrial and constructional organizations, the auditor should ascertain the method of product cost formation traditional for accountancy period or the one applied in international practice In the first case, the total product cost is calculated, depreciating at the end of every month indirect expenses to accounts receivable # 20 "Main production" from accounts 25 "General production costs" and # 26 "General economic expenses" Sums of actual operating product costs are switched from account payable # 20 to accounts receivable # 40 "Ready for shipping products," #45 "Shipped products" or 3#46 "Realized products (services)" A necessity of a monthly distribution of indirect costs proportionally to the chosen base for defining total product cost of certain goods significantly complicates such methodology

The international variant of production cost accountancy of stipulates calculation of an abridged (partial) product cost and depreciation of indirect expenses directly to account # 46

The auditor studies methods of production costs and calculation of the product cost

Correctness of the method for distribution of indirect expenses among objects of calculation is determined in order to ascertain the extent of accurate price setting for products

7 3 2 Inspection of Production Costs by Items of Calculation

Inspection of costs by calculation items allows to define how costs are formed by places of appearance and centers of responsibility and also to spot non-production expenses Calculation items are single-element or complex expenses The auditor has to study estimates and to compare planned and actual expenses, paying special attention to losses and over-expenditures The most important items to be inspected are costs, directly connected to production, cost for preparation of production, non-capital expenses, expenses for invention and rationalization, costs for servicing operating process, costs for providing normal working conditions and safety, personnel, deductions to state social and medical insurance and pensions, payments of bank credits, depreciation of non-material assets and other

Special attention should be paid to the items of expenses connected with production management expenses for management staff, company car fleet, expenses for international travel, payments for services, connected with production, provided by other companies, presentational expenses connected with commercial activities of the company

Out of the previously mentioned expenses, presentational expenses deserve special attention These include official business lunches, entertainment expenses, translation expenses etc

7 3 3 Audit Of Expenses By Economic Groups Of Elements

By-element inspection of the composition and structure of costs over several years is one of the most important directions in audit because it may reveal increased costs in a year that are not typical and probably will not recur, and that therefore should not be allowed in full in setting prices

The element " Material Costs" contains expenses for feedstock and materials, spare parts, production services, fuel and all sources of energy

Expenses for salaries and wages are an important element in product cost formation This element contains costs of labor of the operating staff, including bonuses, as well as labor costs for workers, who are not on the organization's staff, involved in production process

While inspecting "Depreciation of fixed assets", the auditor has to ascertain accuracy and legitimacy of influence of depreciation charges on completeness of recovery of fixed assets The calculation base for this is the value of fixed assets in the financial statement and approved rates, including rapid depreciation of the active part of fixed assets The item "Other costs" should be inspected very meticulously This item contains taxes, deductions to social non-budgetary funds, charges for pollution, certification, fire patrol and security services, expenses for training, communications, rent

Using industry methodological recommendations on questions of planning, accountancy and calculation, the auditor ascertains accuracy of expense grouping by items

7.4 AUDIT OF PAYMENT TRANSACTIONS

7 4 1 Payment Transactions with Accountable Entities

The main objective of audit payment audit is to inspect the expediency and legitimacy of accountable sums, as well as compliance with the procedure of reimbursement of expenses for business trips

Orders, advance reports, teller reports with receipts and payments cash orders of the account book, data of analytical and synthetic accountancy for account # 71 "Payment transactions with accountable entities " These audits should be carried out on a spot-check basis, as a full audit of all transactions would be unduly burdensome both to the company and to NERC

7 4 2 Payment Transactions with Suppliers

Audit of payment transaction must be carried out in the following directions

- Availability and accuracy of agreements (contracts) for supply of materials
- Completeness and timeliness and consumption
- Accuracy of payment
- Compliance with deadlines for legal limitations

The following documents must be checked payment documents, warehouse accountancy books, registers of analytical accountancy

If some payment transactions are done by bills, then accuracy of transactions must also be checked Promissory notes and bills of exchange are used in payments by bills

7 4 3 Payment Transactions with Buyers

Audit of payment transactions with buyers includes product delivery agreement, accuracy of sum calculations that the organization is entitled to, buyers' indebtedness

If there are serious cases of stable indebtedness, its basis is ascertained from original documents

111

Inventory acts must be audited to ascertain general and individual indebtedness in the financial statement

7 4 4 Payment Transactions with Different Debtors and Creditors

Audit of payments for goods sold on credit is carried according to methodological means of document audit

7 4 5 Payments of Labor Costs

Payments of labor costs possess many subtleties and peculiarities Therefore, the auditor has to define the state of the regulatory base and accountancy for relevant questions

7.5 Audit of Financial Performance

7 5 1 Audit of Accuracy of Profit Formation

Audit should reveal correspondence between data in reports on financial performance and spending in the account book, order-journal, and different registers

The auditor should ascertain the basis for inclusion of expenses in product cost, as well as their depreciation by balance sheet profits

The results of realized goods (provided services) are included monthly in account #46 Financial results from the sale of fixed assets and other properties are accumulated in accounts
47 "Realization and other retirement of fixed assets' and "Realization of other assets "

Under current Ukrainian accounting standards, unrealized profits include

- Dividends from assets
- Profits from stakes in other organizations
- Profits from securities other than stocks, (CDs, interest bills)
- Profits from currency operations
- Interest from loans
- Profits from property leases
- Profits fines, late charges, penalties, reimbursements of losses
- Profits from previous years
- Unclaimed accounts payable with expired legal limitation

Unrealized expenses include

- Property tax
- Added profit tax payments
- Local taxes and charges
- Expenses for bonds, currency etc
- Negative currency rate differences
- Legal expenses
- Fines, late charges, penalties, reimbursements
- Production costs which did not result in actual goods, and canceled production orders
- Losses from previous years
- Losses from property theft
- Losses caused by natural disasters

7 5 2 Profit Spending

Spending figures are analyzed by comparing relevant records in the account book, order-journal, and different registers as well as information (Form # 2, Chapter II) from original documents The auditor verifies validity of

- Deductions for the formation of the reserve capital, build-up and consumption funds
- Charity deductions
- Other deductions

13

CHAPTER 8
OIL PIPELINES

OIL PIPELINES

8 1 INTRODUCTION

The Ukrainian oil pipeline system is made up of several state-owned enterprises under the authority of the State Oil and Gas Committee (Derzhnaftogazprom) This Committee was set up in November 1992 to oversee oil and gas activity in the country Recently, the pipeline enterprises Druzhba and Pridneprovskiy were set up as joint-stock companies

History and Structure

The Ukrainian oil pipeline system consists of two large international trunklines—the Druzhba and Pridneprovskiy pipelines—plus a broad network of underutilized petroleum product pipelines

Since the 1960's, Druzhba has served as the main export line for Russian crude exports to Europe It has retained this role in the 1990's despite Russian efforts to step up exports via alternative routes (through Belarus and the ports of Ventspils and Novorossisk)

The 1397 km pipeline now operates at around 60% capacity (18 MT out of possible 30 MT/year) The entire Druzhba enterprise, created as a state company in 1991 following the collapse of the Soviet Union, consists of 14 compressor stations, 2 oil loading facilities, a 50% share in the unfinished Black Sea "Yuzhniy" port and railroad interests in Brody and Stariy Sambir It supplies the Western Ukrainian pipelines of Drogobych and Nadvirna

Pridneprovskiy, built in 1966, is a network of 9 trunklines and 18 compressor stations spanning 2310 km in the south and east of the country It currently operates at 45% capacity (47 5 MT out of a possible 104 MT) and serves largely as an export line for Russian (along with a small share of Kazakh) crude It serves the larger refineries of Kremenchug, Lysichansk, Kherson, and Odessa About 75% of exports are routed via the Russian port of Novorossiysk, 25% via Odessa [1]

[1] *Nefterynok 97*, Ukrainian Petroleum Consultants

The following chart shows transport volumes for Druzhba and Pridneprovskiy from 1995 to mid-1998

	1995	1996	1997	Jan -June 1998
Oil Transport, Total MT	65,956	65, 199	64,386	32,781
For Export	50,285	53,541	53,024	26,522
For Ukraine	15,670	11, 657	11,363	6,259
Druzhba Line	19,250	17,654	18,334	9,371
For export	18,027	16,678	17,240	8,833
For Ukraine	1,223	976	1,094	538
Pridneprovsky pipeline	46,705	47,545	46,052	23,411
For export	32,258	36,683	35,784	17,689
For Ukraine	14,447	10,681	10,268	5,721

Source *Ukrainian Oil & Gas Report*, and *ENERGOBUSINESS*

In addition to Druzhba and Pridneprovskiy, there exists a product pipeline network under the control of Ukranaftoprodukt, the notional distributor of refined products in Ukraine The network is extensive (at 3,200 km, it comprises 17% of the NIS total of 19,000 km) yet largely unintegrated Most refineries have limited or no links with product pipelines and not all product pipelines are interconnected The Odessa refinery is not connected to a product pipeline, Nadvirna and Kherson have only limited connections to neighboring cities, and Lysychansk and Kremenchuk are connected only to surrounding regional networks rather than into a larger system

Ukranaftoprodukt lacks the means to maintain the lines The system has fallen into disuse and disrepair in line with the fall of refinery output Product lines now transport less than 1% of former peak throughput (10 MT/year in 1991) Rail is now used for transport from refinery to terminal, with trucks supplying most retail outlets Ukranaftoprodukt has been rendered a marginal player, as private traders and retailers have dominated the market

The Political Economy of Pipelines

Ukraine remains Russia's largest single market for crude, followed by the Czech Republic, Slovakia and Hungary In 1995, Ukraine imported 13 2 MT from Russia (out of an import total of 15 67 MT) with the remainder supplied by Kazakhstan and domestic production

116

The 13 2 MT purchased from Russia represents a 55% drop from 1992, when Russian imports reached 33 5 MT That year, Russia decided to cease subsidizing its oil exports at well below world market prices Prices have since risen to near international levels Ukraine has had trouble paying for these shipments, and supplies have periodically been reduced by Russian exporters (companies such as Lukoil, Yukos and Slavneft) owed overdue payments

On January 1, 1996, Ukraine raised tariffs by 13% for Druzhba transit along the 715 km within Ukrainian territory This meant an increase from $4 60/ton ($0 064 per ton per 100 km) to $5 20/ton ($0 072 per ton per 100 km) Ukraine justified this by the high price (over $100/ton) it was paying for Russian crude In response, Russia temporarily suspended shipments across Ukraine, and cancelled deliveries to the Drogobych refinery Deliveries resumed after Russian companies agreed to pay the new rates Currently Ukraine receives $125 million a year for use of the Druzhba line and $75 million a year for Pridneprovsky

Future import levels can be projected by Ukrainian refinery demand Assuming domestic production (85% produced by Ukrnafta) holds stable at 4 MT/year, Russian crude imports are likely to remain within the 12 to 16 MT/year range

Oil Product Demand Trends (Mt)

	92	93	94	95	96	97	98E	99E	2000E
Fuel Oil	18 3	11 0	9 1	6 1	5 5	5 4	5 4	5 4	5 5
Diesel Fuel	7 9	6 1	5 6	5 3	5 1	5 4	5 7	6 0	6 2
Gasoline	5 3	3 7	2 5	2 0	1 6	1 5	1 5	1 5	1 5
Other	7 2	5 3	3 4	2 9	2 7	2 2	2 3	2 3	2 5
TOTAL	38 7	26 1	20 6	16 3	14 9	14 8	15 2	15 2	15 7

SOURCE International Energy Agency

As can be seen, the contraction of the economy since 1992 has lead to a severe drop in the demand for refined projects Demand for crude oil is not likely to exceed 20 MT/year in the foreseeable future Thus the construction of any large pipeline and transport facilities (see below) suggest that a major role for Ukraine will be as a transporter of Caspian and/or Persian Gulf oil to the countries of Central and Eastern Europe

Strategic Significance

The Druzhba and Pridneprovskiy lines have strategic as well as economic significance for relations between Russia and Ukraine This is due to Ukraine's dependence on Russian oil, on the one hand, and Ukraine's position as the most direct route to markets in the West

117

The construction of the Odessa-Brody link signifies Ukraine's determination to become a player in the transport of both Persian Gulf (higher quality and cheaper to produce than Russian oil) and Caspian production to Europe, and to loosen its dependence on Russian suppliers

Druzhba has supported the construction of a third Ukrainian trunkline, from Odessa to a Druzhba link-up in Brody, as well as the construction of the Yuzhniy terminal, which should be able to take on large quantities of tanker-delivered oil Until now, the project has stalled due to lack of funding On August 17, 1998, the US Trade and Development Association announced it would support the allocation of $1 5 million to evaluate the construction of a connector pipeline able to handle 14 5 millions tons of oil annually, with the possibility of expansion to 30 million tons This will facilitate the transport of high-quality Caspian oil from Supsa in Georgia for processing in plants in Eastern and Central Europe, as well as future production from the Persian Gulf (via Samsun in Turkey)

Domestic Oil Production

Domestic crude oil production is important in the context of pipelines as it holds the key to future levels of imports The question, then, is what can be done to increase current levels of production, and thus reduce dependence on imported (Russian) oil?

Ukrainian oil is generally of higher quality than the Urals blend imported from Russia It has low tar, sulfur and paraffin levels, with a high yield of light distillates

Unfortunately, Ukrainian reserves are largely depleted Overproduction and inadequate maintenance during the Soviet period have resulted in water flooding and pressure loss The Black Sea offers potential for new finds, but foreign investors have been discouraged by low oil prices and the lack of a solid legal framework for investment

The State Committee for Geology estimates proven or commercial reserves at 153 MT Oil production is concentrated in three regions the Carpathian (West), Donetsk-Dnieper (East) and Crimean (South) The bulk of production comes from state company Ukrnafta, 3 4 MT in 1995, with some production from Ukrgazprom (mostly condensate), and a neglible contribution from Chernomornaftagaz [2] Annual production amounts to 4 MT in total

Oil Pricing

Ukraine has pursued an active policy of price regulation for domestic oil production and product sales since 1992 Measures have included

[2] International Energy Agency, *Energy Policies of Ukraine*, 1996

- Direct setting of administered prices
- Establishment of maximum profit and retail margins
- Requirements to obtain prior approval for price increases
- Issuing of price recommendations through intermediate bodies

Control has been exercised through decrees as well as through informal means (e g through local authorities) In practice, state oil company UkraNafta makes price recommendations based on documented costs and submits them to the State Oil and Gas Committee for approval

In the early 1990's, prices on domestically produced oil were kept low Oil was listed as one of several "critical commodities" subject to regulation In mid-1994, prices for domestic crude were only half those of Russian imports By the end of 1995, however, domestic prices had reached parity at over $80/ton, and kept pace with Russian prices as they ultimately topped $100/ton [3]

Transport Pricing

The strategic, economic and political importance of Russian oil for Ukraine means that price and volume decisions will continue to be taken at the highest levels of government The current fee of $5 20/ton for transit of Russian crude reflects what the Ukrainian government feels it can demand from Russia in light of its political and economic relationship with its neighbor The costs of transmission, namely the operation of compressor stations and maintenance of the pipeline, are factored in as well

Domestic producers are subject to the market power of the pipeline operators, which function as natural monopolies Consistent and transparent tariffs, along with guarantees of pipeline access, need to be established in order for domestic production to attract needed investment capital

[3] International Energy Agency, *Energy Policies of Ukraine*, 1996

8.2 TARIFFS[4]

It is important that oil pipeline tariff methodology and corresponding tariff rates be developed according to internationally acceptable standards and practices Rates should be based on cost-of-service principles and allow for a competitive rate of return to attract investors The methodology should be objective and balanced towards the interests of customers, financial institutions, and investors It is also essential that the methodology be transparent in the determination of tariff rates, and thus cost-justified

This report reviews relevant pipeline tariff concepts and issues, describes cost-of-service methodologies for setting tariffs, and surveys specific tariff practices of several oil producing countries It makes recommendations for the development of a fair and reasonable tariff mechanism for Ukraine

Some additional topics will be considered as well, such as

- the need for an independent regulatory commission to determine tariffs and oversee operations of the pipeline business
- measures to attract foreign investors and financial institutions, the development of alternative (including negotiated) tariff methodologies
- the transition to a new accounting system and the identification and elimination of subsidies and cross-subsidies
- the determination of a competitive rate of return
- the definition of data and information needs to properly analyze the system
- the assignment of a proper valuation of pipeline assets for rate-making purposes
-
- evaluation of current operating conditions and plans for rehabilitation and construction

[4] **Sections 8 2-8 6 are taken with only slight modifications from "Pipeline Tariff Methodologies," a report prepared for Hagler Bailly in Kazakhstan in 1997 by Purvin & Gertz**

Key Factors For Designing Tariffs

When establishing tariffs, there are several important considerations

- Financial Integrity The cash flows generated from tariff revenues must be sufficient to provide a *reasonable level of assurance* that the pipeline operators are able and sufficiently motivated to meet their financial obligations throughout the economic life of the pipeline

- Project Economics The returns provided to equity holder and lenders must be sufficient to *compensate them* for all risks of the project

- Third Party Acceptance The level of tariffs and other commercial arrangement must be *acceptable to third parties* including shippers, producers, and political/regulatory authorities with jurisdiction in pipeline-related matters

- Flexibility The tariff-setting mechanism should be sufficiently flexible to *respond to variations* in the business environment over the economic life of the pipeline

Tariff structures should incorporate both cost- and market-related factors While the tariff should be developed using a cost-based approach, it must also be constrained by the economics of existing and prospective alternative transportation, as well as by the potential for substitution by competitive fuels

It is desirable to levelize the tariff such that it is a uniform real rate indexed to inflation Such a tariff mechanism minimizes front-end loading and rate base depletion The absence of front-end loading may benefit producers-shippers who are faced with low production volumes and high production costs in the early years of field development The minimization of rate base depletion also maintains the incentive for pipeline owners to sustain operations in the later years of the project Furthermore, a levelized tariff system is simple to administer and maintain It is also fair in the sense that it matches the value of the transportation service to shipper which is constant in real terms

Sufficient flexibility needs to be built into the tariff system so that periodic adjustments can be made to reflect actual cost-of-service, throughput and currency exchange rates Adjustments should also be made periodically to encourage improvement in operating efficiency and capital investment

Because the proposed tariff is linked to inflation, there is some risk that tariffs in the later years, when combined with other production costs, may make incremental production uneconomical However, curtailment of production also would restrict transportation volume to the detriment of the pipeline owner Therefore, both shippers and owners have incentive to

121

establish a tariff indexation mechanism that protects the shipper against extreme inflation or any other unanticipated development

It is common for start-up pipeline projects to rely on significant debt financing Lenders are reluctant to provide financing unless there are assurances beyond the pipeline assets themselves To provide lenders these assurances, it is advisable to secure long-term commitments or guarantees on the part of the shippers

Lower debt costs attributable to guarantees are passed through, and shippers receive the benefit in the form of lower tariffs An incentive tariff structure could be constructed to reward shippers who enter into various types of commitments
Where significant political and economic risks exist, special provisions may be inserted in commercial agreements that allow for renegotiation should circumstances warrant Changes in the tax code, commercial law or monetary policy would justify renegotiation Failure to include such provision could materially increase the risks to equity holders and lenders

There are a variety of tools available to the sponsors of pipeline projects to develop tariffs Selecting the appropriate tools requires an appreciation of the commercial requirements of the various parties involved Once these requirements are known, specific tariff proposals can be developed and evaluated

8 3 Tariff Practices

Tariffs are either cost-based or set by direct negotiation between owners and shippers Generally speaking, practices vary depending on whether the pipelines are shipper-owned systems, regulated common carriers or used for third-party transportation

Shipper-owned Systems

The shippers of petroleum have the greatest incentive to ensure the timely availability of the lowest cost transportation service, and they have the most knowledge and control over future transportation requirements which affect initial design and investment cost Therefore, the vast majority of the world's pipelines are constructed by their shippers Since it is always more economical to construct one large pipeline than to construct several smaller pipelines, it is common for a group of shippers to jointly own a single pipeline for their exclusive use In these circumstances, tariff structures are designed to allocate actual operating costs fairly among users, some of whom may utilize different portions of the entire system If individual owners are permitted to use more than their proportional share of capacity at times, then tariff provisions may provide for the allocation of investment recovery as well as the allocation of operation costs

The economic benefit earned by a shipper-owner from the movement of petroleum through a pipeline is not measured by the tariff, but by the difference in market value of the petroleum between origin and destination less actual, out-of-pocket costs This net increase in value is the only relevant economic measure for the integrated shipper-owner The transportation tariff merely transfers notional funds between affiliates and the amount of the tariff has no real consequence unless it influences taxation by shifting the point at which profit appears to have been earned

Third-party Transportation

When a shipper-owner offers surplus transportation capacity to others, then third-party transportation provides actual incremental income to the owner and is an actual incremental cost for the third-party shipper Therefore, third-party transportation has real economic relevance, in contrast to the transfer payments between affiliated shippers and owners

In the absence of common carrier regulations (discussed below), third-party transportation service typically is negotiated from commercial considerations, including the cost of alternative transportation for the third-party shipper, the incremental costs of the pipeline owner, the shipper's commitment of minimum quantities, and the owner's dedication of capacity Negotiated transportation tariffs may incorporate indexation or other mechanisms for cost escalation depending upon the duration of the contract and the type of service provided The tariff may include separate capacity reservation fees and usage fees

It is common for the shipper-owner to provide third-party transportation service when there is adequate system capacity, and this practice frequently is encouraged by governments wishing to promote the production of additional reserves or the optimum use of facilities

Regulated Common Carriers

In some countries, particularly in North America, the petroleum industry is characterized by the presence of numerous small independent crude oil producers and petroleum refiners Pipelines are regulated in these countries to prevent the abuse of monopoly power by pipeline owners who are typically competing oil companies Pipelines are designated as 'common carriers" with the duty to provide transportation (upon reasonable request) so as to avoid subjecting any shipper, locality or territory to any undue or any unreasonable prejudice or disadvantage, file tariff rates for all points on its system, not collect compensation inconsistent with what is specified in such tariffs This principle is know as Mandatory Open Access Government commissions are authorized to review all pipeline tariffs and determine whether a rate is just and reasonable, discriminatory, or preferential

The review of tariff rates normally proceeds from an analysis of cost, including a reasonable return on investment Typically, the initial investment is depreciated over its expected life at

123

a uniform rate based either upon time in service or upon quantity transported A rate base is determined in each year, equal to the total value of the pipeline assets less the total accrued depreciation Thus, the rate base represents that portion of the investment that has not yet been recovered through depreciation

The cost of service for a given year is equal to the annual expenses incurred, plus the depreciation charged in that year, plus a return on the remaining rate base The rate of return is judged in relation to the current rates in the general capital market for business ventures of corresponding risk The total cost of service (in dollars) is divided by the annual quantity transported to derive the cost-of-service tariff

In certain cases, regulatory authorities in the United States and Canada have approved tariff structures that include features that are not entirely based on cost Incentive adjustments have been allowed to encourage cost reductions, throughput maximization or efficiency improvement In the United States, any oil pipeline is also entitled to relief from cost-base regulations if it can demonstrate that its rates are adequately constrained by competition

Summary

A tariff structure should incorporate the following elements

- The tariff should be based on the cost of service but be competitive with existing and prospective alternative transportation It should also reflect the cost of alternative fuels and the potential for substitution In this manner, the developed tariff is both cost-based and market-related

- The cost-of-service tariff should be levelized over the economic life of the pipeline such that it is a uniform real rate indexed to inflation Levelizing tariffs solves the problem of "front-end loading" and "rate base depletion' associated with classical cost-based methodologies that result in very high tariffs at initial stages and very low tariffs in the later stages of the project Furthermore, a levelized tariff is fair in the sense that it matches the value of transportation service to shipper that is constant in real terms It is also simple to administer and maintain

- Sufficient flexibility should be built into the levelized tariff system so that periodic adjustments can be made to reflect actual operating cost, throughput and currency exchange rate Periodic adjustments should also be made to encourage operating efficiency improvement and capital investment

- An incentive tariff mechanism should be included to reward shippers who enter into various types of long-term commitments or guarantees Shippers' guarantees help reduce project risks for prospective lenders and equity holders

8 4 Tariff Concepts and Issues

Pipelines are the most efficient means of transporting large volumes of petroleum over land for long distances Even when water transport is a feasible alternative for some or all of the distance, pipelines are more cost-efficient than all but very large ships Pipelines have extremely low operating costs in relation to other transport modes, they are, however, extremely capital intensive, requiring large investment early in the project life

The engineering features of a pipeline mean that the average cost of a unit of transportation volume will decline throughout the range of technically feasible pipeline size As pipeline diameter increases, pipeline construction costs increase less than proportionally, while pipeline carrying capacity increases exponentially The cost of transporting a barrel of oil decreases about one-third each time the design capacity of the pipeline is doubled

Therefore, when building new pipeline capacity, it is always more efficient to build a single pipeline of sufficient size to satisfy the entire transportation demand than to build several smaller pipelines at the same time The single line should be designed for phased expansion to handle all of the prospective volume (which might be quite uncertain at the time of initial construction) Otherwise, there is a threat of future competition from a larger line with substantially lower cost If the line is oversized for the volume of shipments that actually materialize, however, its owners will have incurred a high cost of unnecessary investment

In order to justify the large initial investment, pipelines must be expected to serve over a long life span The long investment payout period makes the pipeline sensitive to longer term market trends which may affect the need for transportation service and exposes the pipeline to operating and political risk over an extended time period

Pipeline investment is recovered over the subsequent service life according to various accounting conventions (when the pipeline is used captively by its owner) or by means of transportation tariffs (when fees are charged for transportation service provided to others) Different accounting conventions and different forms of tariff are employed, reflecting individual preferences and the laws or accounting practices of different nations There is no single "correct" way to recover initial investment over subsequent service for pipeline systems or for any other type of investment Various forms of "market-related" tariffs and "cost-based' tariffs are in current use

Market-related tariffs seek to value a particular transportation service in relation to the users' cost of alternative transportation The transportation alternatives may be competing pipeline systems or entirely different modes of transportation such as ocean transport or rail movement Potential new alternatives as well as existing alternatives are relevant

25

Cost-based tariffs are intended to allocate actual expenses fairly among shipper-owners and, in situations of governmental regulation, to prevent anti-competitive practice such as unduly discriminatory pricing

Market factors are relevant in a cost-based system, because in the long term, users cannot afford to pay more than what the service is worth Cost factors are relevant in a market-based system since owners cannot operate at a loss for an extended period of time

Whether tariffs are cost-based or market-related, the following issues should be considered when establishing tariffs

- *Pipeline Economics* The tariff structure should provide the pipeline enterprise with sufficient cash flow to meet current obligations, recover past investment, and provide a compensatory return to investors

- *Risk Apportionment* The mechanisms for collecting tariffs should consider the distribution of risks among equity holders, lenders and shippers

- *Flexibility* The tariff-setting mechanism should be sufficiently flexible to respond to changed circumstances such as monetary inflation, commercial, environmental, or tax laws, and other possible variations in the business environment over the life of the pipeline

- *Producer Economics* Pipeline tariffs are a significant consideration for producers Ultimately, the cost of transportation, along with field costs and the market price for hydrocarbons determine the economic viability of various extraction techniques and the quantity of hydrocarbons that can be economically extracted and shipped through the pipeline Tariff proposals should consider effects on producer economics

Pipeline Economics

When setting pipeline tariffs, several factors related to the economic characteristics of the project need to be considered The underlying assumption when formulating a tariff proposal is that, regardless of the basis on which the tariffs are negotiated, project economics will be monitored with a cost-based model The cost-based model will quantify the financial and economic consequences of particular tariff arrangements The primary concern is that life-cycle returns to equity-holders be attractive at reasonable risk

A start-up pipeline will face a variety of challenges related to tariffs The sizing of pipeline facilities and their costs will be based on the anticipated sustainable production plateau for the oil fields, which will not be reached for several years Lenders may require debt maturities significantly shorter than the expected economic life of the pipeline, while the

production economics of producers may constrain the level of tariffs that they can afford to pay These concerns are not unusual and a variety of approaches have been applied to develop commercially acceptable tariff proposals Typically when developing tariff proposals for a new pipeline, one or more of the following approaches will be considered

- *Alternative Depreciation Schedules* For new pipelines, the recovery of investment is a significant cost-of-service component In cases where initial pipeline throughput is low, the use of traditional straight-line depreciation applied to total investment can lead to tariffs that are above the market level It may be helpful to adopt alternative approaches to depreciation in these circumstances

- *Consideration of Debt Provisions* Debt may be relied upon for funding a significant portion of the investments The terms of the debt with respect to interest rate and time to maturity will likely be significant factors in determining cash requirements after start-up Furthermore, shipper guarantees will undoubtedly be required to obtain debt on acceptable terms The tariff structure will have to consider the requirements associated with the terms of the debt financing

- *Adjustments to Equity Holder's Returns* A substantial portion of project risk will ultimately rest with the equity holders The timing of the recovery of equity contribution and the return earned on equity can be designed to meet constraints on tariffs However, it is important that the overall project returns on equity be attractive

Alternative Depreciation Schedules

Tariffs typically include sufficient depreciation charges to recover investment over the useful life of the pipeline using a straight-line schedule Possible problems associated with the use of the straight-line approach include 1) insufficient cash flow to meet debt service requirements, 2) market constraints on the level of tariff to be charged, 3) insufficient volumes to fully absorb depreciation and other costs of providing service It is not unusual for these issues to arise in the early years of a new project

When throughput is low in relation to pipeline capacity during the initial years of a project, reliance on straight-line depreciation may result in unacceptably high depreciation charges on a per unit basis

If it is anticipated that throughput will be substantially higher in subsequent periods, the use of the Unit-of-Throughput (UOT) approach may be appropriate Under the UOT approach, each period's depreciation charge is based on the ratio of throughput for the period to the estimated throughput for the life of the pipeline The use of UOT with an increasing throughput profile reduces depreciation charges in the initial years in comparison to the conventional straight-line approach

Consideration of Debt Provisions

Recognition of the Value of Shipper Guarantees It is common for start-up pipeline projects to rely on debt financing of 70% or greater Lenders are reluctant to provide financing unless there are assurances beyond the pipeline assets themselves In order to provide lenders these assurances, the most common method used in both the oil pipeline and gas transmission industries is to secure long-term commitments on the part of the shippers In the oil pipeline industry these commitments are termed Throughput and Deficiency Agreements (T&D) which bind the shipper to make sufficient payments to cover operating expenses and debt service should tariff revenues prove insufficient

The commitments on the part of shippers are termed contingent claims by financial analysts It is generally recognized that these contingent claims have value They reduce the likelihood of default and lower the risks faced by both equity holders and lenders In the case of regulated pipelines, cost-of-service regulation passes on the lower debt costs attributable to guarantees, and shippers receive the benefit in the form of lower tariffs

Another option that has been relied on for situations in which shippers have supplied guarantees is to provide separate rate structures for shippers who sign T&D agreements Evidence of these arrangements may be found in both the unregulated and regulated environment In unregulated environments, it is common for the pipeline owners to provide assurances for borrowers Typically, they also reserve the right to charge third parties higher rates than their shipper affiliates pay should market conditions permit

Accelerated Debt Repayment In circumstances where the repayment schedule for debt is substantially shorter than the expected economic life of the pipeline, it may be appropriate to adjust cost-of-service This can involve such approaches as basing interest and depreciation on the actual debt outstanding In circumstances where there are constraints on the level of tariffs that can be charged, adjustments to deferral of the recovery of equity contributions and returns may be appropriate as discussed below

Adjustments to Equity Holders' Returns

Typically, deferral of returns to equity holders is accompanied by upward adjustments in equity returns to compensate for the higher level of risks The deferral typically takes one to two forms

- *Recovery of Equity Contributions* In circumstances for which the repayment of debt is on an accelerated schedule with substantial commitments during the early years of the project, deferral of the recovery of equity holders' contributions may be appropriate to meet debt service requirements while maintaining an acceptable tariff profile Under cost-based tariff approaches, this can be accomplished by limiting depreciation in critical

128

periods to the debt portion of the investment and recovering equity contributions in subsequent periods This effectively skews equity return to the later period of the project's life, which increases risk to the equity holder

- *Equity Return* In circumstances for which it is anticipated that events may prevent the full recovery of equity returns during the early years of the project, it may be necessary to defer the return for equity holders to later periods One technique that has been applied under cost-based methodologies to adjust for early period constraints on equity returns is to capitalize under-recovery to the equity portion of return for recovery in later periods A second approach increases the equity return in later periods to maintain a set level of project return for equity holders

Risk Apportionment

A new pipeline enterprise is characterized by large fixed costs related to the recovery of the significant capital investments required When recovering these costs, the pipeline faces two related categories of risk

- *Price Risk* The prices (tariffs) required to recover investment, along with operating costs and returns, will be higher than those the market will pay

- *Quantity Risk* The quantity of hydrocarbons available for transportation will be significantly lower than the level for which the pipeline was sized

Collectively these two categories translate into the financial risks discussed previously under Project Economics The T&D agreement has traditionally mitigated these risks by providing additional assurance that sufficient funds will be available to service debt There have been instances in which the T&D agreements were extended to equity holders as well However, these agreements are not commonplace

Pipeline operators do have the ability to mitigate risks to equity holders Short of the full guarantees mentioned earlier, the rate schedule negotiated with shippers can include incentive tariffs which commit the shipper to "take-or-pay" agreements by which they commit to minimum shipments in return for a lower per unit rate These could be structured in a manner similar to the demand and commodity charge rate design relied on in the natural gas industry in the United States, where shippers pay a monthly demand charge to be assured that capacity is available and a per unit commodity charge when the capacity is used

Flexibility

High levels of uncertainty surrounding commercial and political issues should be addressed when entering into agreements Changes in the tax code, commercial law or monetary policy

may trigger renegotiation Failure to include provisions to address the following could materially increase the risks to the equity holder

- Political Risk This form of risk centers on the legal framework for both commercial and tax issues Future developments in these areas are likely to have a significant impact on the commercial environment for the pipeline industry Ambiguous laws on the rights of property holders, and the potential for external influences on the value of property (e g through changes in the tax code) present real concern to investors Any requirement, furthermore, to contribute to social programs or infrastructure (e g schools, roads) would be a significant consideration from a commercial perspective

- Economic Risk Transition economies carry significant inflation and currency risk The ability of pipelines to include adjustments for inflation in tariffs is an issue of commercial concern

Producer Economics

Reliance of pipelines on field production requires consideration of the relationship between pipeline tariffs and producer economics It can be anticipated that both economic and political consideration will dictate that there be some level of return to producers during the initial stages of production This consideration may effectively constrain the level of pipeline tariffs during the early phases of the project in order to provide acceptable wellhead netbacks for producers

The commercial viability of the pipelines and field producers will be closely linked Producers will want to assure that safe, reliable service is available at a reasonable price The traditional mechanism for addressing producer concerns has been direct involvement of producers as investors/owners in related pipeline systems In this manner, producers have direct input into the operations of the pipeline and can exercise appropriate cost control measures

8.5 Cost-based Methodology

Where pipelines are regulated, cost-based methodologies are used to calculate tariffs Cost-based approaches may also be used in circumstances where tariffs are not regulated and pipelines are jointly owned by numerous owners/shippers In these circumstances, two-tiered tariff structures are common with cost-based tariffs for owners and negotiated tariffs for third party shippers Even in those case where negotiated market-based rates are used, cost-based models are useful for monitoring project economics

Although the mechanics for implementation of cost-base methodologies can vary significantly, they have three principles in common

- *Recovery of Expenses* Tariffs recover all expenses, fees and taxes incurred by the pipeline enterprise in the operation and maintenance of carrier property and the management of the pipeline business

- *Recovery of Investment* Capital investments in plant and equipment are recovered over the economic life of the property through depreciation charges

- *Return on Investment* A return on investment is allowed to pay for the cost of equity contributions and borrowing

The general form of the relationship for calculating cost-of-service is as follows

COS= E+ (V-D)*R

Where

COS = Cost-of-Service for a calendar year,
E = Annual expenses for the pipeline enterprise
V = Gross Value of property to provide service
D = Accrued Depreciation of property calculated using the straight-line method
R = Return on investment

Rate Base

The term "Rate Base" refers to the current net value of plant and equipment owned by a pipeline enterprise

Rate Base = (V-D)

Where

V = The investment in pipeline plant and property including

Historical cost of property, plant and equipment when put in service,
Allowance for Funds used During Construction (AFUDC) time value of monies invested in carrier property for the period prior to it being placed in service, and
Working Capital Inventories of material and supplies and prepayments
Working capital is not depreciated, and

D = Accrued Depreciation The cumulative recovery of investment in

131

pipeline plant and equipment and other capitalized items such as AFDUC related to the consumption of the asset Typically the annual depreciation charge is based on the straight-line approach which recovers an annual amount equal to V divided by the economic life of the asset

Expenses (e)

Expenses include all expenditures and accruals related to the provision of transportation service

Operating Expenses Annual expenses incurred by the pipeline enterprise including

Salaries and wages
Operating fuel and power
Materials and supplies
Outside expenses
Consulting fees, legal expenses, etc
Rent
Employee benefits
Insurance
Taxes other than income (i e VAT, taxes for social programs and infrastructure development)

*Depreciation (*D) The annual depreciation charge as described above under Rate Base
Income Taxes (IT) Taxes levied on the income of the pipeline enterprise

Return (r)

The allowed return earned on Rate Base is a function of the capital structure of the pipeline enterprise and the cost of capital for investments of comparable risk Regulators commonly look to industry norms to determine these characteristics The cost of debt typically relies on either the embedded cost of debt for the pipeline enterprise or the current yield for debt of comparable quality Equity is based on observed equity required by market returns for common stocks of comparable risk

The return applied to Rate Base is the weighted average as calculated by

R= (ROE*E%) + (COD*D%)

Where

R = Rate of return on investment

ROE	=	Return on equity (%),
E%	=	Portion of capital structure funded by equity (%),
COD	=	Cost of debt, and
D%	=	Portion of capital structure funded by debt (%)

8 6 Specific Tariff Practices

In both the United States and Canada, the trend is towards letting the free market determine tariffs to the maximum extent possible Even in situations where a virtual monopoly exists, negotiated tariffs developed between shippers and carriers have been preferred to government regulation Nevertheless, government regulation is still involved in some of the major systems and stand-by authority exists in all the systems

A number of project examples exist that, due to special circumstances, pose unique risks and require unconventional approaches to cost-based tariff solutions Several of these projects are discussed below

Trans Alaska Pipeline System (Taps)

TAPS entered service in 1977 TAPS transports production from the North Slope of Alaska to the Valdez marine terminal for lifting by tanker for delivery to the continental United States The magnitude of the $8 0 billion initial investment by TAPS owners combined with the direct economic interest by the State of Alaska resulted in a protracted dispute between TAPS owners and the State concerning tariff calculations Ultimately, this dispute was resolved through a negotiated settlement that includes the following non-standard features

- Rate Base The TAPS net Rate Base is assumed to be 100% equity The 100% equity assumption reduces volatility associated with the diverse methods used by the TAPS owners to finance construction

- Return on Rate Base A 6 4 percent real equity return was allowed on the inflation-adjusted Rate Base for the years 1977 through 1989 In 1990, the settlement allowed for an after tax fee of $0 35 per barrel denominated in 1983 dollars which replaces the return on equity for pre-1985 investment A 6 4 percent real equity return is allowed on post-1984 investment The $0 35 (1983 dollars) per barrel charge mitigates the effect of Rate Base depletion

Norman Wells Pipeline

The Norman Wells Pipeline (NWP) of Canada entered service in 1985 NWP transports crude oil from the Norman Well oil field in the Northwest Territories to Zama, Alberta The pipeline was built and operates under an agreement between Imperial Oil Ltd , the developer of the field and the only significant shipper, and Interprovincial Pipelines, an independent pipeline company At the time of construction, the NWP project was considered to be high risk Unique risks faced by the project included reliance on a single reservoir with unproved long-term production characteristics, a remote frontier location far removed from crude oil markets, and the magnitude of the required investment in pipeline facilities, $330 million Canadian ($220 million US)

The potential risks faced by the pipeline were mitigated by creation of a separate entity to build and operate the pipeline, negotiation of guarantees by the primary shipper, and reliance on a highly leveraged 75 percent debt capital structure NWP is regulated by the National Energy Board (NEB) of Canada The cost-of service methodology, approved by the NEB, included the following features

- Balance Sheet Returns Equity and debt amounts are based on the figures for long-term debt and stockholders' equity recorded on the pipeline balance sheet

- Cost of Capital A nominal return of 16 0 percent on shareholders' equity is allowed and debt cost is the actual financing cost

- Cost-of-Service The under- or over- collection for a year is carried forward to subsequent years to account for any deviation from actual volume and cost calculations

Oleoducto Transandino (Argentina)

Regulation of the pipeline industry in Argentina falls under the auspices of the Ministry of Energy Pipeline tariffs are generally cost-based and levelized at uniform real (inflation adjusted) rates Tariffs are reviewed and adjusted periodically An examples is reviewed below to illustrate the tariff practices and regulatory issues in Argentina today

Oleoducto TransAndino entered service in 1993 It transports crude oil production from the Nequen Basin in Argentina to the Chilean port of San Vincente near the city of Concepcion on the Pacific Coast A portion of the crude oil is consumed in Chile while the rest is exported to the United States TransAndino is primarily owned by Argentine producers Yacimientos Petroliferos Fiscales (YPF) and Petrolera San Jorge, and the Chilean refiner Empresa Nacional del Petroleo (ENAP)

134

The tariff in Argentina is based on a cost-of-service approach assuming 15% nominal after-tax return on equity and 60,000 barrels per day average throughput The tariff is levelized and set equal to the ratio of the present values of charges to throughput Adjustments can be made periodically to reflect increases in capital investment and actual cost of service

The primary issue is whether the tariff should be lowered when the actual throughput exceeds 60,000 barrels per day In other words, the issue is whether the owners should be limited to the 15% return on equity rather than accelerating the payment of debt Lower tariffs would give higher netbacks on crude oil production to producers and pipeline owners such as YPF In some instances, producers would prefer to take lower netbacks in exchange for higher return on pipeline investments because crude oil wellhead values are subject to royalty and severance taxes In this case, this benefit might not be sufficient because YPF's ownership is only about 57% The requirement of unanimous shareholder agreement in setting TransAndino tariffs protects against extreme positions

8 7 RECOMMENDATIONS FOR UKRAINE

Overview

Fundamental to the development of oil pipeline methodology and determination of subsequent rates is the utilization of certain basic concepts At the heart of these principles is the introduction of the concept of return on investment The concept is fundamental to the construction of an internationally based natural monopoly tariff It is the prime motivational foundation by which a natural monopoly attracts investors It is the belief that an investor, by making his capital available to the company, will obtain a share of the profits earned by that company and a share in the ownership of that company

Rate Of Return

It is necessary to come up with a baseline real internal rate of return on the value of used and useful assets sufficient to attract investors Following international convention, these assets are defined as replacement costs, after depreciation, based on a 30–year straight-line depreciation (SLD) regime historically used in the former Soviet Union

The function of the return on rate base normally is to provide a natural monopoly with the capital to retire past projects, to secure funds for future capital investment through retained earnings, and to provide dividends as income to investors The amount of the dividend each year is established by the management of the natural monopoly under the guidance of the company's board of directors

- The rate of return for investors in international oil pipelines should reflect

- Basic rate of return on capital employed (the price of money)
- Industry risk
- Structural risk (the corporate and financial position of the pipeline company within the national oil industry)
- Country risk (political, economic, legal and regulatory conditions)

The **basic rate of return** can be estimated as the yield on capital employed with minimum risk For 30-year US treasury bonds, yield over the last four decades (adjusted for inflation) has averaged seven percent

Industry risk reflects the uncertainty of the investment compared to other sectors of the industry For example, investments in pipelines are usually not as risky as E&P investments An acceptable premium for pipelines might be 2% compared to at least 10% for many E&P projects

Structural risk reflects the additional premium required to address uncertainties affecting the national pipeline company (e g impending privatization, debts owed by customers)

Country risk may run from 0% in the US, Canada, and Western Europe to 20% (or more) in areas such as Nigeria and Afghanistan experiencing civil unrest

Rate Base Valuation

The most contentious issue in the determination of tariff rates using internationally acceptable methodologies is the proper valuation of the rate base to be considered for establishing a return on investment and the application of depreciation We recommended that a qualified oil field engineering and accounting firm, with international experience in oil property pipeline valuations, should contract with the pipeline companies to take stock of the physical pipelines and other used and useful infrastructure assets This firm should also be charged with the development of specific priority-based recommendations to improve the overall efficiency, reliability, and productivity of the system

Absent the data from a formal physical audit, inspection, and survey, we can still estimate the value of the property using a discount mechanism We propose a model that uses current average construction costs to build a similar system in North America, based upon the pipeline diameter and length and other infrastructure considerations These costs should be projected back to the period when the individual pipeline segments were constructed Then, based on the respective age of the segments, the assets can be depreciated to a current valuation

Some caveats this methodology assumes that maintenance levels and replacement of structures were performed at normal levels throughout the life of the property It also ignores economic and technical changes that have occurred over time To allow for these changes, for the variable level of system maintenance, and for the under-utilization of system capacity, a discount mechanism needs to be applied against the pipeline values

The Ukrainian pipelines operate at very low throughput levels compared to pipelines in North America, where capacity levels approach 90 percent of absolute design capacity The Druzhba line is currently operating at around 60 percent capacity, while Pridneprovsky is at 45% [5]

We consider 80% a reasonable operating efficiency standard for both pipelines This figure reflects operational and technical conditions and acknowledges the difficulty of attaining international operating efficiencies in the short term By dividing the actual throughput of the pipeline by the 80% standard, we establish a discounting factor to reduce the depreciated value of the rate base

There are two main reasons why a pipeline may be operating at reduced throughput First, the pipeline may not support optimum throughput due to poor maintenance Such a scenario would bring down the book value dramatically Alternatively, shippers may have decided to cease using the line

The property book value we derive using the discounting method will almost certainly be lower than what a formal physical evaluation would suggest, particularly if the physical valuation incorporates the strong likelihood of increased throughput in the future (due to increased domestic exploration, transport of Caspian oil etc) Still, it may prove to be higher than the pipelines' own internal assessments This will depend on whether the pipeline's assessments incorporate normative values applied in the Soviet era, and whether they address inflation and currency changes

Tariff Calculation

With the establishment of the rate base valuation, we can use an internationally acceptable tariff methodology to calculate tariff rates

The fundamental equation for tariff calculation is return on rate base plus expenses equals the revenue requirement This amount divided by the throughput establishes the tariff rate

[5] *Ukrainian Oil and Gas Report*, and *Nefterynok 97*, Ukrainian Petroleum Consultants

Return on Rate Base + Expenses = Cost of Service = Revenue Requirement

$$\frac{\text{Revenue Requirement}}{\text{Volume of Throughput}} = \text{Tariff Rate in Hryvnia per 1000 Tonne-Kilometers}$$

In the simplest terms, the above formula produces a shipping or transmission tariff rate In this instance, the throughput is calculated in 1000 tonne-kilometers, which reflects the weight of crude oil moved per distance Thus, the same quantity of oil transported twice as far will be charged a shipping cost that is twice as much

Conclusions and Recommendations

The tariff methodology recommended is an internationally acceptable cost-of service rate-of-return based methodology, which meets the basic requirements of transparency, objectivity, and balance in fixing tariff rates of a monopoly

In determining possible rates, we assume that the pipeline systems will incorporate needed efficiencies and cost-cutting measures in unrelated areas and direct as much effort as possible into maintenance and rehabilitation of used and useful assets Better maintenance and the elimination of transportation bottlenecks will improve throughput, which will directly increase cash flow for operations, return to investors, tax revenues, and most importantly, support further need investment and maintenance

We recommend that a qualified oil field engineering and accounting firm, with international experience in oil property pipeline valuations, should contract with Ukrainian pipeline to take stock of the physical pipelines and other used and useful infrastructure assets This firm should also be charged with the development of specific priority-based recommendations to improve the overall efficiency, reliability, and productivity of the system

We recommend the full conversion of the pipeline companies to International Accounting Standards in order that financial reports accurately reflect costs of operation

We recommend, as part of future reforms, the development of a menu of services to be offered and billed beyond rate base services This is effectively a form of unbundling providing specific services to customers based on customer choice Under this internationally accepted concept, customers pay for their real cost of oil transportation, which generally varies due to the quality of oil In the same vein, customers do not pay for services that are not required Ultimately, we recommend the establishment of base rate tariffs and a series of "add-on-riders" A base rate transportation tariff would not include the costs associated with heating, storing or shipping high viscosity oil, or any other special services required by the customer (receipt and delivery terminaling, tankage charges etc) These services should be charged through riders that are added to the base rate The customers who need these services should pay for these services in addition to basic transportation costs

The pipeline companies should consider, as a further step, incentive-based tariff methodology for certain customers that desire an alternative to cost-of-service methodology The incentive-based methodology would ensure the same standards already introduced (transparency, objectivity, balance, elimination of subsidies) These incentive tariff rates could be offered and negotiated with customers that guarantee payments or prepay in advance, provide large volume shipments, agree to long-term shippers contracts, reserve capacity on a firm or uninterruptible basis, offer

low-interest loans for asset maintenance and rehabilitation, or purchase shares in the pipeline companies themselves

Producers of Ukrainian oil should be given open access to spare capacity on the Druzhba and Pridneprovsky trunklines For these purposes, the pipelines should be regulated as *common carriers* They would be required to transport oil at a tariff approved by NERC or other competent body Regulatory action on access and tariffs is necessary for future upstream investment in Ukraine It is essential that production be economically transported to refineries, otherwise projects may simply not take place

The Druzhba and Pridneprovsky trunklines have strategic significance for Ukraine, it is therefore unlikely the pipelines will be sold off to private investors However, minority stakes could be tendered as a way to raise capital for maintenance and construction costs Real gains could be made by privatizing the neglected product pipelines, which the state is currently financially unable to maintain Due to their small size and lack of strategic significance, their sale to private operators (in all likelihood, to refiners and product traders) would be both economically and politically feasible Again, to encourage competition, they could be regulated as common carriers

The market for products is an example of "don't fix what is not broken " A dynamic retail system has sprung up to replace the planned distribution system managed by Transnaftoprodukt In other words, market-economy conditions have replaced the dead hand of the state Alternative forms of transport have been substituted for the inefficient product pipeline system It is recommended that the market be allowed to continue to develop without government interference

Commercialization must be accompanied by measured but effective regulation This means, in particular, the creation of a fair and impartial body to ensure that transport markets function properly, that monopolies (where they continue to exist) are fairly regulated, that investors are protected, and that relevant social issues are considered We recommend that NERC be assigned this function for pipelines Some essential features of such a body must be independence from politicians and the political structure, security of tenure for members, adequate financial and staff resources, open public input to significant regulatory decisions, some form of legal review by the courts of the regulatory body's decisions NERC or its equivalent should have the responsibility to license legal entities to design, construct, own, maintain, use and operate oil and gas pipelines, and to negotiate tariff rates and user fees for crude oil and oil products transportation

NATIONAL ELECTRICITY REGULATORY COMMISSION OIL PIPELINE REGULATION ACTION PLAN

		1998	1999			
		Q4	Q1	Q2	Q3	Q4
1 Legislative Structure						
	Enact legislation establishing NERC as the regulator for both oil crude and oil products pipelines					
2 NERC Staffing and Administrative Requirements						
3 1 Staffing	Appoint new Commissioners					
	Hire new staff in main and local offices					
	Train new staff through cross-training by electricity personnel					
	Conduct study tours for NERC staff					
3 2 License fees	Calculate license fees					
	Begin to charge license fees					
3 Licenses						
	Investigate licensing in other countries					
	Draft licenses					
	Revise licenses					
	Issue final licenses					
4 Oil Pipeline Pricing Policies						
	Issue data requests to pipelines					
	Obtain data					
	Determine total system costs including rehabilitation, modernization and expansion costs, and debt					
	Draft pricing regulations					
	Issue pricing regulations					
	Begin charging new prices					

APPENDIX A
"NATURAL GAS BALANCING REQUIREMENTS"

MEMORANDUM

To	**National Energy Regulatory Commission**
From	**Elliot Tanos**
Date	**July 28, 1998**
Subject	**Natural Gas Balancing Requirements**

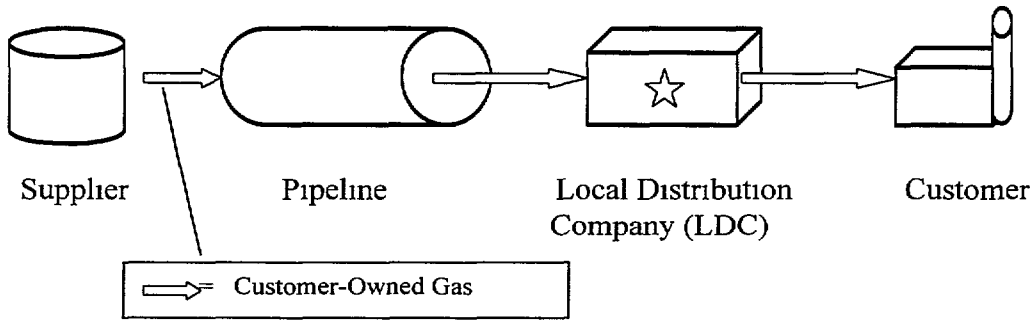
Introduction

The natural gas industry in Ukraine provides transportation services to large industrial customers The large industrial customers pay a supplier for the gas and either directly or through the supplier pays Ukrgazprom, the natural gas pipeline for transportation services Many of these customers also use the facilities of a local distribution company (LDC) and thus should also pay the LDC for distribution services, but to our knowledge such payments to LDCs never occur

This paper focuses on technical issues associated with the transportation of customer-owned natural gas through transportation and distribution systems In order to perform such transportation and distribution services properly, there are some administrative requirements which must be met Today, these administrative requirements are not met, and the market does not function properly

This paper will illustrate these administrative requirements through an LDC The requirements, however, apply equally to a pipeline There are obviously some differences in technical details, but these are distinctions without differences

In the simple flow diagram below, we are focusing on the LDC requirements to administer transportation service for customers



Natural Gas Transportation Service by the LDC consists of

(1) receiving customer-owned gas from the pipeline on behalf of the Customer

Natural Gas Transportation Service by the LDC consists of

(1) receiving customer-owned gas from the pipeline on behalf of the Customer

(2) transporting the gas through the LDC's distribution facilities, and

(3) delivering the equivalent volumes of gas to the customer, after adjustment for system line losses where applicable

Tracking the Flow of Transportation Volumes

The LDC must know the quantities of gas that the pipeline is delivering to its system for final delivery to the transportation customer This means that the pipeline must first know the quantity of gas that the supplier of gas delivers to its system for the customer's account This requires that the pipeline maintain adequate metering and record processes, and nominating requirements by the suppliers

There must also be a process in place which requires the pipeline to report in a timely fashion the volumes that it delivers to the LDC for the customer's account

The LDC, in turn, must have the appropriate metering equipment at the city gate, and at customer's premises to record the deliveries from the pipeline, and the actual consumption by the customer at the customer's facilities There are devices that permit electronic transmittal of the customer's usage data from the customer's facilities to the LDC's gas dispatch center

With appropriate metering and recording, the LDC can then compare the volumes that the pipeline delivered into the system for the customer's account with the volumes that the customer actually consumed Often the volumes that the customer ordered from the pipeline is used as an initial proxy for pipeline deliveries, until the pipeline issues the record of actual deliveries to the LDC for the transportation customer (An issue can also arise if there are discrepancies between what the customer ordered from the pipeline, and what the pipeline ultimately delivered to the LDC for the customer, but for now we will assume that these two figures are equivalent)

The example provided below is offered to highlight the critical need to monitor the deliveries from the pipeline to the LDC for the customer's account, as compared to the volumes that the customer actually consumes

Assume that it is deep winter, and that the LDC has ordered gas volumes from the pipeline that it believes are sufficient to meet the needs of its residential customers The LDC has based its gas purchases on the assumption that the transportation customer (s) has correctly ordered the gas that it will need from its suppliers for this cold winter period Assume however, that the transportation customer grossly underestimated the amount of gas that it would need during its

peak requirement, and as a result uses significant volumes of the LDC's gas If the quantity of the LDC gas used by the transport customer(s) is significant it can critically displace the gas that was to be used by the residential customers, and a shortage of gas for the residential customers may occur, perhaps on the coldest days of the year Of course, this could have dire consequences on the LDC and its residential customers

That is why it is so important to have appropriate metering that will accurately track the gas volumes all the way from the supplier-to the pipeline-to the LDC- to the customer However, even with appropriate metering, there are more measures that must be employed to effectively control the transportation customers in terms of their balancing activities Many utilities have imposed fairly stringent balancing requirements- with severe penalties for failure to stay within prescribed balancing limits

For example, LDC's may impose penalties on a daily and monthly basis if the transportation customer does not stay within a certain balance limit Often the penalties may be graduated, increasing with the level of the customer's imbalances

Specific Examples of Balancing Provisions

The balancing provisions from the Natural Gas Transportation Tariff of Philadelphia Gas Works, an LDC in the United States, are

ALLOWABLE IMBALANCES

> Imbalances may be permitted within a range of +/- 10% on a daily basis if adjusted within +/- 5% by month's end Company will advise Customer of potential imbalance conditions periodically to facilitate correction But repeated excessive overruns or underruns of the hourly and daily gas volumes received for Customer's account may be considered grounds for termination of service under this rate Monthly imbalances within the allowable limits shall be resolved through mutual adjustment of initial deliveries in the subsequent month of service [Note a weakness of this provision is that there are not immediate monetary penalties on a daily basis for excessive imbalances]

CORRECTION FOR QUANTITIES OUTSIDE RANGE OF ALLOWABLE IMBALANCES

> All volumes utilized in excess of the allowable monthly overrun will be considered sold to the Customer under the applicable equivalent retail rate
>
> All volumes delivered to the Company that remain unaccepted by the Customer, in excess of the allowable monthly underrun may be offered for sale to the Company or stored at the Customer's option In the event that the Company does not elect to

purchase volumes in excess of the allowable underrun, a service charge for all such volumes carried forward by the Company will be made

In the context above, OVERRUNS occur when the transportation customer consumes more gas than was delivered into the LDC system for the customer's account

UNDERRUNS occur when the transportation customer consumes less gas than was delivered into the LDC system for the customer's account
An example calculation is provided below to show how the balancing provisions can work in practice

Example of Balancing Activities

Table 1 provides the Daily Reconciliation Sheet that would be followed by the LDC to monitor and control the activities of the transport customer

Column (1) of the table shows the customer-owned gas that the pipeline delivered into the LDC system for the customer's account each day

Column (2) shows the actual volume of gas that the transportation customer consumed each day

Column (3) computes the amount of overrun

Column (4) computes the amount of underrun

Columns (5) and (6) compute the percentage of overruns and underruns, respectively

As can be seen in Columns (5) and (6), this particular transportation customer has daily imbalances that are well in excess of the allowable 10% limit It is incumbent upon the LDC Administrator (under the given balancing conditions) to warn the transport customer, that continued excessive daily imbalances could lead to termination of transportation service (Once again, the weakness of this particular balancing provision is that it does not have a monetary penalty on a daily basis If the LDC does terminate the customer, the LDC will lose money as well)

Table 2 provides the Monthly Reconciliation Sheet

Row (1) of Table 2 provides the Opening Balance for this particular transportation account Because this is assumed to be a new customer, the opening balance is zero

Row (2) indicates the volumes that were delivered by the pipeline to the LDC for the transportation customer's account This number is equal to the total indicated in Table 1, column 1

Row (3) specifies the amount of gas that the LDC will retain for line-loss and unaccounted for volumes (UAF) For this particular LDC, the system UAF is 2 5%
This means that the LDC will subtract 2 5% of the gas volumes that were delivered by the pipeline to the LDC for the customer, to reflect the losses that will occur when transporting the customer's gas through the LDCs system

Row (4) shows the net transport volumes that are available to the Customer after adjustment for UAF

Row (5) specifies the gas volumes that the Customer actually consumed in the month as metered at the customers facilities

Rows (6) – (8) specify the customer's total monthly imbalance If the total imbalance represents an overrun, this will appear in Row (7) If the total imbalance is an underrun, this will appear in Row (8) In this particular example, the customer consumed more gas than was delivered by the pipeline to the LDC for the customer's account Therefore, the total overrun of 127 MM^3 appears in Row (7)

Row (9) specifies the allowable imbalance In this example, the allowable imbalance on a monthly basis is +/- 5% of the volumes that are delivered to the LDC for the customer's account (5% of Row 2, or 47 MM^3) Therefore, for this example, the allowable imbalance is an overrun of 47 MM^3 Under the terms of this particular tariff, the customer would deliver this volume of gas to the LDC as the first deliveries from the pipeline in the next month If the allowable imbalance had been an underrun, the LDC would have provided this gas to the customer as the first delivers of the next month, to the extent that this was practicable given the current operational conditions on the LDC system

Rows (10) and (11) identify the Imbalance in excess of the allowable 10% limit Row (10) indicates overrun quantities, Row (11) shows underrun quantities In this case, there is an excess overrun imbalance of 81 MM^3

Calculating the Bill For Transportation Service, Including the Balancing Charges

Table 3 shows the Monthly Bill Calculation for the natural gas transportation service, under our example

The Monthly Charges consist of (1) a monthly Customer Charge, plus (2) the Delivery Charge, plus (3) the Balancing Charges

105

Row (1) of Table (3) specifies the Customer Charge Row (2) identifies the level of the monthly Customer Charge of 500 UAH This rate is applied to the number of meters (in this case 1) to establish the monthly charge of 500 UAH The Customer Charge recovers LDC costs for such items as the meter and service costs, meter reading costs, customer accounting, and billing costs etc Because the requirements to serve transportation customers can be extensive, often the customer charges can be relatively high for transportation customers

Row 3 identifies the Delivery Charge The Delivery Charge is the volumetric charge applied to all the volumes transported for the customer by the LDC Row (4) indicates the actual transportation volumes to which the Delivery Charge will be applied Row (5) specifies the level of the Delivery Charge When multiplied by the applicable transportation volumes, the total monthly Delivery Charge is computed to be 66,727 5 UAH

Row 6 identifies the Balancing Charges Row (7) shows the Excess Overrun Quantities, which are equal to 81MM^3 Row (8) specifies the level of the per unit charge for all excess overrun quantities In this example, the charge for excess overruns is 280 UAH/ MM^3 which is equal to the assumed rate charged for the applicable retail service When applied to the Excess Overrun Quantities, the monthly Balancing Charges are equal to 22,680 UAH

Rows (9) – (10) show Excess Underrun Quantities and charges, respectively In this example there is an overrun not an underrun

Row 11 shows the total monthly Bill for Transportation Services including balancing Charges, which is the sum of the Customer Charge, Delivery Charge, and Balancing Charges

Conclusion

This simple example has emphasized the importance of appropriate metering, accounting and billing procedures to effectively administer a gas transportation service by a local distribution company and, by analogy, by a pipeline Without such procedures, transportation services cannot be adequately provided Therefore, it is essential that in reforming and restructuring the natural gas sector, the capability to provide such services be implemented in Ukraine

APPENDIX B
"NATURAL GAS TARIFF STRUCTURES"

MEMORANDUM

To	**NERC Commissioners**
From	**Elliot Tanos**
Date	**July 29, 1998**
Subject	**Natural Gas Tariff Structures**

This paper discusses typical natural gas tariff structures maintained by local distribution companies (LDCs) in the United States A review of these tariff structures may offer insights into the range of potential tariffs that can ultimately be employed in Ukraine

In the United States the precise tariff structures differ from LDC to LDC This paper discusses basic tariff structures to illustrate general principles

The following is a listing of basic tariff rate classes

Tariff Rate Classes

1 **General Service- Residential**

2 **General Service- Small Commercial and Industrial**

3 **Interruptible Retail Services- Rates Tied To Oil Prices**

4 **Gas Transportation Services**

- **Firm**
- **Interruptible**

General Service is considered a firm or continuous service- no interruptions of this service are expected

Interruptible Services are offered with varying degrees of interruption Customers using these service generally have installed alternative fuel burning capability to use in the event the LDC must interrupt gas service The price of interruptible gas services can be tied to the price of the installed alternate fuel Examples of this type of pricing are provided later in the paper

Gas Transportation Services can be provided on either a firm or an interruptible basis Under these services, LDC customers that meet certain eligibility requirements can acquire their gas supplies from third-party suppliers and have this customer-owned gas transported through the LDC's network for a transportation charge

Many of these tariffs are based on a two-part tariff structure, under which the tariff rate consists of (1) a Monthly Customer Charge, plus (2) a Commodity Charge or Delivery Charge

Monthly Customer Charge

There are numerous benefits to having a Monthly Customer Charge in the LDC Tariff First, the Customer Charge is intended to recover those LDC costs which vary with the number and size of the customers Examples of these costs are the cost of the meter, service-supply pipe, meter reading costs, accounting, bill preparation and delivery, customer service costs, customer inquiry and education costs, etc

The LDC must continue to pay these customer costs regardless of the level of the customer's consumption Thus the inclusion of a Monthly Customer Charge in the LDC tariff better reflects the continuing incurrence of these costs by the LDC, and also improves the cash flow of the LDC

The impact of including a customer charge on customer's bills, as compared to a single volumetric charge applied to all gas consumed, will differ depending on the consumption pattern of the customer The percentage impact will be larger on smaller volume customers

Often, however, smaller volume customers within a class are subsidized by the larger volume customers in that class For example, within the residential class, non-heating customers are often subsidized by heating customers The gradual introduction of an appropriate customer charge can begin to reduce this cross-subsidization within the classes

Commodity Charges

The Commodity Charge is the volumetric charge applicable to all sales to the customer Under a two part tariff the Commodity Charge will recover the costs not recovered in the customer charge, including capacity costs

The commodity charge should recover variable costs Economically, it would be far preferable to charge a fixed monthly price for capacity costs, because prices should follow costs The capacity costs do not change from month to month, thus neither should the charge for those costs By putting capacity costs into the commodity charge, the price for capacity does indeed change from month to month, and indeed is higher in the winter than in the summer because customers buy more gas in the winter However, politically this is frequently difficult to arrange

Interruptible Service

Many utilities maintain retail tariff rates that are tied to the alternative fuels that the particular customer class has the installed capability to consume The alternative fuel is often a petroleum product such as light or heavy oil

The fact that this service is an interruptible service means that the utility does not necessarily have to incur the high capacity costs to serve these customers during peak winter periods Therefore, the price to these customers can be lower than firm service, and can generally be priced competitively with the alternate fuel

The following pages contain examples of tariff forms for firm, interruptible and transportation services for your review

1 GENERAL SERVICE- RESIDENTIAL

The **CHARACTER** of this service is such that the LDC is obligated to deliver service which anticipates no interruptions, but which may permit unexpected interruptions, such as acts of nature

The **AVAILABILITY** of this service may be limited to a single family dwelling unit, or to buildings consisting of a limited number of units, such as two to five units

The **MONTHLY RATE** for this service may have the following structure

RATE

Customer Charge	$5 00 (10 UAH) per accounting meter per month
Commodity Charge	$7 00 (14 UAH) per thousand cubic feet
Fuel Adjustment Clause	This clause allows the LDC to pass through its cost of fuel to the consumer, subject to regulatory approval
State Tax Adjustment Clause	Any specific taxes that are applied to the rate may be recovered through this clause
Minimum Charge	The monthly Minimum Charge may be the Customer Charge

BUDGET BILLING	An equal monthly payment plan, wherein the customer's bill for the year is divided into 12 equal monthly payments, is available to this customer class
TERM OF CONTRACT	Standard gas service tariffs are for at least one year
RULES AND REGULATIONS	The Rules and Regulations set forth in the LDC's complete Tariff govern the supply of gas under this service

2 GENERAL SERVICE – SMALL COMMERCIAL AND INDUSTRIAL

The **CHARACTER** of this service is firm (no interruptions expected), but unexpected interruptions can occur in case service to higher priority (for example, residential) service is threatened

The **AVAILABILITY** of this service is for use in commercial and industrial applications

The **MONTHLY RATE** for this service may have the following structure

RATE

Customer Charge	$15 (30 UAH) per accounting meter per month
Commodity Charge	$7 50 (15 UAH) per Mcf for all or any part of the first 300 Mcf $6 25 (12 5 UAH) per Mcf for all additional use
Fuel Adjustment Clause	This clause allows the LDC to pass through changes in its cost of fuel to the consumer The regulator may review this cost at the commencement of the fiscal year, and periodically thereafter, e g , on a quarterly Basis Some LDCs have rolled this cost into the Commodity Charge
State Tax Adjustment Clause	Any specific taxes that are applied to the rate may be recovered through this clause
Minimum Charge	The monthly Minimum Charge may be the Customer Charge

BUDGET BILLING An equal monthly payment plan, wherein the customer's bill for the year is divided into 12 equal monthly payments, is usually available to this customer class

TERM OF CONTRACT Standard gas service tariffs are for at least one year

PAYMENT TERMS Standard

RULES AND REGULATIONS The Rules and Regulations set forth in the LDC's Complete Tariff govern the supply of gas under this

service

3 INTERRUPTIBLE RETAIL SERVICES

The **CHARACTER** of this service is interruptible, customers must have dual-fuel capability or be willing to accept interruption of gas service There are often different interruptible retail services with varying degrees of allowable interruptions For example, a 'temperature controlled service' can be interrupted when the ambient temperature reaches a threshold level Other services can be interrupted upon minimal notice from the utility, e g in six hours the customer must convert to alternate fuel or be subject to penalties

The **AVAILABILITY** of this service is for use in commercial and industrial applications having a minimum monthly, seasonal, or annual consumption level

The **MONTHLY RATE** for this service may have the following structure

RATE

Customer Charge $200 (400 UAH) per accounting meter per month

Commodity Charge Prices are set by the LDC (each month) based on the alternate fuels the customer has the installed capability of consuming, and subject to a maximum and minimum pricing level

For example, the monthly rate may be based upon the price of No 6 oil (0 5% sulfur) as published in a certain international news paper, provided that the rate cannot be less than the applicable cost of gas plus a contribution, and not more than the level of the final block of General Service Rate

Fuel Adjustment Clause Not applicable

State Tax Adjustment Clause Any specific taxes that are applied to the rate may be recovered through this clause

Minimum Charge The monthly Minimum Charge may be the Customer Charge, or there may be more complex minimum charges

GAS MEASUREMENT Standards stated

PAYMENT TERMS Standards stated, or specific reference to complete tariff

TERM OF CONTRACT At least one year or as specified in required contract

SPECIAL TERMS AND CONDITIONS May include terms of interruption, Emergency Gas, Penalties, Unique Facility

Requirements, etc **RULES AND REGULATIONS** References to complete tariff

4 GAS TRANSPORTATION SERVICES

The **CHARACTER** of this service can be either firm or interruptible depending upon the contract terms

The **AVAILABILITY** of this service can vary significantly from one jurisdiction to another in terms of the required minimum transportation contract quantities Others have more significant availability requirements Many LDCs allow groups of customers to form buyer groups to combine their requirements to meet the LDC's standards The minimum number of customers that can comprise a buyer group then becomes an issue The state regulatory commission usually dictates the terms of availability

The **MONTHLY RATE** for this service may have the following structure

RATE

Customer Charge $250 (500 UAH) per accounting meter per month

Delivery Charge This charge may be based on the difference between the otherwise applicable retail rate and the appropriate cost of gas

For example, if the otherwise applicable retail rate was Interruptible Retail Service that is tied to the price of No 6 oil, the delivery charge for transportation service could be the interruptible margin, defined to be the retail sales tariff less the avoided cost of gas This could be stated on an annualized basis, or could vary month by month The customer would pick in advance either the annualized or monthly calculation method

Transportation Surcharge Through this charge the Customer would reimburse the LDC for any expense actually incurred for the Customer's benefit from third party suppliers, such as directly assignable taxes, fuel requirements, etc

Standby Service Charges If the Customer elects to contract for Standby Service, wherein the LDC will supply natural gas to the customer if the customer's third party supplies do not arrive, then the charges for that service will be collected through this mechanism

Minimum Charges The minimum monthly charge may be the Customer

Charge or a more complex minimum charge provisions

GAS TRANSPORTATION SERVICE (CONTINUED)

CONDITIONS OF USE

Customer Warranty Customer warrants that it has good and mercantile title to gas delivered to LDC for transportation, free and clear of all liens, encumbrances and claims whatsoever, and will hold the LDC harmless from any such claims

Line-Loss and Unaccounted For Gas LDC will retain for line loss and unaccounted-for gas a percentage of the total volume of gas delivered into its system for customer's account The exact percent of UAF is specified in this section

Emergency Situation In the case when there is an emergency situation which threatens the supply of gas to the firm high priority customers, the utility is permitted to divert the interruptible transportation customers gas for the utility's use The terms of compensation are articulated in the tariff or individual service agreement

Balancing Provisions It is extremely important for the utility to maintain control of its dispatch activities Balancing provisions are placed in the tariff to control over and under deliveries for the customer's account

Allowable Imbalances These are imbalances that are permitted without charges or Penalties, e g , +/- 10% on a daily basis

Correction for Quantities Outside the Range of Allowable Imbalances Tariffs may have graduated penalties as the level and/or percentage of imbalance increases

TYPICAL NATURAL GAS BILLS IN US

The following table summarizes typical monthly bills for natural gas consumers for selected consumption levels in the United States The data was obtained from a national survey and is based on natural gas prices in effect on March 31, 1998

Typical Monthly Bills For Natural Gas Consumers In the United States (for selected consumption levels)

Customer Class	Monthly Consumption		Typical Monthly Bill		Average Price	
	Therms	M^3	$US	UAH	$/Therm	UAH/MM^3
Residential	100	283	73	146	0 73	516
Commercial	300	850	190	380	0 63	447
Industrial	5,000	14,160	2,447	4,894	0 49	346
Interruptible	100,000	283,200	37,037	74,074	0 37	262

(Average bills for transportation service were not available)