

HIGHER GAS PRICES AND QUASI FISCAL DEFICITS IN THE GAS SECTOR

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1. Since January 2006, gas imports from Russia have been supplied under a new deal, which increased the price of imported gas to US\$95/tcm. The deal also provided for an increase in transit revenues from the transit of Russian gas from US\$1.09/tcm/100km to US\$1.60. In October 2006, a new gas import deal was signed, raising the price to US\$130/tcm while keeping transit fees constant.

2. The economic impact of this increase in gas prices has been the topic of much analysis. Researchers are hampered in their efforts by the lack of transparency in the energy sector, which means, for example, that estimates of the size of the increase implied by the January deal differ significantly. Information on the actual mix of domestic and imported gas in domestic consumption, as well as on re-exports of gas is also incomplete. The calculations presented in this note are thus approximate and based on a number of important assumptions.

3. Whilst many studies focused initially on the impact of higher gas prices on GDP growth², more recently attention has shifted to the effect higher prices and the pattern of domestic price adjustments may have on the financial conditions of domestic energy providers, municipal utilities and households. This note focuses on the impact of higher gas prices on quasi-fiscal deficits in the gas sector. It does not tackle second round effects on municipal utilities, which are faced with higher input prices whilst suffering from delayed output price adjustment and/or declining payment morale. It also does not look at the impact of higher gas prices on household incomes and income distribution, on which a parallel note is being prepared.

The structure of demand and production for gas in Ukraine: the situation up to this year

4. Table 1 shows the structure of demand for natural gas in Ukraine over the period 2001-2005. Around 45% of total consumption is accounted for by industry, whereas around one quarter is consumed by households and another 20% by utilities and budgetary institutions. Over 10 % of gas consumed in Ukraine is lost due to inefficiencies, but also due to technological needs such as pumping and pressure control. This is around twice the level of technical losses in Western Europe's transmission and distribution network and it reflects both technological depreciation of transportation and distribution assets and potential illicit sales.

5. Table 1 also reports the shares of domestic gas production and imports in making up total gas supply. Three quarters of gas supply in Ukraine is accounted for by imports

¹ This note was prepared by Martin Raiser and Ruslan Piontkivsky, with valuable inputs and suggestions from Dejan Ostojic, Dmytro Glazkov and Maria Gonzalez (IMF).

² See e.g. World Bank, IMF, Bleyzer Foundation, Institute for Economic Research, CASE and several investment banks.

and the remainder by domestic production.³ We also offer some rough estimates of gas re-exports obtained from the foreign trade statistics for the period 2003-2005 below. They account for less than 5% of domestic demand and hence do not materially affect the structure of consumption.

Table 1: Structure of Supply and Demand in Ukraine's Gas Market, bcm

	2001	2002	2003	2004	2005
Industry	32.17	30.90	34.48	35.02	34.83
Households	17.31	17.05	18.04	17.10	18.03
Municipal utilities	12.39	12.76	14.44	13.89	13.72
Budget Institutions	0.97	0.96	1.06	1.02	1.09
Production and technological losses of gas distribution companies	0.66	0.69	0.76	1.10	1.21
Production and technological needs	6.95	7.41	7.54	7.65	7.52
Total Consumption	70.45	69.76	76.32	75.78	76.40
Domestic Production	18.40	18.50	19.50	20.10	20.20
Import	52.10	51.30	56.82	55.68	56.20
Total Supply	70.50	69.80	76.32	75.78	76.40

Source: Naftogaz, SSC Ukraine

6. The structure of demand and supply matters for the calculation of quasi-fiscal deficits in the gas sector, because different types of consumers pay different prices for gas and because domestic costs of production differ from the cost of gas imports. Table 2 shows the prices paid by different types of consumers from 2001-2005. It is evident that even in previous years industrial consumers have paid higher tariffs than households or budget institutions and utilities. Tariffs for households, budget institutions and utilities were held constant in UAH at 185/tcm, 231 and 242 respectively, while industrial tariffs rose by around 25% over the 2001-2005 to UAH 472/tcm. At the bottom of Table 2, we also report the weighted average unit price of gas, based on the structure of demand given in Table 1.

Table 2: Prices for gas paid by different consumers (gross of VAT and distribution tariff), UAH/tcm

	2001	2002	2003	2004	2005
Industry	384	384	384	389	472
Households	185	185	185	185	185
Municipal utilities	242	242	242	242	242
Budget Institutions	231	231	231	231	231
Production and technological losses of gas distribution companies	0	0	0	0	0
Production and technological needs	0	0	0	0	0

³ There has been speculation that these numbers may not be fully representative of reality. Because of the large differences between domestic and international gas prices throughout the period of independence, incentives are large to illegally import or under declare domestically produced gas and ship these resources to Europe. It is however not possible to ascertain the extent to which this has been technically possible and under the control of the Ukrainian authorities or energy companies.

Average Prices, USD	49.6	49.3	49.9	50.6	59.6
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Source: Naftogas

7. To calculate quasi-fiscal deficits due to mispricing, we need to compare the average sales price calculated at the bottom of Table 2 with the average cost of gas supplied to Ukraine. This cost can be calculated in different ways. The first option is to use the actual cost of production, which is a weighted average of import costs and domestic production costs. We don't have good information on domestic production costs. Our baseline estimates use a constant US\$ 40/tcm price net of distribution costs. This is higher than the marginal cost of gas production in the west Urals, for instance, which ranges between US\$20/30/tcm, but would seem adequate given the age of the existing fields and the significant future investment needs required to maintain present production levels. In our simulations, we also examine the impact of allowing domestic production costs to increase from US\$40/tcm in 2003 to US\$59/tcm in 2007⁴. Domestic distribution costs in all cases are set at US\$ 6/tcm for 2003-2005, rising proportionally with the increase in average unit costs thereafter. VAT is 20% levied on imports and domestic sales alike. We do not account for the double VAT pass-through in place until 2006, since in theory (although unlikely in practice), the effect on financial results in the gas sector should be neutral.

8. The second option to estimate the economic cost of gas is to calculate an export parity price, i.e. the price at which Ukraine could in principle sell its gas in the European market. For Ukraine with a moderate domestic energy resource base and no market power in export markets, the optimal pricing strategy is to price at export parity prices: it can, at the margin, always increase its own revenues if it sells gas for export until domestic prices equal export parity levels.⁵ In practical terms, access to export transport capacity may be limited. Indeed, since we are interested in this paper in the impact that increases in import prices have on the financial situation in the gas sector, the simulations are most interesting with respect to unit costs, since these are affected by rising import prices, whereas export parity prices are not.

9. Table 3 makes it clear that Ukraine had by 2005 not raised domestic tariffs sufficiently to avoid quasi-fiscal deficits due to mispricing in the gas sector, whatever the reference price used. The deficits ranged between 1.1% of GDP and 9% depending on the reference price used.

⁴ These are the production cost estimates included in a recent report by Troika Dialog: "High Gas Prices: Motivating Efficiency", September 21, 2006

⁵ See Tarr and Thomson (2003) for an argument why this logic does not apply in Russia, which has market power and hence maximizes welfare by charging marginal costs to domestic consumers while setting price equal to marginal revenue in export markets.

Table 3: Quasi-fiscal deficits using different benchmarks 2003-2005

	2003	2004	2005
<i>Domestic production cost</i>	40	40	40
<i>Import cost</i>	62	62	62
VAT	12.4	12.4	12.4
<i>Distribution costs</i>	6	6	6
1. Unit Cost, USD	71.6	71.3	71.3
2. Export Parity Price, USD	99.9	120.2	157.7
Total losses in % GDP @ unit cost	-3.3%	-2.4%	-1.1%
Total losses in % GDP @ export parity	-7.6%	-8.1%	-9.0%

Source: Staff calculations

Estimating the impact of higher gas prices: base case assumptions

10. Using the basic tools presented in the previous section, we now estimate the impact of higher gas import prices on quasi-fiscal deficits in Ukraine's gas sector. To do this, we need to make a number of further assumptions. Because these assumptions are rather strong, we focus on a base case in this section and simulate the impact of varying key assumptions in the next section.

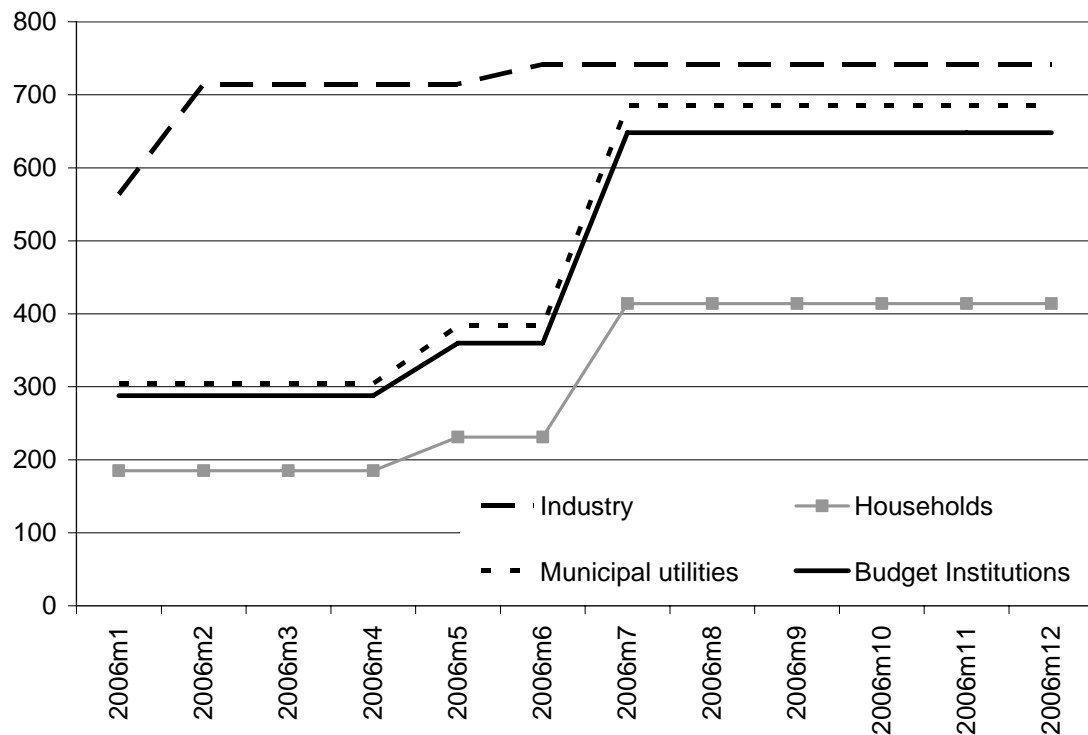
11. First, we assume import prices of US\$95 throughout 2006 and of US\$130 for 2007. This is a safe assumption based on the recent agreement between RosUkrEnergO and Naftogas. We also assume constant domestic production costs of US\$ 40/tcm in 2007. Moreover, we assume that the export parity price is set at US\$ 214/tcm for 2006 and US\$195/tcm for 2007, implying a significant increase from around US\$160 estimated as the export parity for 2005.⁶

12. Second, for 2006 we take actual prices for January through early November, assuming no further price rises since then (see Chart 1). Because of a lag in non-industrial price adjustments, average 2006 prices are below currently prevailing levels.⁷ For 2007, we assume full cost pass through to industrial consumers. In other words, estimated industrial sales margins of currently US\$ 19.8/tcm are assumed to be fully preserved. For non-industry, we assume no further price adjustment beyond current levels. The rationale for this assumption is to look at the impact such a delayed price adjustment would have on quasi-fiscal deficits in the gas sector.

⁶ Export parity prices are taken from IMF.

⁷ In one exercise which we do not report for reasons of space we show that in 2006 there was a rapid increase in quasi-fiscal deficits due to mispricing in the first half of the year, while this was more than compensated by price adjustments during the summer and fall.

Chart 1: Dynamics of natural gas price for different consumers in 2006, UAH/tcm



Source: NERC

13. Third, given the size of gas price increases, some efficiency improvements are likely to have occurred during 2006 and may further occur in 2007. With import price increases of an estimated 72% in 2006 and another 35% in 2007, and taking GDP growth of around 6.5% and 4.5% in 2006 and 2007 respectively into account, in the base case, we assume no increase in gas consumption in both years. This is conservative as it implies a price elasticity of less than 0.1 in both years. Indeed, it is likely that gas imports in 2006 will show a decline, which would be consistent with a price elasticity somewhat higher than 0.1.

14. Fourth, we take into account the nature of the January 2006 gas import deal in calculating quasi-fiscal deficits in the gas sector separately for industrial and non-industrial consumers. This is necessary, because under the gas import deal RosUkrEnergo sells its gas to a Joint Venture with Naftogaz, Ukrgasenergo, which in turn has a monopoly over supplies to domestic industrial consumers. What this effectively means is that Naftogaz has been excluded from the lucrative industrial consumer market.⁸ At the same time, the cost of gas sold by Ukrgasenergo is the essentially the import price, whereas Naftogaz sells a blend of imports and domestically produced gas. This means that there are different unit costs for sales to industry and to non-industry, as well as different sales prices.

⁸ The extent to which Ukrgasenergo's monopoly is complete is somewhat unclear (several large industrial corporations would appear to have their own vertically integrated gas supplies, and some – according to press reports 24 companies in total – have received licenses for direct gas imports from Russia).

15. Fifth, the base case considers the impact of deteriorating payments discipline in the non-industrial sector. In the base case, payment collection is set at 99% for industry (corresponding to 2005 actual), while non-industry collections decline on average to 85% in 2006 and 79% in 2007 (from 93% average in 2005). This is consistent with initial (unconfirmed) reports that payment discipline in sales to municipal utilities has deteriorated sharply in October and November 2006, since electricity and in particular heating tariffs have not yet been fully adjusted to reflect the higher cost of gas..

Table 4: Base Case Scenario

	2003	2004	2005	2006	2007
USD million					
Based on Unit Costs	-1838	-1745	-1017	-665	-1066
<i>Industry</i>	-339	-303	384	690	690
<i>Non-industry</i>	-1499	-1442	-1401	-1355	-1755
Based on Export Parity Prices	-4000	-5456	-7615	-9240	-5719
% GDP					
Based on Unit Costs	-3.7%	-2.7%	-1.2%	-0.6%	-0.9%
<i>Industry</i>	-0.7%	-0.5%	0.5%	0.7%	0.6%
<i>Non-industry</i>	-3.0%	-2.2%	-1.7%	-1.3%	-1.5%
Based on Export Parity Prices	-8.0%	-8.4%	-9.2%	-9.0%	-4.8%

Source: Staff calculations

16. The resulting calculations are shown in Table 4. The following main observations can be made:

- Quasi-fiscal deficits measured against unit costs and export parity prices are projected to decline in 2006 and 2007 relative to previous years. This is a consequence of the significant domestic price adjustment for households and budgetary institutions and utilities. The fall in the overall quasi-fiscal deficit is also a consequence of the full pass through of higher import prices to industrial consumers.
- Sales to industry are profitable and these profits even increase somewhat as a share of GDP in 2006 and 2007. This is because unit profits have increased to an average US\$19.8/tcm in 2006 from an average of US\$ 11 in 2005. Total profits from industrial sales are around US\$700 million in 2006 and 2007. This compares with US\$400 million in 2005.
- Non-industrial sales are loss-making, even using a blend of imported and domestically produced gas. While the size of domestic losses is highly contingent on the cost of domestic gas, the fact that domestic sales are loss-making is not. Even if domestic gas was produced free of charge, there would still be a unit loss of US\$ 5/tcm on average non-industrial sales under 100% payment collection because domestic production does not fully cover domestic consumption needs. Taking into account some deterioration in payments discipline, losses from sales to non-industrial consumers increase somewhat in 2007 from 2005 and 2006, but remain at levels comparable to 2003 and 2004. Payment collection would need to

be sharply lower to reverse the result of overall declining quasi-fiscal deficits as a share of GDP (see next section).

- Against international export parity prices, all domestic gas sales are loss making. However, even against this benchmark, there is a sharp decline in quasi fiscal deficits in 2007, as export parity prices are forecast to fall moderately, and as the higher US\$130/tcm import price is fully passed through to industrial consumers.

Alternative scenarios: production costs, efficiency improvements, pass-through to non-industrial consumers and payment arrears

17. We now proceed to examine the impact of changing several key assumptions in the base case. We focus this analysis on the quasi-fiscal deficits estimated with reference to average unit costs of gas only. The general pattern shown in the base case - quasi-fiscal deficits using export parity prices are larger initially and decline more steeply than using unit costs - holds for all of the simulations presented here. For ease of comparison and interpretation we show the impact of changing our basic assumptions by reporting the difference of the quasi-fiscal deficit relative to the base case in percent of GDP and in nominal US\$.

18. First, we look at the impact of assuming rising rather than constant domestic production costs. We use the following production costs: US\$40/tcm in 2003, US\$44 in 2004, US\$50 in 2005, US\$52 in 2006, US\$59 in 2007⁹. This is called “scenario 1” in Table 5 below.

19. Second, we show two scenarios with two different assumptions for efficiency improvements. In “scenario 2”, gas consumption declines by 5% in both years across the board. In “scenario 3”, gas consumption declines by 10% in industry, as industrial producers invest into efficiency improvements, while it remains constant in non-industry because of a lack of incentives to reduce demand due to lacking gas meters and difficulties to substitute out of existing technologies.

20. Third, we look at the impact of tariff pass-through in non-industry at the same rate as in industry (as compared to the current level of tariffs) in 2007. This implies keeping the ratio of industrial to non-industrial tariffs constant. This is “scenario 4”.

21. Fourth, we look at the impact of maintaining payment collection at the levels of 2005. Specifically, payment collection is set at 99% for industry and 93% average for non-industry in both 2006 and 2007.. This is “scenario 5”.

22. Fifth, we estimate the impact that a 5% exchange rate devaluation without corresponding pass-through to UAH tariffs (“scenario 6”). Because devaluation raises the UAH value of imported gas, if domestic tariffs are not correspondingly increased, losses will go up.

⁹ 2005-2007 numbers correspond to those provided by Troika Dialog in “High Gas Prices: Motivating Efficiency”, September 21. 2006.

23. All six scenarios are presented in Table 5 relative to the base case and in isolation from one another. It is of course plausible that certain scenarios are likely to occur simultaneously, such as lack of efficiency improvements in non-industry and rising payment arrears (reflecting political difficulties in enforcing the pass-through for instance). In “scenario 7”, we show the impact of a “worst case” outcome, in which production costs increase, the government decides to devalue by 5%, the assumption of no pass-through to non-industrial consumers is maintained, there are no efficiency gains in non-industry but 10% efficiency gains in industry and payment collection decreases to 80% (2006) and 70% (2007) in non-industry but stays at 99% in industry. As bad as it seems, this is not an unrealistic scenario. In this worst case, quasi-fiscal deficits would amount to US\$ 1.1 billion in 2006 and US\$ 2.2 billion in 2007. In per cent of GDP, this would still be below levels reached in 2003 and 2004, but it would represent a significant worsening relative to 2005 in both nominal and per cent of GDP terms.

Table 5: Quasi Fiscal Deficits in the Domestic Market of the Gas Sector: Scenario Analysis (relative to the base case)

Scenario	1	2	3	4	5	6	7
Year 2006							
Total, USD million	-240	111	-66	0	180	0	-436
<i>Industry</i>	1	-33	-68	0	0	0	-67
<i>non-industry</i>	-241	144	2	0	180	0	-369
Total, % GDP	-0.2%	0.1%	-0.1%	0.0%	0.2%	0.0%	-0.4%
<i>Industry</i>	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.1%
<i>non-industry</i>	-0.2%	0.1%	0.0%	0.0%	0.2%	0.0%	-0.4%
Year 2007							
Total, USD million	-384	343	-122	731	451	-433	-1181
<i>Industry</i>	0	-62	-127	0	0	-303	-374
<i>non-industry</i>	-384	405	6	731	451	-130	-808
Total, % GDP	-0.3%	0.3%	-0.1%	0.6%	0.4%	-0.4%	-1.1%
<i>Industry</i>	0.0%	-0.1%	-0.1%	0.0%	0.0%	-0.2%	-0.3%
<i>non-industry</i>	-0.3%	0.3%	0.0%	0.6%	0.4%	-0.2%	-0.8%

Source: Staff calculations

The consolidated impact on the state-owned part of the gas sector: taking into account transit revenues and segmented domestic gas sales

24. The final step in our analysis is to consolidate the calculations of quasi-fiscal deficits in the domestic market of the gas sector with estimates of the financial profits made by Naftogaz from gas transit as well as some re-exports of domestically produced and/or imported gas. In principle, there is no economic reason why profits from gas transit should be netted against losses made from domestic gas sales. However, since both transactions take place within the same state-owned company, the consolidation is of interest from a fiscal point of view.

25. First, we make the following assumptions concerning total gas transit and gas transit fees (Table 6). We distinguish between gas transit to Europe and gas transit to

other CIS countries which are remunerated at US\$ 1.6/tcm/100km as of January 2006 and US\$ 1.09/tcm/100km before 2006. Transit transportation costs are set at US\$ 9/tcm for 2003-2005, of which \$4 is a variable cost that increases proportionally with the growth of average unit costs thereafter.

Table 6: Gas Transit and Re-export Assumptions

	2003	2004	2005	2006	2007
Transit revenues					
BCM	129.3	132.4	130.7	130.7	133.3
to Europe	112.4	119.8	118.5	118.5	121.5
to CIS	16.9	12.6	12.2	12.2	11.8
rate, USD/100 km	1.09	1.09	1.09	1.6	1.6
average length to Europe	1157	1157	1157	1157	1157
average length to CIS	430	430	430	430	430
transportation cost	9	9	9	10.7	12.5
Transit profit, USD million	333.0	378.3	375.1	877.6	660.8
Gas re-export					
BCM	4.4	3.3	2.8	0	0
price difference	28.3	49.0	92.4	119.6	69.7
Gas export profit, USD million	125	162	259	0	0

Source: Naftogas, Annual Budget laws, Staff calculations.

26. Second, we allow for some limited re-exports of gas to contribute to Naftogaz profits in 2003-2005. We calculate the amount of re-exports from trade statistics where Ukraine shows some limited gas exports. The unit price for such exports is assumed to be the regional benchmark, or export parity price, as used in the quasi-fiscal deficit calculations. Naftogaz makes a unit profit, equivalent to the difference between this price and the cost of gas, given by the import and domestic blend. Gas re-exports are not allowed as per the terms of the January 2006 deal for 2006 and 2007.

27. Third, in line with the January 2006 agreement, we allow Naftogaz to obtain 50% of all profits made from industrial sales, as a result of its 50% stake in the JV Ukgasenergo with RosUkrEnergo. Naftogaz is also assumed to purchase all remaining imported gas from Ukgasenergo at the import price and deal exclusively with final sales to non-industry. This assumption may need to be revisited. Ukgasenergo has a take or pay contract with Rosukrenergo for 55bcm of gas in 2007. Based on current prices charged to municipal utilities, sales to these customers using imported gas are not profitable. It seems that Naftogaz expects a specific budgetary subsidy to cover these losses until municipal tariffs have been adjusted. Alternatively, Ukgasenergo might have to sell to municipal customers on its own account in line with its take or pay contract and assume the corresponding collection debts. Naftogaz in turn would use domestically produced gas to serve households and budget organizations and make a small profit on these sales. However, we do not consider the possibility of this domestic market segmentation further in this note.

28. Table 7 summarizes the consolidated quasi fiscal deficit of the state-owned part of the gas sector. We present both the base case and the worst case (“scenario 7”) from the

previous analysis for illustration purposes. We should note that these are very rough calculations and abstract from a lot of cost and profit items in Naftogaz's real financial result, such as profits (or losses) related to operating and maintaining the domestic gas distribution system, costs of financing outstanding foreign obligations, taxes, etc.. We should also note that these calculations in a sense represent a conservative case, since we assume fairly high domestic costs of gas production. On the other hand, we do assume that Naftogaz controls all domestic gas production, which is also not entirely correct. The result of independent domestic gas production is an increase in the average unit cost of Naftogaz gas, as the import share in the blend must increase.

29. As in our previous calculations, the consolidated quasi-fiscal deficit in the state-owned part of the gas sector declines both nominally and as a share of GDP in 2006 whilst increasing moderately in 2007. Indeed, in the base case the deficit is almost completely eliminated in 2006 as a result of both tariff increases and higher gas transit revenues. However, because profits from industrial sales do no longer accrue to Naftogaz as of 2006, losses increase in 2007 as import price increases are not passed through and collections decline per assumption. In the worst case, the consolidated quasi-fiscal gap nominally exceeds the levels of 2003 and 2004, although as a share of GDP it is only around half the size in these earlier years.

Table 7: Consolidated Quasi Fiscal Deficit of the State-owned Part of the Gas Sector

	2003	2004	2005	2006	2007
Base case					
USD million	-1380	-1205	-383	-133	-750
% GDP	-2.8%	-1.9%	-0.5%	-0.1%	-0.6%
Worst case (scenario 7)					
USD million	-1388	-1289	-609	-422	-1509
% GDP	-2.8%	-2.0%	-0.7%	-0.4%	-1.3%

Source: Staff calculations.

Conclusions and extensions

30. As this paper has shown, despite the recent increase in import prices for gas domestic gas price adjustments have been largely sufficient to prevent an increase in quasi-fiscal deficits in the gas sector. This is both because sales to industrial consumers are more profitable in 2006 than in previous years, and because prices charged to non-industrial consumers have been adjusted in such a way as to keep unit losses roughly constant. If no further price adjustment takes place in 2007 for non industrial consumers, the result will be an increase in losses from domestic non-industry sales by around US\$ 130 million. Assuming this is fully shouldered by Naftogaz, the increase in transit fees for Russian gas starting from 2006 would still be more than sufficient according to our estimates to fully offset this loss and keep Naftogaz financially better off than it was in 2005.

31. These results are obviously sensitive to alternative assumptions. The two most important ones relate to payment discipline and the cost of domestic gas production. In our worst case scenario (which we emphasize is nonetheless not unrealistic), quasi fiscal deficits in the domestic market increase by around US\$0.4 and US\$1.2 billion respectively in 2006 and 2007 and consolidated quasi fiscal deficit of the state-owned part of the gas sector worsens by around US\$ 0.3 and US\$ 0.8 billion. But even in this case, quasi-fiscal deficits would not exceed the levels reached in 2003 and 2004. This confirms that Ukraine has already undertaken the bulk of the price adjustment needed under the recently agreed import price. Unless payment discipline breaks down completely, this is an important step forward and the authorities should be commended for it.

32. Political pronouncements suggest that the current pricing structure may remain in place for some time. However, evidence of growing gas shortages in Russia itself and the resulting increase in the bargaining power of Central Asian gas suppliers may lead to further import price increases beyond 2007. Ukraine's position as a key transit country means that its energy security is bound together with Russia's gas export interests. This has allowed Ukraine to secure lower gas import prices than eastern European countries for many years. In the long run, Ukraine will be far better off if it decides to collect the implicit large transit rents directly in cash and invests it where returns are highest, rather than distributing it through non-economic pricing widely across the entire economy. In 2006 and 2007, it seems Ukraine has taken an important step in this direction.