Draft

AN EXAMINATION OF FINANCIAL OPTIONS FOR THE UPGRADE OF COMPRESSOR STATIONS ON THE NATURAL GAS TRANSMISSION SYSTEM IN UKRAINE

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ACRONYMS and ABBREVIATIONS

mcm	Thousand cubic maters
mmcm	Million cubic maters
bcm	Billion cubic meters
O&M	Operations and Maintenance
VAT	Value Added Tax
IFI	International Financial Institution
PSI	Private Sector Investor(s)
C&WE	Central and Western Europe
NJSC	National Joint Stock Company “Naftogaz of Ukraine”

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1.0 INTRODUCTION

This report provides an expansion of the earlier assessment for upgrading a portion of the natural gas pipeline system in Ukraine entitled 'INVESTMENT PROGRAM: ENERGY EFFICIENCY UPGRADES TO COMPRESSOR STATIONS OF UKRAINIAN GAS TRANSMISSION SYSTEM.' The purpose of the expansion is to examine the implications of a broader set of financing scenarios for the economy of Ukraine. A brief review of the natural gas sector and proposed upgrades follows.

Of the ~232 bcm of natural gas transmitted and distributed in Ukraine's pipeline system in 1997, ~35% (~81 bcm) was consumed domestically, ~7% (~16 bcm) was placed in storage, and ~58% (~135 bcm) was transmitted to Central and Western Europe (C&WE). Domestic production was ~18 bcm and imports from Russia comprised the remainder at ~214 bcm. The ~135bcm transmitted to C&WE originates entirely in Russia and is reported to comprise ~95% of Russia's exports to C&WE. In 1999, ~20 bcm of gas produced in Turkmenistan will be imported for domestic consumption and it is expected that transmission of natural gas produced in Turkmenistan to C&WE will begin in the next few years.

The proposed investment program involves the modernization and replacement of 96 gas supply units (GSU's) on three of the major natural gas pipelines used for transmission of gas to domestic customers (Shebelinka-Kiev) and to C&WE ("Sojuz"and the two-thread pipeline Urengoy-Uzhgorod and "Progress"). These three pipelines are shown in figure 1. "Sojuz", Urengoy-Uzhgorod and "Progress" account for about 60% of the natural gas transmitted to C&WE.

Figure 1

The upgrades are scheduled to take place over a period of 8 years (2000-7) at a total cost of $451.9 million. The largest investment is to upgrade the compressor stations on the "Sojuz" Pipeline at $204.2 million, followed by the two-thread Urengoy-Uzhgorod and "Progress" Pipeline at $203.2 million, and the Shebelinka-Kiev Pipeline at $54.0 million.

The quantity and cost natural gas destined for domestic consumption is a major concern and the focus of the preceding and current assessment. In 1997, payment for the ~63 bcm imported from Russia for domestic consumption was cash for ~33 bcm (~53%) and 30 bcm (~47%) for transmission fee in lieu of cash valued at a price of USD $80/mcm. The payment scheme in 1999, based upon domestic consumption and production similar to 1997 levels, will be: cash to Russia for ~13 bcm at a price of $60/mcm; cash to Turkmenistan for ~8 bcm at a price of $72/mcm; ~30 bcm from Russia for transmission fee; and ~12 bcm to Turkmenistan in the form of goods and services. Thus, in 1999, ~33% of domestic consumption will be in form of cash and ~67% will be in the form of barter.

The modernization is projected to improve the efficiency of compressor units from ~24-27% to ~31-37.5%, providing for a reduction in 'own consumption' of natural gas by ~0.8 bcm, which can then be reallocated for domestic consumption, thereby reducing imports. The improvement scheduled at the Shebelinka-Kiev Pipeline is deemed to be the highest priority as failure to implement the planned improvements will render it inoperable and ~4 bcm of domestically produced gas will have to be replaced by more costly imported gas.

Section 2 provides the baseline efficiency improvement and investment data from the pre-feasibility study, and a description of the three economic/financial scenarios examined in this assessment. The results of these three scenarios are provided in Section 3 to provide an estimate of the quantitative and qualitative implications of each for the Ukrainian economy. Section 4 provides a summary of the analysis and additional questions/concerns from NJSC "Naftogaz of Ukraine" and potential investors.

Four appendices provide the detailed analysis of the three economic/financial scenarios.

Appendix A contains a description of the initial parameters that can impact the program's financial viability. Appendix B provides basic technical information for each of the pipeline upgrades in the frame of the investment program. Appendix C presents the temporal distribution of the financial benefits. Appendix D provides the analysis of cash flows and values of the main financial metrics.

2.0 FINANCIAL / ECONOMIC SCENARIOS

2.1 Modernization Schedule, Efficiency Improvement, and Investment

An overview of the modernization plan for the three pipelines ("Sojuz", Shebelinka-Kiev, and the two-thread Urengoy-Uzhgorod and "Progress") is shown in Table 1. This table provides the schedule for replacing the compressor stations and gas supply units (GSU's), the baseline 'own consumption,' efficiency improvement, and investment required for the modernization effort.

The planned schedule is to replace 85 turbines and 9 GSU's (turbine and compressor combinations) at 23 compressor stations over the next 8 years (2000-2007). These units have been selected because they are inefficient, have exceeded or are near the end of their operating lives, and require high levels maintenance in order to remain operational. Of particular importance is modernization of the compressor stations on the Shebelinka-Kiev pipeline in order to continue extraction of domestic gas at least in current volumes and avoid more costly gas imports.

Information provided by NJSC indicates that in 1997 7.5 bcm of gas was consumed for the technical needs of gas pipelines and, of this amount, 4.9 bcm (65%) was consumed by the 625 GSU's on the pipeline system as fuel (termed 'own consumption').

These three pipelines account for about 66% of 'own consumption' of the pipeline network in Ukraine and the efficiency upgrades affect 58% of own consumption. The amounts and shares of 'own consumption' of gas by compressor stations in 1997 on the three pipelines were: "Sojuz" -- 1.47 bcm (30%); Urengoy-Uzhgorod and "Progress" -- 1.52 bcm (31%); and Shebelinka-Kiev -- 0.24 bcm (5%). The 94 GSU's on these three pipelines targeted for modernization consumed 2.73 bcm (56%) of total 'own consumption,' as follows: "Sojuz" -- 1.47 bcm (30%); Urengoy-Uzhgorod and "Progress" -- 1.1 bcm (22%); and Shebelinka-Kiev -- 0.16 bcm (3%).

The compressor stations targeted for replacement operate at an efficiency of 23-27% and it is felt that this efficiency can be improved to 31-35%, depending upon the capacity of the GSU's. On the basis of this level of consumption and efficiency improvement, it is estimated that annual 'own consumption' of natural gas can be reduced by approximately 0.8 bcm.

The investment required is estimated to total USD $451.9 million. The largest investment is to upgrade the compressor stations on the "Sojuz" Pipeline at $204.2 million, followed by the two-thread Urengoy-Uzhgorod and "Progress" Pipeline at $193.7 million, and the Shebelinka-Kiev Pipeline at $54.0 million. NJSC deems the modernization of the Shebelinka-Kiev Pipeline to be the highest priority as failure to implement the planned improvements will render the pipeline inoperable and the annual extraction of 4 bcm of domestic gas (~22% of domestic production) will have to be replaced by more costly imported gas.

Table 1. Summary of Proposed Gas Supply Unit Modernization by Pipeline and Total

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Total*	
Turbine Replacement										
"Sojuz" Pipeline	0	7	8	13	18	12	0	0		58
Urengoy-Uzgorod and "Progress" Pipelines	1	3	3	2	5	6	4	3		27
Shebelinka-Kyiv Pipeline	5	4	0	0	0	0	0	0		9[1]
Total	6	14	11	15	23	18	4	3		94
	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Annual Average* *2008-2015*	*Annual Average* *2016-2019*
Baseline 'Own Consumption' (Billion m^3)										
"Sojuz" Pipeline	1.47	1.47	1.48	1.48	1.49	1.5	1.5	1.51	1.52	-
Urengoy-Uzgorod and "Progress" Pipelines	1.10	1.11	1.11	1.12	1.12	1.13	1.13	1.14	1.17	1.20
Shebelinka-Kyiv Pipeline	0.16	0.16	0.16	0.16	-	-	-	-	-	-
Total	2.73	2.74	2.75	2.76	2.61	2.63	2.63	2.65	2.69	1.20
	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Annual Average* *2008-2015*	*Annual Average* *2016-2019*
Efficiency Improvement (Billion m^3)										
"Sojuz" Pipeline (25.0% to 34.0%)	0	0	0.07	0.14	0.24	0.36	0.43	0.43	0.46	-
Urengoy-Uzgorod and "Progress" Pipelines (27% to 35%)	0	0.01	0.04	0.08	0.11	0.18	0.25	0.29	0.34	0.36
Shebelinka-Kyiv Pipeline (23% to 31%)	0	0.02	0.04	0.04	-	-	-	-	-	-
Total	0	0.03	0.15	0.26	0.35	0.54	0.68	0.72	0.80	0.36
	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Total (2000-2007)*	
Investment ($ Million)										
"Sojuz" Pipeline	10.4	26.1	35.6	53.2	54.5	24.4	0	0	204.2	
Urengoy-Uzgorod and "Progress" Pipelines	11.9	33.6	16.2	13.2	33.0	39.6	26.4	19.8	193.7	
Shebelinka-Kyiv Pipeline	30	24	-	-	-	-	-	-	54	
Total	52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8	451.9	

[1]Turbines and compressors

2.2 Economic/Financial Scenarios

Three scenarios examined in this analysis were selected to bound the outcomes and provide a midpoint for purposes of interpolation. The three scenarios are:

20% of the financing is provided by Ukraine and 80% by a loan from an International Financial Institution (20/80/0)

20% of the financing is provided by Ukraine, 40% by a loan from an International Financial Institution, and 40% by a loan from a Private Sector Institution (20/40/40)

20% of the financing is provided by Ukraine and 80% by a loan from a Private Sector Institution (20/0/80)

The proposed financial and gas price assumptions to be used in the financial analysis are shown in Table 2.1

Table 2.1 Main Financial and Gas Price Assumptions

	Financing Provided By:		
	Ukraine	*IFI*	*Private Sector Investor*
Annual Dividend, %	10	-	-
Annual Interest Rate, %	-	6	18
Loan (Principle) Grace Period, Years	-	3	0
Loan Period (# Years)	-	12	10
Average Annual Foreign Inflation, %/Yr	2.4	2.4	2.4
Average External (Ukraine/Russia) Border Gas Price in 2000 (Without VAT) , $/1000 m^3	50	50	50
Marginal Cost of Gas in 2000 (without VAT) , $/1000 m^3	72	72	72
Annual Gas Price Escalation Rate for the Period 2000-2019, % per year	2	2	2

Cost reductions are expected to be realized for reduced O&M costs and increased reliability. O&M cost reductions, shown in Table 2.2, are expected to result from a reduction in inspection, repairs, and the frequency of repairs.

Table 2.2 Assumptions for the reduction in O&M costs

	Value of O&M improvement, Million $/unit/ year	*Annual rate of increase O&M expanses of existing turbines in compare with new one*	*Period*
"Sojuz" Pipeline	0.04	1.025	2000-2015
Urengoy-Uzhgo-rod and "Progress" Pipelines	0.07	1.02	2000-2019
Shebelinka-Kiev Pipeline	0.02	1.03	2000-2003

The reliability of the two transit pipelines ("Sojuz," and Urengoy-Uzhgorod and Progress pipelines) is expected to increase, thereby avoiding penalties associated with emergency shutoffs and violation of contract terms. The avoided penalties begin in 2007 for the "Sojuz" pipeline and 2010 for the Urengoy-Uzhgorod and Progress pipelines.

Table 2.3 Assumed Values for Increasing Reliability (i.e. Reducing/Eliminating Reliability Related Penalties)

	Starting Reliability effect per one turbine, million $	*Escalation rate, year*	*Period*
"Sojuz" Pipeline	0.1	8	2007-2015
Urengoy-Uzhgorod and "Progress" Pipelines	0.2	13	2000-2019

The three financing scenarios are analyzed to provide the following information from financial and economic perspectives:

- Investment by Year
- Cash Flow
- IRR
- NPV

In addition, information is provided regarding:

- Potential Domestic Production/Supply of Equipment
- Increased Availability of Natural Gas
- Implementation time
- Energy Security

3.0 ANALYSIS RESULTS

Section 3.1 contains a summary of the key inputs to the analysis, the results of the analysis are presented in Section 3.2, and a descriptive listing of other considerations is provided in Section 3.3.

3.1 Analysis Inputs

The analysis inputs contained in this section are drawn from the earlier pre-feasibility study of the proposed investment program with a modification to the O&M formulation and the addition of a reliability component. Details of the modified O&M formulation and reliability factor are provided in Appendix A.

The level of investments in the three pipeline systems are shown in Table 3.1. The total investment without VAT is about $451.9 million and with VAT of 20%, the investment is $542.2 million. It can be seen that improvements to the Soyuz and Urengoy-Uzhgorod and "Progress" pipelines account for 45% and 43% of the investment accordingly, and the Shebelinka-Kiev pipeline accounting for the remaining 12%.

Table 3.1 -- Investment Requirements (10^6)

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Total (2000-2007)*
"Sojuz" Pipeline	10.4	26.1	35.6	53.2	54.5	24.4	0.0	0.0	204.2
Urengoy-Uzhgo-rod and "Progress" Pipelines	11.9	33.6	16.2	13.2	33.0	39.6	26.4	19.8	193.7
Shebelinka-Kiev Pipeline	30.0	24.0	-	-	-	-	-	-	54.0
Total without VAT	52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8	451.9
VAT	10.5	16.7	10.4	13.3	17.5	12.8	5.3	4.0	90.4
Total with VAT	62.7	100.4	62.1	79.7	105.0	76.8	31.7	23.8	542.2

The increased availability of natural gas due to the efficiency improvements and continued domestic production for the analysis period (2000-2019) is shown in Table 3.2. The efficiency improvements are expected to peak in the year 2015 at about 830 mmcm and then decline to about 360 mmcm annually. This is due to the staged completion schedule for pipeline improvements and normal decreases in equipment performance (details are provided in Appendix B).

Table 3.2 -- Increase in Availability of Natural Gas Due to Efficiency Improvements and Continued Domestic Production (mmcm)

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Annual Average*	
									2008-2015	*2016-2019*
Efficiency Improvement										
"Sojuz" Pipeline	0	0	66	137	239	359	430	433	458	-
Urengoy-Uzhgorod and "Progress" Pipelines	0	11	44	80	110	178	250	294	338	361
Shebelinka-Kiev Pipeline	0	23	36	36	0	0	0	0	0	-
Total Efficiency Improvement	0	34	146	253	349	537	680	727	796	361
Domestic Production Improvement										
Domestic Production (from Shebelinka-Kiev)	0	0	0	0	4000	4000	4000	4000	4000	0
Total Efficiency and Domestic Production Improvement	0	34	146	253	4349	4537	4680	4727	4796	361

The modernization of the Shebelinka-Kiev pipeline provides for continued domestic production (assumed to be at the current volume) as well as the efficiency improvement as shown in table 3.2. NJSC reports that the pipeline partially will discontinue operation after 2003 because the equipment on 2 of 3 compressor stations will be completely worn out and that 4,000-5,000 mmcm of domestic production will have to be replaced with imported gas. So the benefit of the upgrade is the estimated efficiency improvement through 2003 and the avoided imports for the 12 year operating life of the new GSU (2004 – 2015).

The value of the improvements applicable to each pipeline is shown in Table 3.3. The values in this table are the product of the gas price estimates provided in Table 2.1 and the reduced quantities of 'own consumption' for improved energy efficiency, continued domestic production, reduced O&M, and increased reliability (additional detail is provided in Appendix B).

Table 3.3 -- Value of Efficiency, Domestic Production, O&M, and Reliability Improvements (10^6)

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Annual Average*	
									2008-2015	*2016-2019*
Value of Efficiency Improvement										
"Sojuz" Pipeline	0	0	3.3	6.6	12.3	18.7	22.7	23.9	28.2	-
Urengoy-Uzhgorod and "Progress" Pipelines	0	0.5	2.2	3.9	5.6	9.3	13.2	16.2	20.9	26.3
Shebelinka-Kiev Pipeline	0	1.1	1.8	1.8	0	0	0	0	0	-
Value of Efficiency Improvement	0	1.6	7.3	12.3	17.9	28.0	35.9	40.1	49.1	26.3
Domestic Production (from Sheblinka-Kiev)										
Value of Domestic Production	0	0	0	0	78.4	78.4	78.4	78.4	78.4	-
O&M Improvement										
"Sojuz" Pipeline	0	0	0.3	0.6	1.1	1.9	2.4	2.5	2.8	-
Urengoy-Uzhgorod and "Progress" Pipelines	0	0.1	0.3	0.5	0.6	1.0	1.5	1.8	1.9	2.2
Shebelinka-Kiev Pipeline	0.1	0.1	0.1	0.1	0	0	0	0	0	-
Value of O&M Improvement	0	0.2	0.7	1.2	1.7	2.9	3.9	4.3	4.7	2.2
Reliability Improvement										
"Sojuz" Pipeline	0	0	0	0	0	0	0	0	11.7	-
Urengoy-Uzhgorod and "Progress" Pipelines	0	0	0	0	0	0	0	0	2.2	26.2
Value of Reliability Improvement	0	0	0	0	0	0	0	0	13.9	26.2
Total value of improvements										
"Sojuz" Pipeline	0.0	0.0	3.6	7.2	13.4	20.6	25.1	26.4	42.7	-
Urengoy-Uzhgorod and "Progress" Pipelines	0.0	0.6	2.5	4.4	6.3	10.3	14.7	18.0	25.0	54.7
Shebelinka-Kiev Pipeline	0.1	1.2	1.9	1.9	78.4	78.4	78.4	78.4	78.4	-
Total value of improvements	0.1	1.8	8.0	13.5	98.1	109.	118.	122.8	146.	54.7

As shown in Table 3.3, the value of the total annual average improvement for the three pipelines resulting from the investment program is estimated to be $148.1 million when the investment program is completed in 2008. The shares of this improvement are:

- Increased Efficiency – 34%
- Continued Domestic Production – 53%
- Reduced O&M Costs – 3%
- Increased Reliability (i.e. avoided penalties) – 10%

3.2 Financial Scenario Comparison

Tables 3.4, 3.5, and 3.6 provide the calculations for the three financing scenarios presented in Section 2.2. The first section of each of the three tables shows the distribution of investment funds by source, and for Ukraine without and with VAT. The second section shows the payment streams by investor source, which when subtracted from the value of the improvements (which is the same for all three scenarios), provides the cash flow for the proposed financing scheme.

Table 3.4 Financing Under 20/80/0 Scenario (Ukraine/International Financial Institution/Private Sector Investor(s))

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Total (2000-2007)*	
Investment										
Ukraine without VAT	52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4	88.4	
Ukraine with VAT	62.8	38.4	13.1	17.2	21.9	15.2	5.8	4.3	178.7	
IFI	0.0	62.0	49.0	62.4	83.1	61.6	25.9	19.4	363.5	
PSI	0	0	0	0	0	0	0	0	0	
Total Investment without VAT	52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8	451.8	
Total Investment with VAT	62.8	100.	62.1	79.7	105.	76.8	31.7	23.8	542.2	
	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Annual Average*	
									2008-2015	*2016-2019*
Payment										
Principal on IFI Loan	0.0	0.0	0.0	0.0	40.4	40.4	40.4	40.4	40.4	-
Interest + Commitment Fee	0.0	3.8	5.9	8.6	12.3	13.0	12.2	11.2	5.61	-
Subtotal - IFI Loan Payment	0.0	3.8	5.9	8.6	52.7	53.4	52.6	51.6	46.0	-
Profit Tax Payment	0.0	-2.1	-3.5	-4.1	18.3	18.1	18.9	21.3	35.9	15.3
Equity Payment to Ukraine	52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4	0	0
Total Payment	52.3	23.3	5.1	8.5	75.4	74.0	72.0	73.2	81.8	15.3
Value of Improvements										
Total Value of Improvements without VAT	0.1	1.9	8.0	13.6	98.1	109.	118.	123.	146.	54.7
Total Value of Improvements with VAT	0.1	2.2	9.5	16.0	117.	130.	141.	147.	174.	65.2
Financial Cash Flow										
without VAT	-52.2	-21.4	2.9	5.1	22.7	35.3	46.2	49.6	81.4	39.4
with VAT	-62.7	-37.9	-6.4	-6.5	18.7	37.4	57.0	62.3	101.	46.8

[1]for 2008-2012

Table 3.5 Financing Under 20/40/40 Scenario (Ukraine/International Financial Institution/Private Sector Investor(s))

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Total (2000-2007)*	
Investment										
Ukraine without VAT	52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4	88.4	
Ukraine with VAT	62.8	38.4	13.1	17.2	21.9	15.2	5.8	4.3	178.7	
IFI	0.0	31.0	24.5	31.2	41.5	30.8	13.0	0.0	172.0	
PSI	0.0	31.0	24.5	31.2	41.5	30.8	13.0	0.0	172.0	
Total Investment without VAT	52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8	451.8	
Total Investment with VAT	62.8	100.	62.1	79.7	105.	76.8	31.7	23.8	542.2	
	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Annual Average*	
									2008-2015	*2016-2019*
Payment										
IFI loan payment										
Principal on IFI Loan	0.0	0.0	0.0	0.0	20.2	20.2	20.2	20.2	20.2	-
Interest + Commitment Fee	0.0	1.9	2.9	4.3	6.1	6.5	6.1	5.6	2.8	-
Subtotal - IFI Loan Payment	0.0	1.9	2.9	4.3	26.3	26.7	26.2	25.8	23.0	-
PSI loan payment										
Principal on PSI Loan	0.0	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	-
Interest	0.0	4.8	5.8	7.9	11.5	13.5	12.7	11.3	3.42	-
Subtotal - PSI Loan Payment	0.0	23.0	24.0	26.0	29.7	31.6	30.8	29.5	21.6	-
Profit Tax Payment	0.0	-3.0	-4.4	-5.1	16.7	16.1	16.9	19.6	35.8	15.3
Equity Payment to Ukraine	52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4	0	0
Total Payment	52.3	41.7	22.4	24.8	50.8	50.1	48.3	49.4	57.3	15.3
Total Value of Improvements without VAT	0.1	1.9	8.0	13.6	98.1	109.	118.	123.	146.	54.7
Total Value of Improvements with VAT	0.1	2.2	9.5	16.0	117.	130.	141.	147.	174.	65.2
Financial Cash Flow										
without VAT	-52.2	-41.7	-17.3	-15.6	21.0	32.4	43.7	47.7	86.9	39.4
with VAT	-62.7	-58.2	-26.6	-27.1	17.0	34.5	54.4	60.3	106.7	46.8

[1]for 2008-2012
[21]for 2008-2010

Table 3.6 Financing Under 20/0/80 Scenario (Ukraine/International Financial Institution/Private Sector Investor(s))

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Total (2000-2007)*	
Investment										
Ukraine without VAT	52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4	88.4	
Ukraine with VAT	62.8	38.4	13.1	17.2	21.9	15.2	5.8	4.3	178.7	
IFI	0	0	0	0	0	0	0	0	0	
PSI	0.0	62.0	49.0	62.4	83.1	61.6	25.9	19.4	363.5	
Total Investment without VAT	52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8	451.8	
Total Investment with VAT	62.8	100.5	62.1	79.7	104.9	76.8	31.7	23.8	542.2	
	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*Annual Average*	
									2008-2015	*2016-2019*
Payment										
Principal	0.0	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	-
Interest	0.0	9.7	11.6	15.7	23.0	26.9	25.3	22.7	11.3	-
Subtotal - PSI Loan Payment	0.0	46.0	48.0	52.1	59.4	63.3	61.7	59.0	47.7	-
Profit Tax Payment	0.0	-3.9	-5.3	-6.2	15.1	14.0	15.0	17.8	35.7	15.3
Equity Payment to Ukraine	52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4	0.0	0.0
Total Payment	52.3	17.8	-2.5	-2.3	19.5	16.4	15.4	18.2	35.7	15.3
Total Value of Improvements without VAT	0.1	1.9	8.0	13.6	98.1	109.3	118.2	122.9	146.0	54.7
Total Value of Improvements with VAT	0.1	2.2	9.5	16.0	117.4	130.5	141.1	146.6	174.3	65.2
Financial Cash Flow										
without VAT	-52.2	-61.9	-37.5	-36.2	19.3	29.6	41.1	45.6	92.5	15.3
with VAT	-62.7	-78.4	-46.8	-47.8	15.3	31.7	51.8	58.3	112.3	46.8

[1]for 2008-2010

The cash flows for the three scenarios without and with VAT are provided in Table 3.7. The two cases are provided as potential lenders such as an IFI may not extend the loan to cover VAT, but are interested in the impact of the VAT on project financing. In both cases (without and with VAT) the cash flow is negative by the amount of investment in the first years as no significant returns are generated. In all cases except for the 20/80/0 financing scenario, the cash flow is negative in the first four years. Until the year 2008, the 20/80/0 scenario produces the most

positive cash flow, but after 2007 the cash flows of the 20/40/40 and 20/0/80 scenarios become larger. This due to a combination of the lower effective interest rate associated with the 20/80/0 scenario and the loan repayment terms (the grace period for the principle on the IFI loan vs the immediate repayment of principle for the PSI, which results in a lower payment in later years).

Table 3.7 Cash Flow Comparison Between Scenarios

	2000	2001	2002	2003	2004	2005	2006	2007	*Annual Average (2008-2019)*
Cash Flow without VAT									
Scenario 1: 20/80/0	-52.2	-21.4	2.9	5.1	22.7	35.3	46.2	49.6	67.4
Scenario 2: 20/40/40	-52.2	-41.7	-17.3	-15.6	21.0	32.4	43.7	47.7	71.1
Scenario 3: 20/0/80	-52.2	-61.9	-37.5	-36.2	19.3	29.6	41.1	45.6	74.8
Cash Flow with VAT									
Scenario 1: 20/80/0	-62.7	-37.9	-6.4	-6.5	18.7	37.4	57.0	62.3	83.1
Scenario 2: 20/40/40	-62.7	-58.2	-26.6	-27.1	17.0	34.5	54.4	60.3	86.7
Scenario 3: 20/0/80	-62.7	-78.4	-46.8	-47.8	15.3	31.7	51.8	58.3	90.4

Summary financial metrics are provided in Tables 3.8 and 3.9 for the investment program as a whole and with respect to Ukraine's investment only (with VAT and without VAT accordingly). As above, outside investors may be interested in these statistics for the entire program, whereas the Ukrainian investors may wish to focus on the return to their investment. Note that these metrics are calculated using discount rates calculated as the sum of products of the real cost of capital for each source and the share of the source in the total amount of financing using the information in Table 2.1.

Table 3.8 Comparison of Financial Metrics (Excludes VAT)

	With Respect to the Project Total			*With Respect Ukraine's Investment*		
	Scenario 1	*Scenario 2*	*Scenario 3*	*Scenario 1*	*Scenario 2*	*Scenario 3*
Discount rate, %	5.2	9.6	14	5.2	9.6	14
Present Value of Investment, (10^6)	370.8	318.4	276.6	80.7	75.2	70.5
Discounted Return, (10^6)	1041.5	673.3	454.4	522.6	286.1	136.5
Net Present Value, (10^6)	670.7	355.0	177.8	441.9	210.9	66.0
Financial Rate of Return, %	24.3	24.3	24.3	30.7	23.6	19.0
Discounted Payback Period, years	8.6	9.0	10.0	6.6	9.3	13.1
Simple Payback Period, years	4.9	4.9	4.9	1.8	1.8	1.9

Table 3.9 Comparison of Financial Metrics (includes VAT)

	With Respect to the Project Total			*With Respect Ukraine's Investment*		
	Scenario 1	*Scenario 2*	*Scenario 3*	*Scenario 1*	*Scenario 2*	*Scenario 3*
Discount rate, %	5.2	9.6	14	5.2	9.6	14
Present Value of Investment, (10^6)	445.0	382.1	331.9	154.8	138.9	125.8
Discounted Return, (10^6)	1242.9	803.5	542.2	663.5	377.2	198.0
Financial Net Present Value, (10^6)	797.9	421.5	210.3	508.7	238.3	72.2
Financial Rate of Return, %	0.2	24.2	24.2	26.7	21.9	18.4
Discounted Payback Period, years	8.4	9.6	10.0	7.6	10.0	13.4
Simple Payback Period, years	4.9	4.9	4.9	2.9	3.0	3.0

Note that in Tables 3.8 and 3.9 Discounted Payback is the number of years required to recover the initial discounted investment by accumulating discounted net project returns and Simple Payback is the total investment divided by the average annual value of the returns for the 20 year period 2000-2019.

As one would expect, the lower the discount rate (which directly corresponds to the financing mix and interest rate), the better the values for financial metrics.

3.3 Economic Analysis

The economic analysis provides the estimated cost and benefit to Ukraine of the proposed Program investment This is accomplished in part by eliminating the transfer payments from the financial analysis as these do represent the use of real resources but only the transfer of claims to real resources from one entity in the society to another. These transfer payments include VAT, income taxes, and domestic credit transactions that include loans, repayment of principal, and interest payments. In addition, the marginal price of natural gas is used to value fuel imports as it is assumed that the highest cost imports will be reduced first. Finally, the analysis assumed a 10% social opportunity cost of capital (discount rate) for Ukraine.

The results of the economic analysis shown in Table 3.10. As with the financial analysis, the economic analysis shows the program to be very beneficial.

Table 3.10 Economic Net Benefits Flow and Indicators of the Program

	2000	2001	2002	2003	2004	2005	2006	2007	*Annual Average (2008-2019)*
Investment									
Investment, million $	52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8	0
Present value of investment, million $	314.2								
Benefits									
Value of avoided reduction of domestic gas production, million $	0.0	0.0	0.0	0.0	168.9	172.8	176.8	190.7	151.3
Value of efficiency improvement, million $	0	2.4	10.5	17.7	25.7	40.2	51.6	57.7	59.6
Value of the reduced O&M, million $	0.1	0.3	0.7	1.3	1.8	2.9	3.9	4.3	3.9
Total avoided contractual losses as a result of the reliability improvement, million $	0	0	0	0	0	0	0	0	18.0
Total benefits, million $	0.1	2.6	11.2	19.0	196.4	215.8	232.2	252.7	232.8
Economic Metrics									
Present value of total benefits, million $	1313.4								
Economic net present value (ENPV), million $	999.2								
Economic rate of return (ERR),%	43.3								

Discounted Payback Period, years	6.7	
Simple Payback Period, years	2.4	

3.4 Other Considerations

This section provides non-quantifiable considerations that may bear upon the use of IFI financing vs private sector financing.

Potential Domestic Production/Supply of Equipment

IFI, specifically WB, financing requires open competitive solicitation, which may result in foreign rather than domestic supply of equipment.

Conversely, private financing may not require open competitive procurement, thereby made readily enabling purchase of domestically produced equipment.

A foreign consortium may be able to bring in a partner to manufacture equipment to recognized international standards, thereby enabling domestic manufacture and supply of equipment for the upgrade and export.

The assurance of procurement of domestic manufactured equipment can be maximized by partnering with a foreign consortium and proper structuring of the financing package. An added benefit of this approach is the high potential for equipment export and earning of hard currency.

Economic Implications

At least three alternative pipeline routes are being considered to transmit gas from Russia and the Caspian Sea region to C&WE. In fact, construction has begun on the northern route (Yamal) through Belarus and Poland to Germany. Unless gas consumption in C&WE expands significantly, transmission through Ukraine may decrease, resulting in the need to increase cash purchases to meet domestic consumption. The participation of a foreign partner/consortium may provide assurance of access to markets in C&WE at current or higher volumes.

In addition to the annual value of the 0.8 bcm directly attributable to the efficiency improvement, another 0.05-0.08 bcm is estimated to be obtained from operational efficiencies and increased reliability. The total annual value of this gas is estimated to be $3.6-5.8 million at the marginal price of $72/mcm.

The participation of a foreign consortium will likely help ensure an export market for domestically produced equipment, thus providing a source of hard currency earnings.

Implementation time

Will likely be reduced by relying on private financing and/or engaging a foreign consortium due to the reduced need for competitive bidding and reduced reporting requirements.

Energy Security

As mentioned in the economic impacts section, the requirement for imported gas is reduced – by 0.8 bcm for efficiency improvement, plus ~4 bcm for continued domestic production, plus 0.05-0.08 bcm for other operational efficiencies and improved reliability – for a total of 4.85-4.88 bcm.

4.0 CONCLUSIONS

This analysis examined three financing scenarios to replace 96 turbines and 9 compressors at 23 compressor stations on Ukraine's Soyuz, Urengoy-Uzhgorod and "Progress" and Shebelinka-Kiev natural gas pipelines over the 8 year period 2000-2007 at an estimated cost of $461.4 million. The turbines and compressors are determined to be at the end of their operating life and replacement would provide improvements in energy efficiency, reduced O&M expenses, improved reliability, and, in the case Sheblinka-Kiev pipeline, prevented reduction of domestic gas production. It is estimated that the efficiency improvements will provide about 800 million cubic meters and domestic production of about 4,000 million cubic meter gas annually, thus directly reducing the need for imported gas.

The Soyuz and Urengoy-Uzhgorod and "Progress" pipelines each account for 44% of the investment, with the Shebelinka-Kiev pipeline accounting for the remaining 12%. Of the value of the improvements for the period 2000-2019, improved energy efficiency accounts for 34% of the total, reduced O&M for 3%, increased reliability for 10%, and continued domestic production for 53%.

The three financing scenarios are:

20/80/0. 20% of the financing is provided by Ukraine, 80% by an international financing institution, and 0% by a private sector investor.

20/40/40. 20% of the financing is provided by Ukraine, 40% by an international financing institution, and 40% by a private sector investor.

20/0/80. 20% of the financing is provided by Ukraine, 0% by an international financing institution, and 80% by a private sector investor.

The financing sources have different loan terms with average nominal interest rates of about 7.0%, 12.5%, and 18.0% respectively for the three scenarios. The loan period also differed with 10 years for private sector capital, and 12 years for capital provided by an IFI.

The scenarios were analyzed on the basis of financial and economic performance from investment perspectives of the program as a whole and only Ukraine. The financial analysis accounted for taxes, cost of financing, fuel costs and other factors that would impact the return that investors could expect to realize. The economic analysis excluded direct taxes, financial transfers and used marginal fuel prices to characterize the economics of the program for the Ukrainian economy. An important note is that the determination of fuel price is difficult as transactions are frequently not based on cash, which makes it difficult to establish value.

A number of metrics (present value of the investment, present value of the return, net present value, internal rate of return, discounted payback, and simple payback) were constructed for the three financing scenarios by the two investment perspectives these are displayed in tables 3.8, 3.9, and 3.10. The net present value was positive and the internal rate of return exceeded 20% for all cases except in the Ukraine investment perspective for the 20/0/80 financing scenario. And, as expected, the metrics showed that the investment became more attractive as the loan terms became more favorable and the interest rate decreased.

While the metrics indicate that it is beneficial to maximize financing from an IFI, there are a number of considerations that further bear upon the economic or national consequences of structuring a financing approach. These are contained in Section 3.4, the most important are:

The involvement of a private sector financier may enable equipment to be obtained from domestic sources, whereas this may not be possible using financing from an IFI.

In addition, a private sector financier may be able to assist in arranging a partnership for the domestic manufacture of and an export market for equipment.

A private sector financier may be able to assist in securing a stable market for current or increased levels of contract purchases of in Central and Western Europe, thus securing Ukraine's transmission role.

The ability to reduce the import of at least 4.8 bcm annually with the corresponding cash outflow.

Appendix A

Input Data for the Investment Program

This appendix provides three groups of initial parameters that can impact the program financial viability:

1. Parameters of the investment loan for each financing scenario.
2. Natural gas price forecast.
3. External economic parameters.

All assumptions are preliminary. They should be reviewed and corrected by the financial organizations, which are the potential lenders of the program and the National Joint Stock Company "Naftogas of Ukraine" (NJSC).

Investment Period. The NJSC feels that the gas supply unit (GSU) upgrades are urgently needed. In accordance with priorities and the conditions of the compressor stations, the investment period is scheduled to be over a period of 8 years beginning in 2000.

Financing Share and Timing. In all three financing scenarios, the share of debt capital is 80% of the program cost without value added tax (VAT). The remaining 20% of capital expenses, as well as necessary VAT payments will be financed by NJSC. It is estimated that not less than 1.5 years will be required for project development, which provides that loan funds (debt capital) would be available in 2001. Year 2000 investments will be made by NJSC and credited to its financing share.

The loan would be used only for supplying turbines and installing and constructing new compressor stations. Only NJSC incurs expenses for the improvement of the turbine DN-80.

The maturity of the World Bank loan is assumed to be 12 years with a 3-year grace period on principal and a nominal interest rate of 7% (including 1% mark-up on the on-lending by the Ministry of Finance). In addition, the borrower also pays an annual commitment fee of 0.25% of the undisbursed loan balance.

The maturity of the Private Sector Investor loan is assumed to be 10 years with no grace period and a nominal interest rate of 18%. On-lending by the Ministry of Finance is not assumed.

Cost of Capital. The cost of NJSC's own capital is estimated as 10% annually of the cost of invested funds. It is approximately 20% higher than the current average deposit rate for legal entities in Ukraine.

The total cost of capital required for the investment program reflects the weighted average cost of capital from the different sources in accordance with standard financial procedures.[1]

[1] E.Brigham. 1992. *Basics of Financial Management*. pp 297-335, 6th Edition, Driden Press.

The discount rate for each scenario is calculated as the sum of products of the real cost of capital for each source and the share of the source in the total amount of financing. The real capital cost for each component of the capital structure is determined by subtracting average annual foreign inflation from the nominal value of the capital cost.

Natural Gas Price. Natural gas freed up as a result of improving the efficiency of the GSUs is valued because of the payment received for the transit of Russian gas to Western Europe and sold by NJSC in the internal market. The average sale price in the internal market is calculated as the price at the Western Europe border less the transportation cost from the border of Ukraine with Russia to the western border of Germany (approximately $\$31/1000m^3$).

The regional dynamics of gas price fluctuation are determined by the global oil market and, to some extent, on the local supply conditions. Given that these two factors introduce uncertainty into a price forecast, it is assumed that the Western European border price will be about $\$81/1000\ m^3$, which is the 1998 level of gas prices in the Eastern United States and will escalate in accordance with a gas price forecast made by LCG Consulting (http://www.energyonline.com) for the United States. Thus, it is assumed that the nominal gas price at the Ukrainian-Russian border in 2001 will be about $\$50/1000m^3$ increasing to $\$117/1000m^3$ in 2020. In 2020 constant dollars, gas cost will increase by 50% (from \$50 to $\$75/1000m^3$) during the 20-year period at an annual escalation rate of about 2%.

External Economic Parameters. It is assumed that the profit tax will remain at its current rate of 30% during the period. The depreciation rate used (15% of net fixed assets) is set by the government of Ukraine. It is recognized that this depreciation rate and the procedure for calculation of depreciation do not comply with the world practice and do not provide depreciation payments required for the replacement of fixed assets (the rate and methodology reflect the government's attempt to increase revenue by increasing taxable income). It is expected that, with stabilization of the economic situation, the current depreciation rate will be revised and increased in the near term. Therefore net cash flow calculated with the depreciation rate of 15% can be considered as a conservative assessment.

Table A. Basic Data for Investment Program

1. Loan/Investment Parameters

	Financial Scenarios						
	Scenario1		Scenario 2			Scenario3	
	Ukraine (Equity)	IFI/Ministry of Finance (Loan)	Ukraine (Equity)	IFI/Ministry of Finance (Loan)	PSI (Loan)	Ukraine (Equity)	PSI (Loan)
Cost of Capital (Nominal Value of Dividend)*, %/year	10		10			10	
Interest Rate*, %/year		6		6	18		18
Onlending Fee from Ministry of Finance*, %/year		1		1			
Loan Commitment Fee of Undistributed Balance*, %		0.25		0.25	0		0
Loan (Principle) Grace Period (# Years)		3		3	0		0
Loan Period (# Years)		12		12	10		10
Financing Share, %	20	80	20	40	40	20	80

**nominal value*

2. Gas price projections

Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gas Price, million $/MMCM		0.050	0.050	0.052	0.052	0.057	0.059	0.061	0.065	0.067	0.072	0.074	0.078	0.083	0.087	0.091	0.098	0.102	0.109	0.113	0.117
Average Annual Foreign Inflation, %/year	2.4																				
Foreign Inflation Index		1.00	1.02	1.05	1.07	1.10	1.13	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.43	1.46	1.50	1.53	1.57
Deflator		1.00	0.98	0.95	0.93	0.91	0.89	0.87	0.85	0.83	0.81	0.79	0.77	0.75	0.73	0.72	0.70	0.68	0.67	0.65	0.64
Gas Price in Constant (2000 $), million $/MMCM		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07

3. Economic parameters

Profit Tax, %	30
Depreciation Rate (Ukraine Currently Sets as a % of Net Fixed Assets), %	15
Estimated Value of Lost Profit Due to Elimination of Domestic Production, $/MMCM	19.6

Appendix B

Input Data for the Projects in the Frame of the Program

This appendix provides the basic technical information for each pipeline project in the frame of the investment program, for cost and benefit analysis. The initial data was provided by the National Joint Stock Company "Naftogas of Ukraine" (NJSC).

Cost of Equipment and Installation. The installed cost for replacement of the 25 MW DN-80 is based on the actual cost to modernize two gas supply units (GSUs). The construction cost of the two compressor stations with a capacity of 6 MW is based on the actual construction cost of a compressor station on the "Dikanka" pipeline as it is equipped with a similar GSU.

The installed cost of the AI-336-10 and DI-70P units for modernization of the GSUs on the "Sojuz" pipeline is assessed by NJSC experts on the basis of the production cost of the prototype turbines and an estimate of the full-scale production cost for this series of turbines. The cost for the design improvement of the DN-80 turbine (conditionally named DN-80+) is determined by an agreement between the NJSC and the Scientific and Production Enterprise "Mashproect." The production and installation cost of the DN-80 and DN-80+ turbines is determined on the basis of the actual production and installation data for two DN-80 turbines in 1997 and 1998.

Efficiency of Existing Turbines. The efficiency of the existing turbines targeted for replacement is based on the average measured efficiency of turbines at the compressor stations of the appropriate gas pipelines.

The energy-efficiency improvement of gas supply units is a combination of the difference in efficiency of the existing and new turbines at the time of installation and of the faster rate of efficiency decrease of the existing turbines as a result of their technical condition in comparison with the new ones.

Overhaul. The program envisages that the turbines will be overhauled at the enterprise-manufacturer rather than in the field because, according to the NJSC experts, field overhauls do not restore efficiency and reliability to the full extent.

Operation and Maintenance. The O&M expenses for the existing turbines are expected to increase at an annual rate that is approximately 2.5% greater than for the new turbines as the continued operation of the existing equipment necessitates more frequent examinations and repairs, and also increases in the price of overhauls and decreases the time between overhauls.

The annual O&M differential for the compressor stations of the "Sojuz" pipeline is assumed to be 0.5% higher than for the Urengoy-Uzgorod and "Progress" pipeline due to the fact that the turbines at the latter are not as old. Thus, the annual O&M differential for the "Sojuz"

pipeline is assumed to be 2.5% and 2.0% is assumed for the Urengoy-Uzgorod and "Progress" pipeline.

Reliability Improvement. The current carrying capacity of transit pipelines ("Sojuz," and Urengoy-Uzgorod and "Progress") is used to the full extent and contract terms for the supply of Russian gas to Central and Western Europe envisage 100% loading of these pipelines for the 20-year period. Continued operation of the existing turbines carries the increasing risk of disrupting the transmission of Russian gas resulting in a decrease of transit payments and fines for violation of contracted delivery terms.

It is assumed that reliability-related financial losses that cannot be compensated by O&M measures will occur in 2007 on the "Sojuz" pipeline and in 2010 on the Urengoy-Uzgorod and "Progress" pipeline. This is related to the fact that on the "Sojuz" pipeline the equipment has operated 80 to 100 thousand hours, and on the Urengoy-Uzgorod and "Progress" pipeline the equipment has operated 65 to 85 thousand hours versus equipment operating life of 100 thousand hours according to technical specifications.

Table B.1. Basic Data of "Sojuz" Pipeline Modernization Project																	
Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cost of Turbine AI-336-10 or DI-70P, million $	2.70																
Cost of Turbine AI-336-10 or DI-70P with Contingency, million $	2.97																
Installation Cost, million $	0.50																
Installation Cost with Contingency, million $	0.55																
Total Cost, million $	3.52																
Efficiency of Existing Turbines MS-3002 in 2000, %	24.8																
Annual Fuel Gas Consumption (without Project), MMCM	1470.0																
Coefficient of Annual Efficiency Decrease of Turbines MS-3002	0.995																
O&M Cost of Existing Turbine, million$/unit/year	0.55																
O&M Cost of New Turbine, million$/unit/year	0.51																
Annual % Increase O&M Cost of Existing Compared to AI-336-10 or DI-70P Turbines	1.025																
Saving O&M Cost, million$/unit/year		0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06
Efficiency of Existing Turbines MS-3002 by year, %		24.7	24.6	24.4	24.3	24.2	24.1	23.9	23.8	23.7	23.6	23.5	23.4	23.2	23.1	23.0	22.9
Efficiency of New Turbines AI-336-10 and DI-70P, %	34																
Coefficient of Annual Efficiency Decrease of Turbines AI-336-10 and DI-70P	0.996																
Overhaul Period of New Turbines, years	4.0																
Decrease of Efficiency During Overhaul Period of New Turbines, years		34.0	33.9	33.7	33.6	34.0											
Efficiency of New Turbines after Installation		34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6
Reliability Effect per 1 New Turbine Installed in 2000, million $		0	0	0	0	0	0	0	0.1	0.1	0.15	0.25	0.4	0.6	0.9	1.4	2.1

Table B.2. Basic Data of Urengoy-Uzhgorod and "Progress" Pipelines Modernization Project

Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Project Lifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Investments in DN-80 before 2000, million $	3.9																				
Cost of Turbine DN-80, million $	3.95																				
Cost of Turbine DN-80 with Contingency, million $	4.3																				
Installation Cost DN-80, million $	0.4																				
Installation Cost DN-80 with Contingency, million $	0.4																				
Total Cost DN-80, million $	4.8																				
Cost of Turbine DN-80+, million $	5.6																				
Cost of Turbine DN-80+ with Contingency, million $	6.2																				
Installation Cost DN-80+, million $	0.4																				
Installation Cost DN-80+ with Contingency, million $	0.4																				
Total Cost DN-80+, million $	7																				
Efficiency of Existing Turbines MS-5002 in 2000, %	26.8																				
Annual Fuel Gas Consumption (without project), MMCM	1100																				
Coefficient of Annual Efficiency Decrease of Turbines MS-5002	0.995																				
Product Upgrade, million $		10	17.5																		
Product Upgrade with Contingency, million$		11	19.3																		
O&M Cost of Existing Turbine, million$/unit/year	1.07																				
O&M Cost of New Turbine (DN-80 and DN-80+), million$/unit/year	1.00																				
Annual % Increase O&M Cost of Existing Compared to New Turbine	1.020																				
O&M Saving, million$/unit/year		0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10
Efficiency of Existing Turbines MS-5002 by year, %		26.8	26.7	26.5	26.4	26.3	26.1	26.0	25.9	25.7	25.6	25.5	25.4	25.2	25.1	25.0	24.9	24.7	24.6	24.5	24.4
Efficiency of New Turbines DN-80, %	34																				
Coefficient of Annual Efficiency Decrease of Turbines DN-80	0.996																				
Overhaul Period of Turbines DN-80, years	4.0																				
Efficiency of New Turbines DN-80+, %	37.5																				
Coefficient of Annual Efficiency Decrease of Turbines DN-80+	0.997																				
Overhaul Period of Turbines DN-80+, years	4.0																				
Decrease of Efficiency During Overhaul Period of DN-80, years		34.0	33.9	33.7	33.6	34.0															
Efficiency of Turbines DN-80 after Installation, %		34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6
Decrease of Efficiency During Overhaul Period of DN-80+, years		37.5	37.4	37.3	37.2	37.5															
Efficiency of Turbines DN-80+ after Installation, %		37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2
Reliability Increase Resulting from Installation New Turbine, million $		0	0	0	0	0	0	0	0	0	0	0.2	0.2	0.30	0.50	0.8	1.2	1.8	2.8	4.2	6.0

Table B.3. Basic Data of Shebelinka-Kiev Pipeline Modernization Project					
Period #		1	2	3	4
Project Lifetime (2000-2015)		2000	2001	2002	2003
Reduced Domestic Gas Production, annual MMCM	4000				
1. CS LUBNY					
Number of New GSUs Put Into Operation (end of year)	4				
GSU Equipment Cost, million $/unit	4.2				
GSU Equipment Cost with Contingency, million $/unit	4.6				
Installation and Works, million $	5				
Installation and Works with Contingency, million $	5.5				
Total Cost, million $	24.0				
1. CS YAGOTIN					
Number of New GSUs Put Into Operation (end of year)	5				
GSU Equipment Cost, million $/unit	4.2				
GSU Equipment Cost with Contingency, million $/unit	4.6				
Installation and Works, million $	6.3				
Installation and Works with Contingency, million $	6.9				
Total Cost, million $	30.0				
Efficiency of Existing GSUs, %	23.9				
Annual Fuel Gas Consumption (without project), MMCM	156				
Coefficient of Annual Efficiency Decrease of Existing GSUs	0.995				
O&M Cost of Existing GSUs, million$/unit/year	0.04				
O&M Cost of New GSUs, million$/unit/year	0.02				
Annual % Increase O&M Cost of Existing Compared to New GSUs	1.03				
Efficiency of Existing GSUs by year, %		23.9	23.8	23.7	23.5
Efficiency of New GSUs, %	31				
Coefficient of Annual Efficiency Decrease of GSUs	0.996				
Decrease of Efficiency During Overhaul Period of New GSU, year		31.0	30.9	30.8	30.6
Efficiency of New Turbines after Installation		31.0	30.9	30.8	30.6

Appendix C

Benefits from Implementation of the Projects and the Program

Tables in this appendix present the distribution of the following financial benefits in time:

- Cost of fuel gas savings.

- Savings due to the decrease of expenses for gas supply unit operation and maintenance.

- Cost of the expected penalties envisaged by contracts of gas transit, avoided as a result of the program implementation.

- Economic effect from the decrease of imported gas demand due to the continuation of domestic extraction at the present level.

- Total benefits.

Table C.1. Benefits of "Sojuz" Pipeline Modernization Project

Period #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Name of Compressor Stations:	*Number of Installed Turbines AI-336-10 and DI-70P*															
1, CS NOVOPSKOV		1	1	1	1											
2. CS BOROVAYA		1		1	2	1										
3. CS PERVOMANSK		1		1	2	1										
4. CS MASHEVKA			1	1	1	2										
5. CS KREMENCHUG			1	1	1	2										
6. CS ALEXANDROVKA		1	1	1	1											
7. CS TALNOJE		1	1	2	1											
8. CS GAYSIN		1		1	2	1										
9. CS BAR-1		1		1	2	1										
10. CS GUSYATIN-1			1	1	2	1										
11. CS BOGORODCHANY-1			1	1	2	1										
12. CS KHUST			1	1	1	2										
TOTAL (at end of year)	0	7	8	13	18	12										
Total Number of Installed Turbines AI-336-10 and DI-70P	0	7	15	28	46	58	58	58	58	58	58	58	58	58	58	58
Remaining Number of Existing Turbines (begining of year)	58	58	51	43	30	12	0									
Efficiency of AI-336-10 and DI-70P Turbines Installed by End of 2001, %			34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9
Efficiency of AI-336-10 and DI-70P Turbines Installed by End of 2002, %				34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0
Efficiency of AI-336-10 and DI-70P Turbines Installed by End of 2003, %					34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6
Efficiency of AI-336-10 and DI-70P Turbines Installed by End of 2004, %						34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7
Efficiency of AI-336-10 and DI-70P Turbines Installed by End of 2005, %							34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9
Average Efficiency of Installed AI-336-10 and DI-70P Turbines, %			34.0	33.9	33.9	33.9	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8
Average Efficiency of all Turbines, %	24.7	24.6	25.6	26.8	28.9	31.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8
Efficiency Improvement,%	0	0	1.2	2.5	4.7	7.8	9.9	10.0	10.1	10.2	10.4	10.4	10.5	10.7	10.8	10.9
Efficiency Improvement Ratio	0	0	0.0	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Annual Fuel Gas Savings, MMCM	0	0	66.4	136.6	238.6	358.5	429.9	433.2	438.0	444.1	450.5	453.8	458.5	464.5	470.8	474.0
Cumulative Gas Savings, MMCM	0	0.0	66.4	203.0	441.6	800.1	1229.9	1663.1	2101.1	2545.2	2995.7	3449.5	3908.0	4372.5	4843.2	5317.2
Annual Value of Efficiency Improvement, million $	0	0	3.3	6.6	12.3	18.7	22.7	23.9	24.4	25.7	26.2	27.4	28.5	29.7	30.8	32.5
Cumulative Value of Efficiency Improvement, million $	0	0	3.3	9.9	22.2	40.9	63.6	87.5	111.9	137.6	163.9	191.3	219.7	249.4	280.2	312.7
Annual Value of O&M Reduction Resulting from Installation of AI-336-10 and DI-70P Turbines in 2001, million $			0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Annual Value of O&M Reduction Resulting from Installation of AI-336-10 and DI-70P Turbines in 2002, million $				0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Annual Value of O&M Reduction Resulting from Installation of AI-336-10 and DI-70P Turbines in 2003, million $					0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
Annual Value of O&M Reduction Resulting from Installation of AI-336-10 and DI-70P Turbines in 2004, million $						0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
Annual Value of O&M Reduction Resulting from Installation of AI-336-10 and DI-70P Turbines in 2005, million $							0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
Total Annual Value of Reduced O&M, million $	0	0	0.28	0.6	1.1	1.9	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9	2.9	3.0
Reliability Increase Resulting from Installation AI-336-10 and DI-70P Turbines in year 2001, million $		0	0	0	0	0	0	0	0.7	0.7	1.05	1.75	2.8	4.2	6.3	9.8
Reliability Increase Resulting from Installation AI-336-10 and DI-70P Turbines in year 2002, million $			0	0	0	0	0	0	0	0.8	0.8	1.2	2	3.2	4.8	7.2
Reliability Increase Resulting from Installation AI-336-10 and DI-70P Turbines in year 2003, million $				0	0	0	0	0	0	0	1.3	1.3	1.95	3.25	5.2	7.8
Reliability Increase Resulting from Installation AI-336-10 and DI-70P Turbines in year 2004, million $					0	0	0	0	0	0	0	1.8	1.8	2.7	4.5	7.2
Reliability Increase Resulting from Installation AI-336-10 and DI-70P Turbines in year 2005, million $						0	0	0	0	0	0	0	1.2	1.2	1.8	3
Total Avoided Contractual Losses as a Result of Reliability Improvement, million $	0	0	0	0	0	0	0	0	0.7	1.5	3.15	6.05	9.75	14.55	22.6	35
Total Annual Benefits, million $	0	0	3.6	7.2	13.4	20.6	25.1	26.4	27.7	29.8	32.1	36.1	41.0	47.1	56.4	70.5
Cumulative Total Benefits, million $	0	0	3.6	10.8	24.2	44.8	69.9	96.3	124.0	153.8	185.9	222.0	263.1	310.1	366.5	437.0

Table C.2. Benefits of Urengoy-Uzhgorod and "Progress" Pipelines Modernization Project																					
Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Name of Compressor Stations where DN-80 will be Installed:		*Number of Replacement Turbines*																			
Project Lifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1. CS ROMNY			1	1																	
2. CS SOFIYEVKA			1	1																	
3. CS BAR-2		1	1																		
Annual Installation of DN-80 Units (end of year)		1	3	2																	
Cumulative Installation of DN-80 Units (end of year)		1	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Name of compressor stations were DN-80+ will be Installed:																					
1. CS ROMNY				1	1		1														
2. CS SOFIYEVKA					1	1		1													
3. CS STAVYSHE						1	1	1													
4. CS ILYINTSY						1	1		1												
5. CS GUSYATIN-2						1	1		1												
6. CS BAR-2						1	1	1													
7. CS GOLYATIN							1	1	1												
Annual Installation of DN-80+ Units (end of year)				1	2	5	6	4	3												
Cumulative Installation of DN-80+ Units (end of year)				1	3	8	14	18	21	21	21	21	21	21	21	21	21	21	21	21	21
Cumulative Installation of DN-80 and DN-80+ Units (end of year)		1	4	7	9	14	20	24	27	27	27	27	27	27	27	27	27	27	27	27	27
Remaining Number of Existing Turbines (begining of year)		27	26	23	20	18	13	7	3	0	0	0	0	0	0	0	0	0	0	0	0
Efficiency of DN-80 Turbines Installed by End of 2000, %			34	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7
Efficiency of DN-80 Turbines Installed by End of 2001, %				34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9
Efficiency of DN-80 Turbines Installed by End of 2002, %					34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0	33.9	33.7	33.6	34.0
Average efficiency of installed DN-80 turbines, %			34	34.0	33.9	33.8	33.7	33.8	33.9	33.8	33.7	33.8	33.9	33.8	33.7	33.8	33.9	33.8	33.7	33.8	33.9
Efficiency of DN-80+ Turbines Installed by End of 2002, %				37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4
Efficiency of DN-80+ Turbines Installed by End of 2003, %					37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5
Efficiency of DN-80+ Turbines Installed by End of 2004, %						37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2
Efficiency of DN-80+ Turbines Installed by End of 2005, %							37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3
Efficiency of DN-80+ Turbines Installed by End of 2006, %								37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4
Efficiency of DN-80+ Turbines Installed by End of 2007, %									37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5	37.4	37.3	37.2	37.5

Table C.2. Benefits of Urengoy-Uzhgorod and "Progress" Pipelines Modernization Project (continuation)

Period #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Project Lifetime (2000-2019)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Average Efficiency of Installed DN80+ Turbines, %				37.5	37.5	37.4	37.4	37.4	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3
Average Efficiency of all New DN-80 and DN-80+ Turbines, %		34.0	34.0	34.4	35.0	35.8	36.3	36.5	36.5	36.5	36.6	36.6	36.5	36.5	36.6	36.6	36.5	36.5	36.6	36.6
Average Efficiency of all Turbines, %	26.8	26.9	27.6	28.5	29.2	31.2	33.7	35.3	36.5	36.5	36.6	36.6	36.5	36.5	36.6	36.6	36.5	36.5	36.6	36.6
Efficiency Improvement, %	0	0.3	1.1	2.1	2.9	5.0	7.7	9.4	10.8	10.9	11.1	11.2	11.3	11.4	11.6	11.7	11.8	11.9	12.1	12.2
Efficiency Improvement Ratio	0	0	0	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Annual Fuel Gas Savings, MMCM	0	11	44	80	110	178	250	294	325	329	333	337	340	344	348	352	355	359	363	367
Cumulative Gas Savings, MMCM	0	11	55	135	245	422	672	966	1291	1620	1953	2290	2630	2974	3322	3674	4029	4388	4751	5118
Annual Value of Efficiency Improvement, million $	0	0.5	2.2	3.9	5.6	9.3	13.2	16.2	18.1	19.0	19.4	20.3	21.1	22.0	22.8	24.1	24.8	26.1	26.8	27.4
Cumulative Value of Efficiency Improvement, million $	0	0.5	2.7	6.6	12.2	21.5	34.7	50.9	69.0	88.1	107.5	127.8	148.9	170.9	193.7	217.8	242.7	268.7	295.5	322.9
Annual Value of O&M Reduction Resulting From Installation of DN-80 Turbunes in 2000, million $		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Value of O&M Reduction Resulting From Installation of DN-80 Turbunes in 2001, million $			0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Annual Value of O&M Reduction Resulting From Installation of DN-80 Turbunes in 2002, million $				0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Annual Value of O&M Reduction Resulting From Installation of DN-80+ Turbunes in 2002, million $				0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Annual Value of O&M Reduction Resulting From Installation of DN-80+ Turbunes in 2003, million $					0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Annual Value of O&M Reduction Resulting From Installation of DN-80+ Turbunes in 2004, million $						0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
Annual Value of O&M Reduction Resulting From Installation of DN-80+ Turbunes in 2005, million $							0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6
Annual Value of O&M Reduction Resulting From Installation of DN-80+ Turbunes in 2006, million $								0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Total Annual Value of Reduced O&M, million $	0.0	0.1	0.3	0.5	0.6	1.0	1.5	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.3
Reliability Increase Resulting from Installation DN-80 Turbines in year 2000, million $	0	0	0	0	0	0	0	0	0	0	0.2	0.2	0.3	0.5	0.8	1.2	1.8	2.8	4.2	6.0
Reliability Increase Resulting from Installation DN-80 Turbines in year 2001, million $		0	0	0	0	0	0	0	0	0	0	0.6	0.6	0.9	1.5	2.4	3.6	5.4	8.4	12.6
Reliability Increase Resulting from Installation DN-80 Turbines in year 2002, million $			0	0	0	0	0	0	0	0	0	0	0.6	0.6	0.9	1.5	2.4	3.6	5.4	8.4
Reliability Increase Resulting from Installation DN-80+ Turbines in year 2002, million $				0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.6	1.0	1.6	2.4	3.6
Reliability Increase Resulting from Installation DN-80+ Turbines in year 2003, million $					0	0	0	0	0	0	0	0	0	0	1.0	1.0	1.5	2.5	4.0	6.0
Reliability Increase Resulting from Installation DN-80+ Turbines in year 2004, million $						0	0	0	0	0	0	0	0	0	0	1.2	1.2	1.8	3.0	4.8
Reliability Increase Resulting from Installation DN-80+ Turbines in year 2005, million $							0	0	0	0	0	0	0	0	0	0	0.8	0.8	1.2	2.0
Reliability Increase Resulting from Installation DN-80+ Turbines in year 2006, million $								0	0	0	0	0	0	0	0	0	0	0.6	0.6	0.9
Total avoided Contractual Losses as a Result of Reliability Improvement, million $	0	0	0	0	0	0	0	0	0	0	0.2	0.8	1.5	2.4	4.6	7.9	12.3	19.1	29.2	44.3
Total Annual Benefits, million $	0	0.6	2.5	4.4	6.3	10.3	14.7	18.0	19.9	20.9	21.5	23.0	24.6	26.4	29.4	34.1	39.2	47.3	58.2	74.0
Cumulative Total Benefits, million $	0	0.6	3.1	7.5	13.7	24.0	38.7	56.7	76.6	97.5	119.0	142.0	166.6	193.0	222.4	256.6	295.8	343.1	401.3	475.3

Table C.3. Benefits of Shebelinka-Kiev Pipeline Modernization Project

Period #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Name of Compressor Stations:	*Number of New GSUs*															
1. CS LUBNY		4.0														
2. CS YAGOTIN	5.0															
TOTAL (end of year)	5.0	4.0	0.0													
Total Number of New GSUs (end of year)	5.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Remaining Number of Existing GSUs (beginning of year)	9.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Efficiency of New GSUs Installed by End of 2000, %	31.0	30.9	30.8	30.6	31.0	30.9	30.8	30.6	31.0	30.9	30.8	30.6	31.0	30.9	30.8	30.6
Efficiency of New GSUs Installed by End of 2001, %		31.0	30.9	30.8	30.6	31.0	30.9	30.8	30.6	31.0	30.9	30.8	30.6	31.0	30.9	30.8
Average Efficiency of Installed New Turbines, %	31.0	30.9	30.8	30.7	30.8	30.9	30.8	30.7	30.8	30.9	30.8	30.7	30.8	30.9	30.8	30.7
Average Efficiency of all Turbines, %	23.9	27.8	30.8	30.7	30.8	30.9	30.8	30.7	30.8	30.9	30.8	30.7	30.8	30.9	30.8	30.7
Efficiency Improvement,%	0.0	4.0	7.1	7.1												
Efficiency Improvement Ratio	0.0	0.1	0.2	0.2												
Reduction of Domestic Gas Production, MMCM					4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Value of Reduction of Domestic Gas Production, million $					78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4
Annual Fuel Gas Savings, MMCM	0.0	22.5	36.2	36.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumulative Gas Savings, MMCM	0.0	22.5	58.7	95.0												
Annual Value of Efficiency Improvement, million $	0.0	1.1	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumulative Value of Efficiency Improvement, million $	0.0	1.1	2.9	4.7												
Annual Value of O&M Reduction Resulting from Installation of New GSUs in 2000, million $	0.1	0.1	0.1	0.1												
Annual Value of O&M Reduction Resulting from Installation of New GSUs in 2001, million $		0.1	0.1	0.1												
Total Annual Value of Reduced O&M, million $	0.1	0.2	0.2	0.2												
Total Annual Benefit, million $	0.1	1.3	2.0	2.0	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4
Cumulative Total Benefit, million $	0.1	1.4	3.4	5.3	83.8	162.2	240.6	319.1	397.5	476.0	554.4	632.8	711.3	789.7	868.2	946.6

Table C.4. Benefits of Investment Program

Period #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Program Lifetime (2000-2019)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Value of Reduction of Domestic Gas Production, million $	0.0	0.0	0.0	0.0	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	78.4	0.0	0.0	0.0	0.0
Fuel Gas Savings, MMCM	0.0	33.6	146.4	253.1	348.2	536.1	679.9	727.2	762.7	772.8	783.6	790.8	798.5	808.4	819.0	826.1	355.2	359.0	363.2	367.0
Cumulative Fuel Gas Savings, MMCM	0.0	33.6	180.0	433.0	781.2	1317.3	1997.3	2724.5	3487.1	4259.9	5043.4	5834.2	6632.8	7441.2	8260.2	9086.3	9441.5	9800.5	10163.6	10530.6
Total Annual Value of Efficiency Improvement, million $	0.0	1.6	7.3	12.3	17.9	27.9	35.9	40.2	42.5	44.8	45.7	47.7	49.6	51.6	53.6	56.6	24.8	26.1	26.8	27.4
Cumulative Value of Efficiency Improvement, million $	0.0	1.6	8.9	21.2	39.1	67.0	102.9	143.1	185.6	230.4	276.0	323.7	373.3	425.0	478.6	535.2	560.0	586.1	612.9	640.3
Total Value of Reduced O&M, million $	0.1	0.3	0.7	1.3	1.8	2.9	3.9	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	2.1	2.2	2.2	2.3
Cumulative Value of Reduced O&M, million $	0.1	0.4	1.1	2.4	4.2	7.1	11.0	15.2	19.6	24.0	28.6	33.3	38.0	42.9	47.9	53.0	55.1	57.3	59.5	61.8
Total Avoided Contractual Losses as a Result of Reliability Improvement, million $	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.5	3.4	6.9	11.3	17.0	27.2	42.9	12.3	19.1	29.2	44.3
Cumulative Value of Reliability Effect, million $	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.2	5.6	12.4	23.7	40.6	67.8	110.7	123.0	142.1	171.3	215.6
Total Annual Benefit, million $	0.1	1.9	8.0	13.6	98.1	109.3	118.2	122.9	126.0	129.2	132.0	137.6	144.1	151.9	164.3	183.0	39.2	47.3	58.2	74.0
Cumulative Total Benefit, million $	0.1	2.0	10.0	23.6	121.7	231.0	349.2	472.1	598.1	727.3	859.3	996.9	1141.0	1292.9	1457.1	1640.2	1679.4	1726.7	1784.9	1858.9

Appendix D

Net Cash Flows from the Implementation of the Projects and the Investment Program

This appendix includes results of the analysis of net cash flows and values of the following financial indicators:

- Net present value, $ million.

- Internal rate of return, %.

- Discounted payback period, years.

- Simple payback period, years.

Table D.1-1. Financial Cash Flow Projection ("Sojuz')

(Scenario 1) 20/80/0

Period #	Basic Data	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Cost of Equipment, million $		10.4	22.3	31.2	46.0	44.6	17.8										
Total Cost of Installation, million $		0.0	3.9	4.4	7.2	9.9	6.6										
Total Capital Expenditures, million $		10.4	26.1	35.6	53.2	54.5	24.4										
Cumulative Capital Investments, million $		10.4	36.5	72.1	125.3	179.7	204.2										
Increase in Gross Fixed Assets, million $		0.0	24.6	28.2	45.8	63.4	42.2										
Net Fixed Assets, million $		0.0	24.6	49.1	87.5	137.7	159.3	135.4	115.1	97.8	83.2	70.7	60.1	51.1	43.4	36.9	31.4
Depreciation, million $		0.0	0.0	3.7	7.4	13.1	20.7	23.9	20.3	17.3	14.7	12.5	10.6	9.0	7.7	6.5	5.5
Financing:																	
Ukraine (Equity), million $		10.4	3.9	5.3	7.9	8.1	3.6										
Ukraine's Equity Redistributed Proportionally, million $		10.4	1.6	2.2	3.3	3.4	1.5										
IFI (Loan), million $		0.0	24.5	33.3	49.8	51.0	22.9										
Total Project Financing, million $		10.4	26.1	35.6	53.2	54.5	24.4										
Auxiliary Information for Redistribution of Ukraine Equity Among Projects of Program:																	
Equity Since 2001 Excluding Expenditure on Products Upgrade, million $	28.9																
Commitment, million $		0	181.6	157.1	123.8	73.9	22.9										
Repayment of Loan, million $			0	0	0	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2			
Servicing of Finance:																	
Interest Payments, million $		0	1.1	2.7	5.0	7.3	7.4	6.5	5.6	4.6	3.7	2.8	1.9	0.9			
Loan Commitment Fees, million $		0	0.5	0.4	0.3	0.2	0.1										
Unpaid Principal (begining of year), million $		0	24.5	57.8	107.7	158.7	161.4	141.2	121.1	100.9	80.7	60.5	40.4	20.2			
Net Benefit After Financing, million $		0	-1.6	-3.2	-5.4	-7.2	-7.6	-5.3	0.5	5.8	11.4	16.8	23.7	31.1	39.4	49.9	65.0
Profit Tax Paid, million $		0	-0.5	-1.0	-1.6	-2.2	-2.3	-1.6	0.2	1.7	3.4	5.0	7.1	9.3	11.8	15.0	19.5
Net Benefit After Financing and Taxes, million $		0	-1.1	-2.2	-3.8	-5.0	-5.3	-3.7	0.4	4.0	8.0	11.8	16.6	21.8	27.6	34.9	45.5
Add Back Depreciation, million $		0	0.0	3.7	7.4	13.1	20.7	23.9	20.3	17.3	14.7	12.5	10.6	9.0	7.7	6.5	5.5
Cash Flow Before Repayment of Principal, million $		-10.4	-2.7	-0.8	0.3	4.7	13.8	20.2	20.7	21.3	22.7	24.2	27.2	30.8	35.3	41.4	51.0
Cash Flow After Repayment of Principal, million $		-10.4	-2.7	-0.8	0.3	-15.5	-6.4	0.0	0.5	1.1	2.5	4.1	7.0	10.6	35.3	41.4	51.0
Cumulative Cash Flow, million $		-10.4	-13.1	-13.9	-13.6	-29.2	-35.5	-35.5	-35.0	-33.9	-31.4	-27.3	-20.3	-9.7	25.6	67.0	118.0
Cumulative Discounted Cash Flow, million $		-9.9	-12.4	-13.0	-12.8	-24.8	-29.5	-29.5	-29.2	-28.5	-27.0	-24.6	-20.8	-15.3	2.0	21.4	44.0
Discount Rate, %	5.2																
NET PRESENT VALUE (NPV), million $		44.0															
INTERNAL RATE OF RETURN (IRR), %		14.3															
DISCOUNTED PAYBACK PERIOD, years		13.9															
SIMPLE PAYBACK, years		2.6															

Table D.1-2. Financial Cash Flow Projection (Urengoy-Uzhgorod and "Progress")																				
(Scenario 1) 20/80/0																				
Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Project Lifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Cost of Equipment (DN80) Less Expenses before 2000, million $		0.4	13.0	8.7																	
Total Cost of Installation (DN80), million $		0.4	1.3	0.9																	
Total Capital Expenditures (DN80), million $		0.9	14.4	9.6																	
Cumulative Capital Investments (DN80), million $		0.9	15.2	24.8																	
Total Cost of Equipment (DN80+), million $				6.2	12.3	30.8	37.0	24.6	18.5												
Total Cost of Installation (DN80+), million $				0.4	0.9	2.2	2.6	1.8	1.3												
Total Capital Expenditures (DN80+), million $				6.6	13.2	33.0	39.6	26.4	19.8												
Cumulative Capital Investments (DN80+), million $				6.6	19.8	52.8	92.4	118.8	138.6												
Total Cost of Equipment (DN80 and DN80+), million $		0.4	13.0	14.9	12.3	30.8	37.0	24.6	18.5												
Total Cost of Installation (DN80 and DN80+), million $		0.4	1.3	1.3	0.9	2.2	2.6	1.8	1.3												
Total Capital Expenditures (DN80 and DN80+), Including Product Upgrade, million $		11.9	33.6	16.2	13.2	33.0	39.6	26.4	19.8												
Cumulative Capital Investments (DN80 and DN80+), million $		11.9	45.5	61.7	74.9	107.9	147.5	173.9	193.7												
Increase in Gross Fixed Assets, million $		4.8	14.4	16.6	14.0	35.0	42.0	28.0	21.0												
Net Fixed Assets, million $		4.8	18.4	32.2	41.4	70.2	101.7	114.4	118.2	100.5	85.4	72.6	61.7	52.5	44.6	37.9	32.2	27.4	23.3	19.8	16.8
Depreciation, million $		0.0	0.7	2.8	4.8	6.2	10.5	15.2	17.2	17.7	15.1	12.8	10.9	9.3	7.9	6.7	5.7	4.8	4.1	3.5	3.0
Financing:																					
Ukraine (Equity), million $		11.9	20.6	0.6	0.5	1.3	1.6	1.0	0.8												
Ukraine's Equity Redistributed Proportionally, million $		11.9	19.9	0.3	0.2	0.6	0.7	0.5	0.4												
IFI (Loan), million $		0.0	13.7	15.9	13.0	32.4	38.9	25.9	19.4												
Total Project Financing, million $		11.9	33.6	16.2	13.2	33.0	39.6	26.4	19.8												
Auxiliary Information for Redistribution Ukraine Equity Among Projects of Program:																					
Equity Since 2001 Excluding Expenditure on Products Upgrade, million $	7.1																				
Commitment, million $		0.0	159.2	145.5	129.6	116.6	84.2	45.4	19.4												
Repayment of Loan, million $						17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7							
Servicing of Finance:																					
Interest Payments, million $		0	0.6	1.4	2.0	3.4	4.4	4.8	4.9	4.1	3.3	2.4	1.6	0.8	0	0	0	0	0	0	0
Loan Commitment Fees, million $		0	0.4	0.4	0.3	0.3	0.2	0.1	0.0												
Unpaid Principal (beginning of year), million $		0	13.7	29.6	42.6	75.0	96.2	104.4	106.1	88.4	70.8	53.1	35.4	17.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Benefit After Financing, million $		0	-1.1	-2.0	-2.7	-3.7	-4.9	-5.5	-4.1	-1.9	2.6	6.2	10.5	14.5	18.5	22.8	28.4	34.4	43.2	54.7	71.0
Profit Tax Paid, million $		0	-0.3	-0.6	-0.8	-1.1	-1.5	-1.7	-1.2	-0.6	0.8	1.9	3.2	4.4	5.5	6.8	8.5	10.3	13.0	16.4	21.3
Net Benefit After Financing and Taxes, million $		0	-0.8	-1.4	-1.9	-2.6	-3.4	-3.9	-2.9	-1.3	1.8	4.4	7.4	10.2	12.9	15.9	19.9	24.1	30.3	38.3	49.7
Add Back Depreciation, million $		0	0.7	2.8	4.8	6.2	10.5	15.2	17.2	17.7	15.1	12.8	10.9	9.3	7.9	6.7	5.7	4.8	4.1	3.5	3.0
Cash Flow Before Repayment of Principal, million $		-11.9	-19.9	1.0	2.7	3.0	6.4	10.9	13.9	16.4	16.9	17.2	18.3	19.4	20.8	22.6	25.6	28.9	34.4	41.8	52.7
Cash Flow After Repayment of Principal, million $		-11.9	-19.9	1.0	2.7	-14.7	-11.3	-6.8	-3.7	-1.3	-0.8	-0.5	0.6	1.7	20.8	22.6	25.6	28.9	34.4	41.8	52.7
Cumulative Cash Flow, million $		-11.9	-31.8	-30.8	-28.1	-42.7	-54.1	-60.8	-64.6	-65.9	-66.7	-67.2	-66.6	-64.9	-44.1	-21.4	4.1	33.1	67.4	109.2	161.9
Cumulative Discounted Cash Flow, million $		-11.3	-29.3	-28.4	-26.2	-37.6	-45.9	-50.7	-53.2	-54.0	-54.5	-54.8	-54.5	-53.6	-43.3	-32.8	-21.4	-9.2	4.6	20.6	39.7
Discount Rate, %	5.2																				
NET PRESENT VALUE (NPV), million $		39.7																			
INTERNAL RATE OF RETURN (IRR), %		9.5																			
DISCOUNTED PAYBACK PERIOD, years		17.3																			
SIMPLE PAYBACK, years		3.5																			

Table D.1-3. Financial Cash Flow Projection (Shebelinka-Kiev Pipeline Modernization)																	
(Scenario 1) 20/80/0																	
Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Cost of Equipment, million $		23.1	18.5														
Total Cost of Installation and Works, million $		6.9	5.5														
Total Capital Expenditures, million $		30.0	24.0														
Cumulative Capital Investments, million $		30.0	54.0														
Redistribution of Shares in Program Financing:																	
Adjusted Financing in Shebelinka-Kiev Project to Maintain Share for Entire Investment Program, million $	10.8																
Amount to be Redistributed to "Sojuz" and Urengoy-Uzhgorod & "Progress" Projects to Maintain Share for Entire Investment Program, million $	19.2																
Increase in Gross Fixed Assets, million $		30.0	24.0														
Net Fixed Assets, million $		30.0	49.5	42.1	35.8	30.4	25.8	22.0	18.7	15.9	13.5	11.5	9.7	8.3	7.0	6.0	5.1
Depreciation, million $		0.0	4.5	7.4	6.3	5.4	4.6	3.9	3.3	2.8	2.4	2.0	1.7	1.5	1.2	1.1	0.9
Financing:																	
Ukraine (Equity), million $		30.0															
IFI (Loan), million $			24.0														
Total Project Financing, million $		30.0	24.0														
Commitment, million $		0.0	24.0														
Repayment of Loan, million $						2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7			
Servicing of Finance:																	
Interest Payments, million $		0	1.1	1.1	1.1	1.1	1.0	0.9	0.7	0.6	0.5	0.4	0.2	0.1			
Loan Commitment Fees, million $		0	0.06														
Unpaid Principal, million $		0	24.0	24.0	24.0	24.0	21.3	18.7	16.0	13.3	10.7	8.0	5.3	2.7			
Net Benefit After Financing, million $		0.1	-4.4	-6.5	-5.5	72.0	72.9	73.7	74.4	75.0	75.6	76.0	76.5	76.9	77.2	77.4	77.5
Profit Tax Paid, million $		0.0	-1.3	-2.0	-1.6	21.6	21.9	22.1	22.3	22.5	22.7	22.8	22.9	23.1	23.2	23.2	23.3
Net Benefit After Financing and Taxes, million $		0.1	-3.1	-4.6	-3.8	50.4	51.0	51.6	52.1	52.5	52.9	53.2	53.5	53.8	54.0	54.2	54.3
Add Back Depreciation, million $		0.0	4.5	7.4	6.3	5.4	4.6	3.9	3.3	2.8	2.4	2.0	1.7	1.5	1.2	1.1	0.9
Cash Flow Before Repayment of Principal, million $		-30.0	1.4	2.8	2.5	55.7	55.6	55.5	55.4	55.3	55.3	55.3	55.3	55.3	55.3	55.2	55.2
Cash Flow After Repayment of Principal, million $		-30.0	1.4	2.8	2.5	53.1	52.9	52.8	52.7	52.7	52.6	52.6	52.6	52.6	55.3	55.2	55.2
Cumulative Cash Flow, million $		-30.0	-28.5	-25.7	-23.2	29.9	82.8	135.6	188.3	241.0	293.6	346.2	398.8	451.4	506.7	561.9	617.1
Cumulative Discounted Cash Flow, million $		-28.5	-27.2	-24.7	-22.7	18.5	57.5	94.6	129.7	163.1	194.8	224.9	253.5	280.7	307.9	333.7	358.2
Discount Rate, %	5.2																
NET PRESENT VALUE (NPV), million $		358.2															
INTERNAL RATE OF RETURN (IRR), %		53.6															
DISCOUNTED PAYBACK PERIOD, years		4.5															
SIMPLE PAYBACK, years		0.7															

Table D.1-4. Financial Cash Flow Projection of Investment Program

(Scenario 1) 20/80/0

Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Program lifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Cost of Equipment, million $		33.9	53.8	46.0	58.4	75.4	54.8	24.6	18.5												
Total Cost of Installation and Works, million $		7.4	10.7	5.7	8.0	12.1	9.2	1.8	1.3												
Product Upgrade, million $		11.0	19.3																		
Total Capital Expenditures, million $		52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8												
Cumulative Capital Investments, million $		52.3	136.0	187.8	254.2	341.6	405.6	432.0	451.8												
Increase in Gross Fixed Assets, million $		34.8	63.0	44.7	59.8	98.4	84.2	28.0	21.0												
Net Fixed Assets, million $		34.8	92.6	123.4	164.7	238.3	286.8	271.8	252.0	214.2	182.1	154.8	131.6	111.8	95.1	80.8	68.7	27.4	23.3	19.8	16.8
Depreciation, million $		0	5.2	13.9	18.5	24.7	35.7	43.0	40.8	37.8	32.1	27.3	23.2	19.7	16.8	14.3	12.1	4.8	4.1	3.5	3.0
Financing:																					
Ukraine (Equity), million $		52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4												
IFI (Loan), million $		0.0	62.0	49.0	62.4	83.1	61.6	25.9	19.4												
Total Project Financing, million $		52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8												
Commitment, million $		0	363.5	301.5	252.5	190.0	107.0	45.4	19.4												
Repayment of Loan, million $		0	0	0	0	40.4	40.4	40.4	40.4	40.4	40.4	40.4	40.4	40.4							
Servicing of Finance:																					
Interest Payments, million $		0	2.9	5.1	8.0	11.8	12.8	12.1	11.1	9.3	7.4	5.6	3.7	1.9							
Loan Commitment Fees, million $		0	0.9	0.8	0.6	0.5	0.3	0.1													
Unpaid Principal, million $		0	62.0	111.0	173.5	256.5	277.7	263.3	242.3	201.9	161.5	121.2	80.8	40.4							
Net Benefit After Financing, million $		0.1	-7.1	-11.7	-13.5	61.2	60.5	63.0	70.9	78.9	89.6	99.1	110.7	122.5	135.1	150.0	170.9	34.4	43.2	54.7	71.0
Profit Tax Paid, million $		0	-2.1	-3.5	-4.1	18.3	18.1	18.9	21.3	23.7	26.9	29.7	33.2	36.7	40.5	45.0	51.3	10.3	13.0	16.4	21.3
Net Benefit After Financing and Taxes, million $		0.1	-5.0	-8.2	-9.5	42.8	42.3	44.1	49.6	55.2	62.7	69.4	77.5	85.7	94.6	105.0	119.6	24.1	30.3	38.3	49.7
Add Back Depreciation, million $		0.0	5.2	13.9	18.5	24.7	35.7	43.0	40.8	37.8	32.1	27.3	23.2	19.7	16.8	14.3	12.1	4.8	4.1	3.5	3.0
Cash Flow Before Repayment of Principal, million $		-52.2	-21.4	2.9	5.1	63.1	75.7	86.6	90.0	93.1	94.9	96.7	100.7	105.5	111.4	119.3	131.8	28.9	34.4	41.8	52.7
Cash Flow After Repayment of Principal, million $		-52.2	-21.4	2.9	5.1	22.7	35.3	46.2	49.6	52.7	54.5	56.3	60.3	65.1	111.4	119.3	131.8	28.9	34.4	41.8	52.7
Cumulative Cash Flow, million $		-52.2	-73.7	-70.7	-65.7	-42.9	-7.6	38.6	88.2	140.9	195.4	251.7	312.0	377.1	488.4	607.7	739.5	28.9	63.3	105.1	157.7
Cumulative Discounted Cash Flow, million $		-49.7	-69.0	-66.5	-62.4	-44.7	-18.7	13.7	46.8	80.2	113.0	145.3	178.1	211.8	266.5	322.3	380.8	393.0	406.8	422.8	441.9
Discount Rate, %	5.2																				
NET PRESENT VALUE (NPV), million $		441.9																			
INTERNAL RATE OF RETURN (IRR), %		30.7																			
DISCOUNTED PAYBACK PERIOD, years		6.6																			
SIMPLE PAYBACK, years		1.8																			

Table D.2-1. Financial Cash Flow Projection ("Sojuz')

(Scenario 2) 20/40/40

Period #	Basic Data	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Cost of Equipment, million $		10.4	22.3	31.2	46.0	44.6	17.8										
Total Cost of Installation, million $		0.0	3.9	4.4	7.2	9.9	6.6										
Total Capital Expenditures, million $		10.4	26.1	35.6	53.2	54.5	24.4										
Cumulative Capital Investments, million $		10.4	36.5	72.1	125.3	179.7	204.2										
Increase in Gross Fixed Assets, million $		0.0	24.6	28.2	45.8	63.4	42.2										
Net Fixed Assets, million $		0.0	24.6	49.1	87.5	137.7	159.3	135.4	115.1	97.8	83.2	70.7	60.1	51.1	43.4	36.9	31.4
Depreciation, million $		0.0	0.0	3.7	7.4	13.1	20.7	23.9	20.3	17.3	14.7	12.5	10.6	9.0	7.7	6.5	5.5
Financing:																	
Ukraine (Equity), million $		10.4	3.9	5.3	7.9	8.1	3.6										
Ukraine's Equity Redistributed Proportionally, million $		10.4	1.6	2.2	3.3	3.4	1.5										
Loan, million $			24.5	33.3	49.8	51.0	22.9										
Including:																	
IFI , million $		0	12.2	16.7	24.9	25.5	11.4										
PSI , million $			12.2	16.7	24.9	25.5	11.4										
Total Project Financing, million $		10.4	26.1	35.6	53.2	54.5	24.4										
Auxiliary Information for Redistribution of Ukraine Equity Among Projects of Program:																	
Equity Since 2001 Exluding Expenditure on Products Upgrade, million $	28.9																
IFI Commitment, million $		0	90.8	78.6	61.9	37.0	11.4										
PSI Commitment, million $			90.8	78.6	61.9	37.0	11.4										
IFI Repayment of Loan, million $						10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1			
PSI Repayment of Loan, million $			9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1					
Servicing of Finance:																	
IFI Interest Payments, million $		0	0.6	1.3	2.5	3.7	3.7	3.2	2.8	2.3	1.9	1.4	0.9	0.5			
PSI Interest Payments, million $			1.9	3.1	5.6	8.1	8.5	7.1	5.7	4.2	2.8	1.4					
IFI Loan Commitment Fees, million $		0	0.2	0.2	0.2	0.1											
PSI Loan Commitment Fees, million $																	
IFI Unpaid Principal, million $		0	12.2	28.9	53.8	79.4	80.7	70.6	60.5	50.4	40.4	30.3	20.2	10.1			
PSI Unpaid Principal, million $			12.2	19.8	35.7	52.1	54.5	45.4	36.3	27.2	18.2	9.1					
Net Benefit After Financing, million $		0	-2.7	-4.7	-8.3	-11.6	-12.3	-9.1	-2.4	3.8	10.5	16.8	24.6	31.6	39.4	49.9	65.0
Profit Tax Paid, million $		0	-0.8	-1.4	-2.5	-3.5	-3.7	-2.7	-0.7	1.1	3.1	5.0	7.4	9.5	11.8	15.0	19.5
Net Benefit After Financing and Taxes, million $		0	-1.9	-3.3	-5.8	-8.1	-8.6	-6.4	-1.7	2.7	7.3	11.7	17.2	22.1	27.6	34.9	45.5
Add Back Depreciation, million $		0	0	3.7	7.4	13.1	20.7	23.9	20.3	17.3	14.7	12.5	10.6	9.0	7.7	6.5	5.5
Cash Flow Before Repayment of Principal, million $		-10.4	-3.5	-1.9	-1.8	1.6	10.5	17.5	18.7	19.9	22.0	24.2	27.8	31.1	35.3	41.4	51.0
Cash Flow After Repayment of Principal, million $		-10.4	-12.6	-10.9	-10.9	-17.6	-8.7	-1.7	-0.5	0.8	2.8	5.1	17.7	21.0	35.3	41.4	51.0
Cumulative Cash Flow, million $		-10.4	-23.0	-33.9	-44.8	-62.4	-71.1	-72.7	-73.2	-72.5	-69.6	-64.6	-46.8	-25.8	9.5	50.9	101.9
Cumulative Discounted Cash Flow, million $		-9.5	-20.0	-28.3	-35.8	-46.9	-51.9	-52.8	-53.1	-52.7	-51.6	-49.7	-43.8	-37.5	-27.7	-17.2	-5.4
Discount Rate, %	9.6																
NET PRESENT VALUE (NPV), million $		-5.4															
INTERNAL RATE OF RETURN (IRR), %		8.5															
DISCOUNTED PAYBACK PERIOD, years		NONE															
SIMPLE PAYBACK, years		2.9															

Table D.2-2.Financial Cash Flow Projection (Urengoy-Uzhgorod and "Progress")

(Scenario 2) 20/40/40

Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Project Llifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Cost of Equipment (DN80) Less Expenses Before 2000, million $		0.4	13.0	8.7																	
Total Cost of Installation (DN80), million $		0.4	1.3	0.9																	
Total Capital Expenditures (DN80), million $		0.9	14.4	9.6																	
Cumulative Capital Investments (DN80), million $		0.9	15.2	24.8																	
Total Cost of Equipment (DN80+), million $				6.2	12.3	30.8	37.0	24.6	18.5												
Total Cost of Installation (DN80+), million $				0.4	0.9	2.2	2.6	1.8	1.3												
Total Capital Expenditures (DN80+), million $				6.6	13.2	33.0	39.6	26.4	19.8												
Cumulative Capital Investments (DN80+), million $				6.6	19.8	52.8	92.4	118.8	138.6												
Total Cost of Equipment (DN80 and DN80+), million $		0.4	13.0	14.9	12.3	30.8	37.0	24.6	18.5												
Total Cost of Installation (DN80 and DN80+), million $		0.4	1.3	1.3	0.9	2.2	2.6	1.8	1.3												
Total Capital Expenditures (DN80 and DN80+), Including Product Upgrade, million $		11.9	33.6	16.2	13.2	33.0	39.6	26.4	19.8												
Cumulative Capital Investments (DN80 and DN80+), million $		11.9	45.5	61.7	74.9	107.9	147.5	173.9	193.7												
Increase in Gross Fixed Assets, million $		4.8	14.4	16.6	14.0	35.0	42.0	28.0	21.0												
Net Fixed Assets, million $		4.8	18.4	32.2	41.4	70.2	101.7	114.4	118.2	100.5	85.4	72.6	61.7	52.5	44.6	37.9	32.2	27.4	23.3	19.8	16.8
Depreciation, million $		0.0	0.7	2.8	4.8	6.2	10.5	15.2	17.2	17.7	15.1	12.8	10.9	9.3	7.9	6.7	5.7	4.8	4.1	3.5	3.0
Financing:																					
Ukraine (Equity), million $		11.9	20.6	0.6	0.5	1.3	1.6	1.0	0.8												
Ukraine's Equity Redistributed Proportionally, million $		11.9	19.9	0.3	0.2	0.6	0.7	0.5	0.4												
Loan, million $			13.7	15.9	13.0	32.4	38.9	25.9	19.4												
Including:																					
IFI , million $			6.9	7.9	6.5	16.2	19.4	13.0	9.7												
PSI , million $			6.9	7.9	6.5	16.2	19.4	13.0	9.7												
Total Project Financing, million $		11.9	34.3	16.5	13.5	33.7	40.4	27.0	20.2												
Auxiliary Information for Redistribution Ukraine Equity Among Projects of Program:																					
Equity Since 2001 Excluding Expenditure on Products Upgrade, million $	7.1																				
IFI Commitment, million $			79.6	72.7	64.8	58.3	42.1	22.7	9.7												
PSI Commitment, million $			79.6	72.7	64.8	58.3	42.1	22.7	9.7												
IFI Repayment of Loan, million $						8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8							
PSI Repayment of Loan, million $			8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0									
Servicing of Finance:																					
IFI Interest Payments, million $			0.3	0.7	1.0	1.7	2.2	2.4	2.4	2.0	1.6	1.2	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PSI Interest Payments, million $			1.1	1.1	0.8	2.1	3.9	4.7	5.0	3.7	2.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IFI Loan Commitment Fees, million $			0.2	0.2	0.2	0.1	0.1														
PSI Loan Commitment Fees, million $			0	0	0	0	0														
IFI Unpaid Principal, million $			6.9	14.8	21.3	37.5	48.1	52.2	53.1	44.2	35.4	26.5	17.7	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PSI Unpaid Principal, million $			6.9	6.8	5.4	13.6	25.1	30.1	31.8	23.9	15.9	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Benefit After Financing, million $			-1.7	-2.2	-2.4	-3.9	-6.5	-7.7	-6.6	-3.6	1.7	6.2	11.3	14.9	18.5	22.8	28.4	34.4	43.2	54.7	71.0
Profit Tax Paid, million $			-0.5	-0.7	-0.7	-1.2	-1.9	-2.3	-2.0	-1.1	0.5	1.9	3.4	4.5	5.5	6.8	8.5	10.3	13.0	16.4	21.3
Net Benefit After Financing and Taxes, million $			-1.2	-1.6	-1.7	-2.7	-4.5	-5.4	-4.6	-2.5	1.2	4.3	7.9	10.5	12.9	15.9	19.9	24.1	30.3	38.3	49.7
Add Back Depreciation, million $			0.7	2.8	4.8	6.2	10.5	15.2	17.2	17.7	15.1	12.8	10.9	9.3	7.9	6.7	5.7	4.8	4.1	3.5	3.0
Cash Flow Before Repayment of Principal, million $		-11.9	-20.3	0.9	2.9	2.9	5.3	9.4	11.8	15.2	16.3	17.2	18.8	19.7	20.8	22.6	25.6	28.9	34.4	41.8	52.7
Cash Flow After Repayment of Principal, million $		-11.9	-28.3	-7.1	-5.1	-13.9	-11.5	-7.4	-5.0	-1.6	-0.5	0.4	10.0	10.9	20.8	22.6	25.6	28.9	34.4	41.8	52.7
Cumulative Cash Flow, million $		-11.9	-40.2	-47.2	-52.3	-66.2	-77.8	-85.2	-90.2	-91.8	-92.3	-92.0	-82.0	-71.1	-50.3	-27.7	-2.1	26.8	61.2	103.0	155.7
Cumulative Discounted Cash Flow, million $		-10.8	-34.4	-39.8	-43.3	-52.1	-58.7	-62.6	-65.1	-65.7	-66.0	-65.8	-62.5	-59.2	-53.4	-47.7	-41.8	-35.7	-29.1	-21.8	-13.4
Discount Rate, %	9.6																				
NET PRESENT VALUE (NPV), million $		-13.4																			
INTERNAL RATE OF RETURN (IRR), %		7.7																			
DISCOUNTED PAYBACK PERIOD, years		none																			
SIMPLE PAYBACK, years		3.6																			

Table D.2-3. Financial Cash Flow Projection (Shebelinka-Kiev Pipeline Modernization)																	
(Scenario 2) 20/40/40																	
Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Capital Expenditures, million $		30.0	24.0														
Cumulative Capital Investments, million $		30.0	54.0														
Redistribution of Shares in Program Financing:																	
Adjusted Financing in Shebelinka-Kiev Project to Maintain Share for Entire Investment Program, million $	10.8																
Amount to be Redistributed to "Sojuz" and Urengoy-Uzhgorod & "Progress" Projects to Maintain Share for Entire Investment Program, million $	19.2																
Increase in Gross Fixed Assets, million $		30.0	24.0														
Net Fixed Assets, million $		30.0	49.5	42.1	35.8	30.4	25.8	22.0	18.7	15.9	13.5	11.5	9.7	8.3	7.0	6.0	5.1
Depreciation, million $		0.0	4.5	7.4	6.3	5.4	4.6	3.9	3.3	2.8	2.4	2.0	1.7	1.5	1.2	1.1	0.9
Financing:																	
Ukraine (Equity), million $		30.0															
Loan, million $			24.0														
Including:																	
IFI , million $			12.0														
PSI , million $			12.0														
Total Project Financing, million $		30.0	24.0														
IFI Commitment, million $		0	12.0														
PSI Commitment, million $			12.0														
IFI Repayment of Loan, million $						1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3			
PSI Repayment of Loan, million $			1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2					
Servicing of Finance:																	
IFI Interest Payments, million $		0	0.6	0.6	0.6	0.6	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.1			
PSI Interest Payments, million $			1.9	1.7	1.5	1.3	1.1	0.9	0.7	0.6	0.4	0.2					
IFI Loan Commitment Fees, million $		0	0	0	0	0	0										
PSI Loan Commitment Fees, million $			0	0	0	0	0										
IFI Unpaid Principal, million $		0	12.0	12.0	12.0	12.0	10.7	9.3	8.0	6.7	5.3	4.0	2.7	1.3			
PSI Unpaid Principal, million $			12.0	10.8	9.6	8.4	7.2	6.0	4.8	3.6	2.4	1.2					
Net Benefit After Financing, million $		0.1	-5.7	-7.7	-6.4	71.2	72.3	73.2	74.0	74.8	75.4	76.0	76.6	76.9	77.2	77.4	77.5
Profit Tax Paid, million $		0	-1.7	-2.3	-1.9	21.4	21.7	22.0	22.2	22.4	22.6	22.8	23.0	23.1	23.2	23.2	23.3
Net Benefit After Financing and Taxes, million $		0.1	-4.0	-5.4	-4.5	49.8	50.6	51.2	51.8	52.3	52.8	53.2	53.6	53.8	54.0	54.2	54.3
Add Back Depreciation, million $		0.0	4.5	7.4	6.3	5.4	4.6	3.9	3.3	2.8	2.4	2.0	1.7	1.5	1.2	1.1	0.9
Cash Flow Before Repayment of Principal, million $		-30.0	0.5	2.1	1.8	55.2	55.1	55.1	55.1	55.1	55.2	55.3	55.3	55.3	55.3	55.2	55.2
Cash Flow After Repayment of Principal, million $		-30.0	-0.7	0.9	0.6	52.7	52.6	52.6	52.6	52.6	52.7	52.7	54.0	54.0	55.3	55.2	55.2
Cumulative Cash Flow, million $		-30.0	-30.6	-29.8	-29.1	23.5	76.2	128.7	181.3	233.9	286.6	339.3	393.3	447.3	502.6	557.8	613.0
Cumulative Discounted Cash Flow, million $		-27.3	-27.9	-27.2	-26.8	6.5	36.9	64.5	89.8	112.9	133.9	153.1	171.1	187.5	202.8	216.8	229.5
Discount Rate, %	9.6																
NET PRESENT VALUE (NPV), million $		229.5															
INTERNAL RATE OF RETURN (IRR), %		51.0															
DISCOUNTED PAYBACK PERIOD, years		4.8															
SIMPLE PAYBACK, years		0.7															

Table D.2-4. Financial Cash Flow Projection of Investment Program

(Scenario 2) 20/40/40

Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Program Lifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Cost of Equipment, million $		33.9	53.8	46.0	58.4	75.4	54.8	24.6	18.5												
Total Cost of Installation and Works, million $		7.4	10.7	5.7	8.0	12.1	9.2	1.8	1.3												
Product Upgrade, million $		11.0	19.3																		
Total Capital Expenditures, million $		52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8												
Cumulative Capital Investments, million $		52.3	136.0	187.8	254.2	341.6	405.6	432.0	451.8												
Increase in Gross Fixed Assets, million $		34.8	63.0	44.7	59.8	98.4	84.2	28.0	21.0												
Net Fixed Assets, million $		34.8	92.6	123.4	164.7	238.3	286.8	271.8	252.0	214.2	182.1	154.8	131.6	111.8	95.1	80.8	68.7	27.4	23.3	19.8	16.8
Depreciation, million $		0	5.2	13.9	18.5	24.7	35.7	43.0	40.8	37.8	32.1	27.3	23.2	19.7	16.8	14.3	12.1	4.8	4.1	3.5	3.0
Financing:																					
Ukraine (Equity), million $		52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4												
Loan, million $			62.0	49.0	62.4	83.1	61.6	25.9	19.4												
Including:																					
IFI , million $		0	31.0	24.5	31.2	41.5	30.8	13.0	9.7												
PSI , million $		0	31.0	24.5	31.2	41.5	30.8	13.0	9.7												
Total Project Financing, million $		52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8												
IFI Commitment, million $		0.0	181.7	150.7	126.2	95.0	53.5	22.7	9.7												
PSI Commitment, million $			181.7	150.7	126.2	95.0	53.5	22.7	9.7												
IFI Repayment of Loan, million $			0.0	0.0	0.0	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PSI Repayment of Loan, million $			18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Servicing of Finance:																					
IFI Interest Payments, million $		0.0	1.4	2.6	4.0	5.9	6.4	6.1	5.6	4.6	3.7	2.8	1.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PSI Interest Payments, million $			4.8	5.8	7.9	11.5	13.5	12.7	11.3	8.5	5.7	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IFI Loan Commitment Fees, million $		0.0	0.5	0.4	0.3	0.2	0.1														
PSI Loan Commitment Fees, million $			0.0	0.0	0.0	0.0	0.0														
IFI Unpaid Principal, million $		0.0	31.0	55.5	86.7	128.3	138.9	131.6	121.2	101.0	80.8	60.6	40.4	20.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PSI Unpaid Principal, million $			31.0	37.3	50.4	73.7	86.4	81.2	72.7	54.5	36.3	18.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Benefit After Financing, million $		0.1	-10.0	-14.6	-17.1	55.8	53.5	56.5	65.2	75.1	87.7	99.1	112.6	123.4	135.1	150.0	170.9	34.4	43.2	54.7	71.0
Profit Tax Paid, million $		0.0	-3.0	-4.4	-5.1	16.7	16.1	16.9	19.6	22.5	26.3	29.7	33.8	37.0	40.5	45.0	51.3	10.3	13.0	16.4	21.3
Net Benefit After Financing and Taxes, million $		0.1	-7.0	-10.2	-12.0	39.1	37.5	39.5	45.6	52.5	61.4	69.3	78.8	86.4	94.6	105.0	119.6	24.1	30.3	38.3	49.7
Add Back Depreciation, million $		0.0	5.2	13.9	18.5	24.7	35.7	43.0	40.8	37.8	32.1	27.3	23.2	19.7	16.8	14.3	12.1	4.8	4.1	3.5	3.0
Cash Flow Before Repayment of Principal, million $		-52.2	-23.5	0.9	2.6	59.4	70.8	82.1	86.0	90.3	93.5	96.7	102.0	106.1	111.4	119.3	131.8	28.9	34.4	41.8	52.7
Cash Flow After Repayment of Principal, million $		-52.2	-41.7	-17.3	-15.6	21.0	32.4	43.7	47.7	52.0	55.1	58.3	81.8	85.9	111.4	119.3	131.8	28.9	34.4	41.8	52.7
Cumulative Cash Flow, million $		-52.2	-93.9	-111.2	-126.8	-105.8	-73.3	-29.6	18.0	70.0	125.1	183.4	265.2	351.2	462.5	581.8	713.6	742.5	776.8	818.6	871.3
Cumulative Discounted Cash Flow, million $		-47.7	-82.4	-95.5	-106.3	-93.0	-74.3	-51.3	-28.4	-5.6	16.4	37.7	64.9	91.0	121.9	152.0	182.4	188.5	195.1	202.5	210.9
Discount Rate, %	9.6																				
NET PRESENT VALUE (NPV), million $		210.9																			
INTERNAL RATE OF RETURN (IRR), %		23.6																			
DISCOUNTED PAYBACK PERIOD, years		9.3																			
SIMPLE PAYBACK, years		1.8																			

Table D.3-1. Financial Cash Flow Projection ("Sojuz')																	
(Scenario 3) 20/0/80																	
Period #	Basic Data	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Cost of Equipment, million $		10.4	22.3	31.2	46.0	44.6	17.8										
Total Cost of Installation, million $		0.0	3.9	4.4	7.2	9.9	6.6										
Total Capital Expenditures, million $		10.4	26.1	35.6	53.2	54.5	24.4										
Cumulative Capital Investments, million $		10.4	36.5	72.1	125.3	179.7	204.2										
Increase in Gross Fixed Assets, million $		0.0	24.6	28.2	45.8	63.4	42.2										
Net Fixed Assets, million $		0.0	24.6	49.1	87.5	137.7	159.3	135.4	115.1	97.8	83.2	70.7	60.1	51.1	43.4	36.9	31.4
Depreciation, million $		0.0	0.0	3.7	7.4	13.1	20.7	23.9	20.3	17.3	14.7	12.5	10.6	9.0	7.7	6.5	5.5
Financing:																	
Ukraine (Equity), million $		10.4	3.9	5.3	7.9	8.1	3.6										
Ukraine's Equity Redistributed Proportionally, million $		10.4	1.6	2.2	3.3	3.4	1.5										
PSI (Loan), million $		0	24.5	33.3	49.8	51.0	22.9										
Total Project Financing, million $		10.4	26.1	35.6	53.2	54.5	24.4										
Auxiliary Information for Redistribution of Ukraine Equity Among Projects of Program:																	
Equity Since 2001 Exluding Expenditure on Products Upgrade, million $	28.9																
Commitment, million $		0	181.6	157.1	123.8	73.9	22.9										
Repayment of Loan, million $			18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2					
Servicing of Finance:																	
Interest Payments, million $		0	3.8	6.2	11.1	16.3	17.0	14.2	11.3	8.5	5.7	2.8					
Unpaid Principal, million $		0	24.5	39.7	71.4	104.2	109.0	90.8	72.6	54.5	36.3	18.2					
Net Benefit After Financing, million $		0	-3.8	-6.3	-11.3	-16.0	-17.1	-12.9	-5.2	1.9	9.5	16.8	25.5	32.0	39.4	49.9	65.0
Profit Tax Paid, million $		0	-1.1	-1.9	-3.4	-4.8	-5.1	-3.9	-1.6	0.6	2.8	5.0	7.7	9.6	11.8	15.0	19.5
Net Benefit After Financing and Taxes, million $		0	-2.7	-4.4	-7.9	-11.2	-12.0	-9.1	-3.7	1.3	6.6	11.7	17.9	22.4	27.6	34.9	45.5
Add Back Depreciation, million $		0	0.0	3.7	7.4	13.1	20.7	23.9	20.3	17.3	14.7	12.5	10.6	9.0	7.7	6.5	5.5
Cash Flow Before Repayment of Principal, million $		-10.4	-4.3	-3.0	-3.9	-1.5	7.2	14.8	16.6	18.6	21.3	24.2	28.5	31.4	35.3	41.4	51.0
Cash Flow After Repayment of Principal, million $		-10.4	-22.5	-21.1	-22.0	-19.6	-11.0	-3.3	-1.5	0.4	3.2	6.0	28.5	31.4	35.3	41.4	51.0
Cumulative Cash Flow, million $		-10.4	-32.9	-54.0	-76.0	-95.6	-106.6	-110.0	-111.5	-111.0	-107.9	-101.8	-73.3	-41.9	-6.7	34.8	85.8
Cumulative Discounted Cash Flow, million $		-9.1	-26.4	-40.7	-53.7	-63.9	-68.9	-70.2	-70.8	-70.6	-69.8	-68.3	-62.4	-56.7	-51.1	-45.3	-39.0
Discount Rate, %	14																
NET PRESENT VALUE (NPV), million $		-39.0															
INTERNAL RATE OF RETURN (IRR), %		5.6															
DISCOUNTED PAYBACK PERIOD, years		none															
SIMPLE PAYBACK, years		3.3															

Table D.3-2. Financial Cash Flow Projection (Urengoy-Uzhgorod and "Progress")

(Scenario 3) 20/0/80

Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Project Lifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Cost of Equipment (DN80) Less Expenses Before 2000, million $		0.4	13.0	8.7																	
Total Cost of Installation (DN80), million $		0.4	1.3	0.9																	
Total Capital Expenditures (DN80), million $		0.9	14.4	9.6																	
Cumulative Capital Investments (DN80), million $		0.9	15.2	24.8																	
Total Cost of Equipment (DN80), million $				6.2	12.3	30.8	37.0	24.6	18.5												
Total Cost of Installation (DN80), million $				0.4	0.9	2.2	2.6	1.8	1.3												
Total Capital Expenditures (DN80), million $				6.6	13.2	33.0	39.6	26.4	19.8												
Cumulative Capital Investments (DN80), million $				6.6	19.8	52.8	92.4	118.8	138.6												
Total Cost of Equipment (DN80 and DN80+), million $		0.4	13.0	14.9	12.3	30.8	37.0	24.6	18.5												
Total Cost of Installation (DN80 and DN80+), million $		0.4	1.3	1.3	0.9	2.2	2.6	1.8	1.3												
Total Capital Expenditures (DN80 and DN80+), Including Product Upgrade, million $		11.9	33.6	16.2	13.2	33.0	39.6	26.4	19.8												
Cumulative Capital Investments (DN80 and DN80+), million $		11.9	45.5	61.7	74.9	107.9	147.5	173.9	193.7												
Increase in Gross Fixed Assets, million $		4.8	14.4	16.6	14.0	35.0	42.0	28.0	21.0												
Net Fixed Assets, million $		4.8	18.4	32.2	41.4	70.2	101.7	114.4	118.2	100.5	85.4	72.6	61.7	52.5	44.6	37.9	32.2	27.4	23.3	19.8	16.8
Depreciation, million $		0.0	0.7	2.8	4.8	6.2	10.5	15.2	17.2	17.7	15.1	12.8	10.9	9.3	7.9	6.7	5.7	4.8	4.1	3.5	3.0
Financing:																					
Ukraine (Equity), million $		11.9	20.6	0.6	0.5	1.3	1.6	1.0	0.8												
Ukraine's Equity Redistributed Proportionally, million $		11.9	19.9	0.3	0.2	0.6	0.7	0.5	0.4												
PSI (Loan), million $		0.0	13.7	15.9	13.0	32.4	38.9	25.9	19.4												
Total Project Financing, million $		11.9	33.6	16.2	13.2	33.0	39.6	26.4	19.8												
Auxiliary Information for Redistribution Ukraine Equity Among Projects of Program:																					
Equity Since 2001 Excluding Expenditure on Product Upgrade, million $	7.1																				
Commitment, million $		0	159.2	145.5	129.6	116.6	84.2	45.4	19.4												
Repayment of Loan, million $			15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9									
Servicing of Finance:																					
Interest Payments, million $		0	2.1	2.1	1.7	4.2	7.8	9.4	9.9	7.5	5.0	2.5									
Unpaid Principal, million $			13.7	13.7	10.7	27.2	50.2	60.2	63.7	47.8	31.8	15.9									
Net Benefit After Financing, million $		0	-2.2	-2.4	-2.1	-4.2	-8.1	-10.0	-9.1	-5.3	0.8	6.2	12.2	15.3	18.5	22.8	28.4	34.4	43.2	54.7	71.0
Profit Tax Paid, million $		0	-0.7	-0.7	-0.6	-1.3	-2.4	-3.0	-2.7	-1.6	0.3	1.9	3.6	4.6	5.5	6.8	8.5	10.3	13.0	16.4	21.3
Net Benefit After Financing and Taxes, million $		0.0	-1.6	-1.7	-1.5	-2.9	-5.7	-7.0	-6.4	-3.7	0.6	4.3	8.5	10.7	12.9	15.9	19.9	24.1	30.3	38.3	49.7
Add Back Depreciation, million $		0.0	0.7	2.8	4.8	6.2	10.5	15.2	17.2	17.7	15.1	12.8	10.9	9.3	7.9	6.7	5.7	4.8	4.1	3.5	3.0
Cash Flow Before Repayment of Principal, million $		-11.9	-20.7	0.8	3.1	2.7	4.1	7.8	10.4	14.0	15.7	17.1	19.4	20.0	20.8	22.6	25.6	28.9	34.4	41.8	52.7
Cash Flow After Repayment of Principal, million $		-11.9	-36.6	-15.2	-12.8	-13.2	-11.8	-8.1	-5.5	-1.9	-0.2	1.2	19.4	20.0	20.8	22.6	25.6	28.9	34.4	41.8	52.7
Cumulative Cash Flow, million $		-11.9	-48.5	-63.7	-76.5	-89.7	-101.5	-109.6	-115.1	-117.0	-117.2	-116.0	-96.6	-76.6	-55.8	-33.2	-7.6	21.3	55.7	97.5	150.1
Cumulative Discounted Cash Flow, million $		-10.4	-38.6	-48.9	-56.4	-63.3	-68.7	-71.9	-73.9	-74.4	-74.5	-74.2	-70.2	-66.5	-63.2	-60.0	-56.9	-53.8	-50.5	-47.1	-43.2
Discount Rate, %	14.0																				
NET PRESENT VALUE (NPV), million $		-43.2																			
INTERNAL RATE OF RETURN (IRR), %		6.5																			
DISCOUNTED PAYBACK PERIOD, years		none																			
SIMPLE PAYBACK, years		3.7																			

Table D.3-3. Financial Cash Flow Projection (Shebelinka-Kiev Pipeline Modernization) (Scenario 3) 20/0/80																	
Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Lifetime (2000-2015)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Cost of Equipment, million $		23.1	18.5														
Total Cost of Installation and Works, million $		6.9	5.5														
Total Capital Expenditures, million $		30.0	24.0														
Cumulative Capital Investments, million $		30.0	54.0														
Redistribution of Shares in Program Financing:																	
Adjusted Financing in Shebelinka-Kiev Project to Maintain Share for Entire Investment Program, million $	10.8																
Amount to be Redistributed to "Sojuz" and Urengoy-Uzhgorod & "Progress" Projects to Maintain Share for Entire Investment Program, million $	19.2																
Increase in Gross Fixed Assets, million $		30.0	24.0														
Net Fixed Assets, million $		30.0	49.5	42.1	35.8	30.4	25.8	22.0	18.7	15.9	13.5	11.5	9.7	8.3	7.0	6.0	5.1
Depreciation, million $		0.0	4.5	7.4	6.3	5.4	4.6	3.9	3.3	2.8	2.4	2.0	1.7	1.5	1.2	1.1	0.9
Financing:																	
Ukraine (Equity), million $		30.0															
PSI (Loan), million $			24.0														
Total Project Financing, million $		30.0	24.0														
Commitment, million $			24.0														
Repayment of Loan, million $			2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4					
Servicing of Finance:																	
Interest Payments, million $		0	3.7	3.4	3.0	2.6	2.2	1.9	1.5	1.1	0.7	0.4					
Unpaid Principal, million $		0	24.0	21.6	19.2	16.8	14.4	12.0	9.6	7.2	4.8	2.4					
Net Benefit After Financing, million $		0	-7.0	-8.8	-7.3	70.5	71.6	72.7	73.6	74.5	75.3	76.0	76.7	77.0	77.2	77.4	77.5
Profit Tax Paid, million $		0	-2.1	-2.6	-2.2	21.1	21.5	21.8	22.1	22.4	22.6	22.8	23.0	23.1	23.2	23.2	23.3
Net Benefit After Financing and Taxes, million $		0.1	-4.9	-6.2	-5.1	49.3	50.1	50.9	51.6	52.2	52.7	53.2	53.7	53.9	54.0	54.2	54.3
Add Back Depreciation, million $		0	4.5	7.4	6.3	5.4	4.6	3.9	3.3	2.8	2.4	2.0	1.7	1.5	1.2	1.1	0.9
Cash Flow Before Repayment of Principal, million $		-30.0	-0.4	1.3	1.2	54.7	54.7	54.8	54.8	55.0	55.1	55.3	55.4	55.3	55.3	55.2	55.2
Cash Flow After Repayment of Principal, million $		-30.0	-2.8	-1.1	-1.2	52.3	52.3	52.4	52.5	52.6	52.7	52.9	55.4	55.3	55.3	55.2	55.2
Cumulative Cash Flow, million $		-30.0	-32.7	-33.9	-35.1	17.2	69.5	121.9	174.3	226.9	279.6	332.4	387.9	443.2	498.5	553.7	608.9
Cumulative Discounted Cash Flow, million $		-26.3	-28.4	-29.2	-29.9	-2.7	21.1	42.0	60.4	76.6	90.8	103.3	114.8	124.9	133.7	141.4	148.2
Discount Rate, %	14																
NET PRESENT VALUE (NPV), million $		148.2															
INTERNAL RATE OF RETURN (IRR), %		48.6															
DISCOUNTED PAYBACK PERIOD, years		5.0															
SIMPLE PAYBACK, years		0.8															

Table D.3-4. Financial Cash Flow Projection of Investment Program

(Scenario 3) 20/0/80

Period #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Program Lifetime (2000-2019)		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Cost of Equipment, million $		33.9	53.8	46.0	58.4	75.4	54.8	24.6	18.5												
Total Cost of Installation and Building and Assembly Jobs, million $		7.4	10.7	5.7	8.0	12.1	9.2	1.8	1.3												
Product Upgrade, million $		11.0	19.3																		
Total Capital Expenditures, million $		52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8												
Cumulative Capital Investments, million $		52.3	136.0	187.8	254.2	341.6	405.6	432.0	451.8												
Increase in Gross Fixed Assets, million $		34.8	63.0	44.7	59.8	98.4	84.2	28.0	21.0												
Net Fixed Assets, million $		34.8	92.6	123.4	164.7	238.3	286.8	271.8	252.0	214.2	182.1	154.8	131.6	111.8	95.1	80.8	68.7	27.4	23.3	19.8	16.8
Depreciation, million $		0.0	5.2	13.9	18.5	24.7	35.7	43.0	40.8	37.8	32.1	27.3	23.2	19.7	16.8	14.3	12.1	4.8	4.1	3.5	3.0
Financing:																					
Ukraine (Equity), million $		52.3	21.7	2.8	3.9	4.4	2.4	0.5	0.4												
PSI (Loan), million $		0.0	62.0	49.0	62.4	83.1	61.6	25.9	19.4												
Total Project Financing, million $		52.3	83.7	51.8	66.4	87.5	64.0	26.4	19.8												
Commitment, million $		0	363.5	301.5	252.5	190.0	107.0	45.4	19.4												
Repayment of Loan, million $		0	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3									
Servicing of Finance:																					
Interest Payments, million $		0	9.7	11.6	15.7	23.0	26.9	25.3	22.7	17.0	11.3	5.7									
Unpaid Principal, million $		0	62.0	74.7	100.8	147.5	172.7	162.3	145.4	109.0	72.7	36.3									
Net Benefit After Financing, million $		0.1	-13.0	-17.5	-20.6	50.4	46.6	49.9	59.4	71.2	85.7	99.0	114.4	124.3	135.1	150.0	170.9	34.4	43.2	54.7	71.0
Profit Tax Paid, million $		0	-3.9	-5.3	-6.2	15.1	14.0	15.0	17.8	21.4	25.7	29.7	34.3	37.3	40.5	45.0	51.3	10.3	13.0	16.4	21.3
Net Benefit After Financing and Taxes, million $		0.1	-9.1	-12.3	-14.5	35.3	32.6	34.9	41.6	49.8	60.0	69.3	80.1	87.0	94.6	105.0	119.6	24.1	30.3	38.3	49.7
Add Back Depreciation, million $		0.0	5.2	13.9	18.5	24.7	35.7	43.0	40.8	37.8	32.1	27.3	23.2	19.7	16.8	14.3	12.1	4.8	4.1	3.5	3.0
Cash Flow Before Repayment of Principal, million $		-52.2	-25.6	-1.1	0.1	55.6	65.9	77.4	82.0	87.6	92.1	96.6	103.3	106.8	111.4	119.3	131.8	28.9	34.4	41.8	52.7
Cash Flow After Repayment of Principal, million $		-52.2	-61.9	-37.5	-36.2	19.3	29.6	41.1	45.6	51.3	55.8	60.3	103.3	106.8	111.4	119.3	131.8	28.9	34.4	41.8	52.7
Cumulative Cash Flow, million $		-52.2	-114.1	-151.6	-187.9	-168.6	-139.0	-97.9	-52.3	-1.0	54.8	115.1	218.4	325.2	436.5	555.8	687.5	28.9	63.3	105.1	157.7
Cumulative Discounted Cash Flow, million $		-45.8	-93.5	-118.8	-140.2	-130.2	-116.7	-100.3	-84.3	-68.5	-53.5	-39.2	-17.8	1.7	19.4	36.1	52.3	55.5	58.7	62.2	66.0
Discount Rate, %	14.0																				
NET PRESENT VALUE (NPV), million $		66.0																			
INTERNAL RATE OF RETURN (IRR), %		19.0																			
DISCOUNTED PAYBACK PERIOD, years		13.1																			
SIMPLE PAYBACK, years		1.9																			