

**German Advisory Group**  
**Institute for Economic Research and Policy Consulting**

Technical Note [TN/02/2015]

## **Accounting for gas distribution losses**

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## Accounting for gas distribution losses

### Executive Summary

In 2014 about 2.6% of the gas – worth about USD 250 m – was lost in Ukraine’s gas distribution networks. This order of magnitude is on par with losses in other east European countries. In Ukraine losses are unevenly distributed across the country. In some oblasts, distribution losses exceed 6% while in Kyiv they are reported to be close to zero. As the revenues of the regional distribution companies are regulated to reflect their cost, distribution companies’ revenues depend on which losses are accepted by the regulator as cost.

The current methodology involves three steps – (1) a rather imprecise quantitative methodology, (2) *ad hoc* adjustments by the ministry and (3) *ad hoc* adjustments by the regulator. We suggest two improvements:

First, in the medium term (2-5 years) Ukraine should move to a system of incentive-based distribution tariffs. This would provide the gas distribution companies with incentives to invest into reducing losses to the most sensible level. Before this can be introduced, there are a number of more urgent reforms that should be prioritised by policy-makers and regulators.

Second, in the short-term (within the next two years) the methodology to calculate losses should move to a transparent benchmarking system. This will require that the regulator collects up-to-date structural data (e.g., network length or size of consumer categories) from the distribution companies. Based on historic losses and the relevant structural data the regulator can deduce an allowed level of reasonable losses. The methodology should be made transparent and any necessary *ad hoc* adjustment should be published and clearly justified. We suggest a benchmark approach using the well-established frontier analysis methodologies for determining the allowed losses (calibration is beyond the scope of the paper and unfeasible with publicly available data).

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## 1. Introduction

Gas distribution networks deliver gas from the supplier to the final consumer. They are natural monopolies and are historically regulated to prevent abuse of their market position and charging unreasonably high prices. One of the factors that affect the final users' gas tariff is the treatment of gas losses in the distribution system.

The networks can suffer from gas losses during operation thus lowering their efficiency and increasing costs of operation. Losses can occur due to multiple reasons: pipe leaks, equipment damage, measurement errors, stolen gas and accounting errors. Some gas may also be required for technical maintenance. Gas distribution networks with high losses may not only increase costs for consumers, but may also pose safety concerns if excessive pipe leaks are present.

These losses and other costs not related to immediate consumption must be covered by someone – typically network operator or consumers. However, the government has interest in regulating the amount of network losses to ensure the efficiency of the system and to protect the consumers from fully carrying the cost of losses. Still the government has to ensure that the distribution companies can earn a proper return on investment.

Typically, network operators are allowed either to fully recover all losses or a predefined “reasonable” amount. Identifying the “reasonable” amount for losses and/or setting up a system that encourages efficiency of distribution systems is a major task for regulators. Different countries have various systems to regulate the losses and reimburse companies for investment.

## 2. Ukraine's Approach

### 2.1 Overview

Ukraine's gas distribution networks operate at the average loss rate of about 2.6% in 2014<sup>1</sup>. Given that the market value of the natural gas consumed by Ukraine in 2014 was about USD 9.5 bn<sup>2</sup>, the cost of these losses for Ukraine was about USD 250 m in 2014.

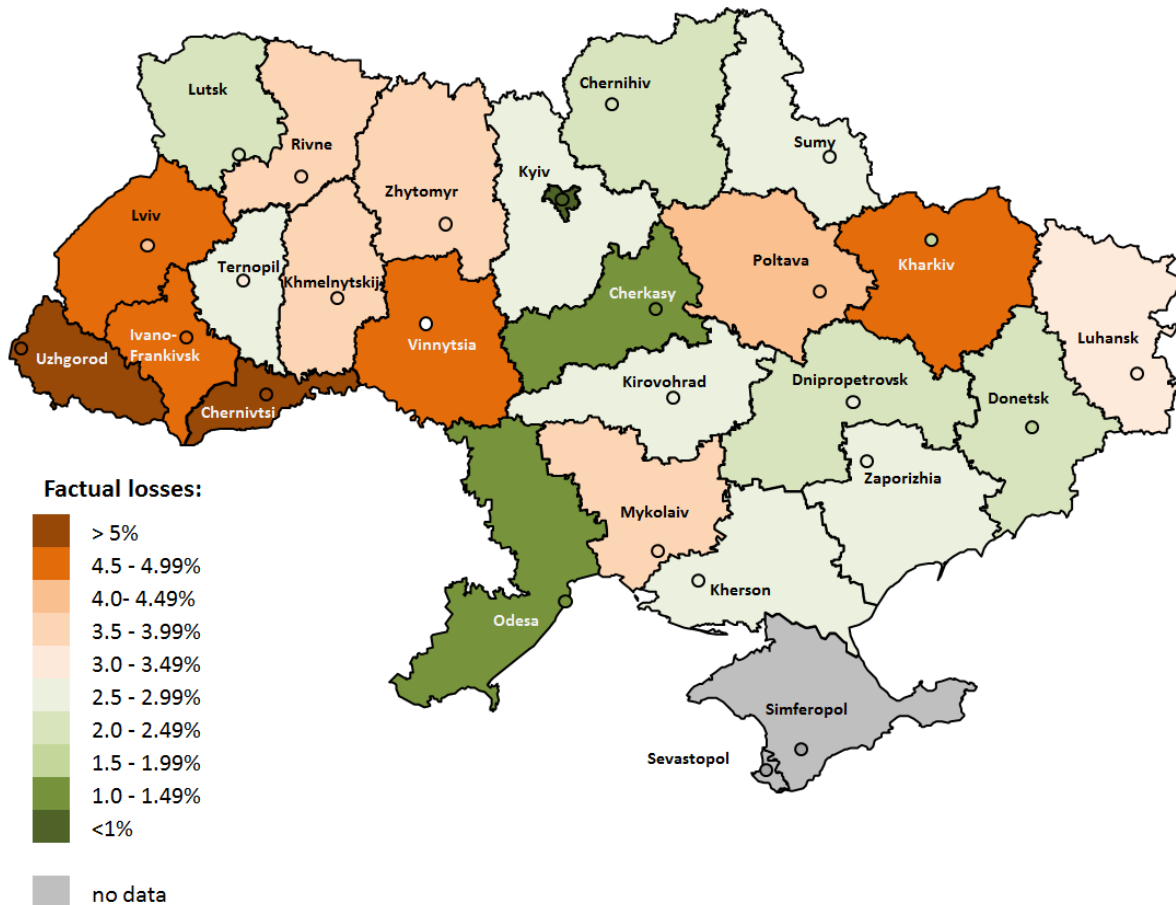
However, the share of losses varies greatly across the oblasts and network operators. Out of Ukraine's 40 regional operators, one quarter reported losses below 2% and one quarter reported losses of over 4%. Kyiv network reported the lowest losses at 0.1% and Zakarpattya, Tysmenytsia and Chernivtsi reported very large losses at over 6%. As the most inefficient operators are generally small, their losses are not very high in absolute amounts.

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<sup>1</sup> Losses are reported by the distribution companies to the regulator. We have no means to verify these values and note that incentives to, either, under-report (to demonstrate good performance) or over-report (to seek higher compensation for losses from tariffs) might exist. However the regulators watch out for extreme deviations of losses volumes.

<sup>2</sup> UkrStat

**Figure 1**  
Reported gas losses of Ukrainian distribution networks in 2014



Source: NERCU

In contrast to other countries, a large share of the distribution network losses is caused by accounting differences which result from the lack of metering. Still 29% of households consuming gas have no gas meters installed (89% of them use gas only for cooking, 9% for cooking and water heating and only 2% for room heating). The penetration of meters strongly differs between regions. In Kiev, only 16% of the households have a gas meter – which is partly due to the fact that there is almost no gas-heating (all distributed heating) and that only 8% of the 666,000 Kiev households that use gas for cooking have meters. By contrast, in Zakarpattia 98% of the households have meters.

Before 2014 norms for unmetered consumption were rather high (6 to 9.8 cubic meters for 1 month/person for a cooking stove<sup>3</sup>). As this might have exceeded the actual use significantly, distribution companies with low penetration of meters were able to report fantastically low losses. After the norms have been drastically reduced (to 3 cubic meters for 1 month/person for a cooking stove) this picture might have shifted, and distribution companies might actually lose on unmetered consumption.

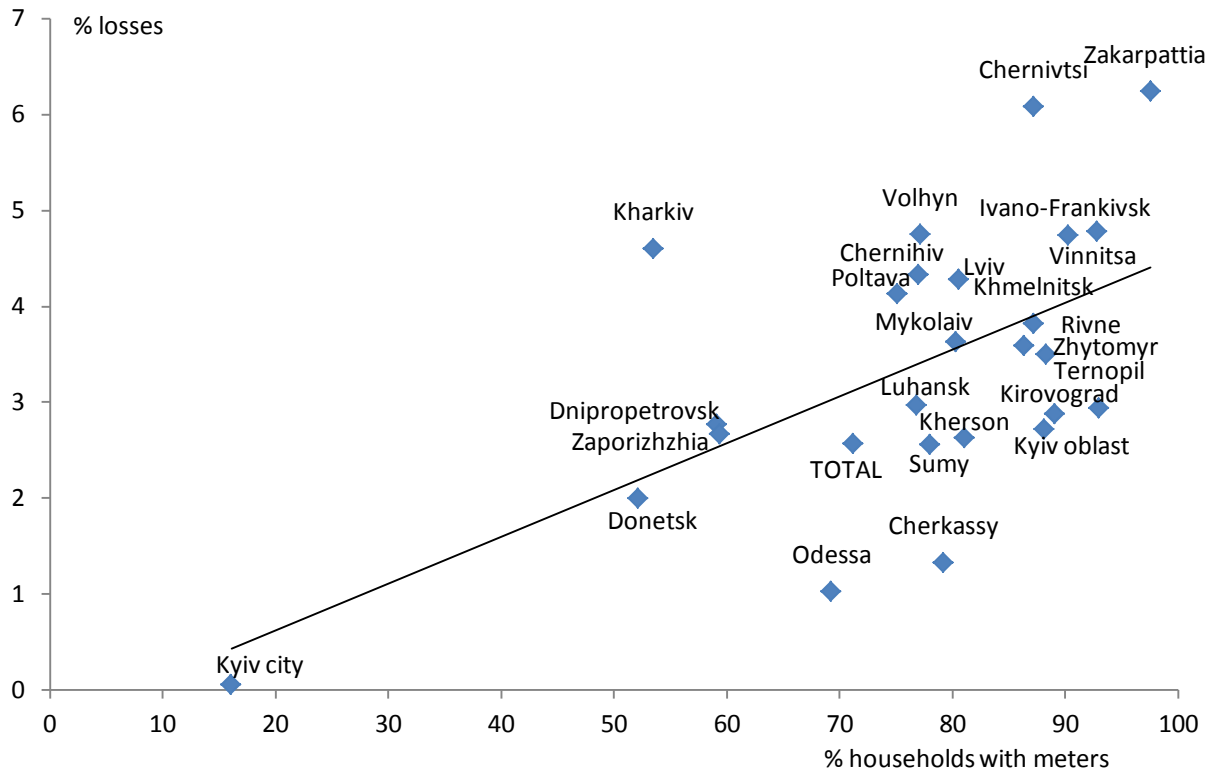
For the past, the relationship is illustrated by Figure 2. The top graph indicates that losses are highest for regions with high penetration of meters. The bottom graph indicates that losses in regions with the highest network length are highest. The two together explain 34% of the network losses<sup>4</sup>.

<sup>3</sup> <http://104.ua/ua/gas/id/skilki-lichilnikiv-gazu-vstanovleno-v-ukrajini-12550>

<sup>4</sup> The explanatory power of network length might be even higher, if more reliable network length data becomes available.

**Figure 2**

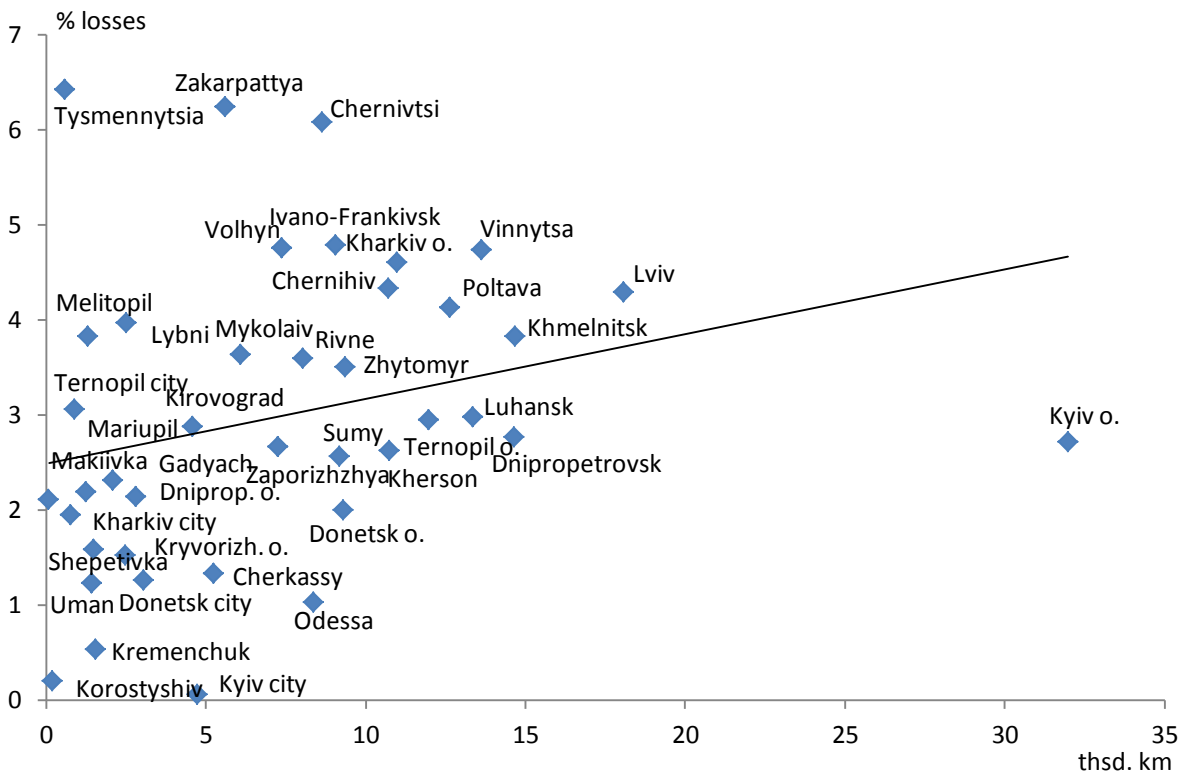
Reported gas distribution losses in 2014 vs. penetration of metering, by oblast



Source: Own calculations

**Figure 3**

Reported gas distribution losses in 2014 vs. network length, by distribution company (oblgaz)



Source: Own calculations

## 2.2 Current regulation of losses

Ukraine predefines the volume of gas losses that are allowed to be recovered from the tariff paid by consumers. The levels of losses vary across the regions and are set individually for each one. The procedure to define the losses for the distribution networks requires three steps.

First, the network operators submit a proposal to the Ministry of Energy for planned losses in the following period (one year). The expected losses are calculated as a function of technical parameters of the network equipment including length and diameter of the pipes, their age, type of measuring equipment and its location (living apartment vs. public building) etc. The norms for expected gas losses for each piece of equipment are set by the Ministry of Energy on the basis of Ukraine's construction norms and were developed using GOST technical standards for gas equipment.

However, the numbers based on the current methodology are not representative of the actual losses – on average the calculated losses are about 70% above the actual losses! In 2014 only for two operators the actual losses exceeded the calculated losses, while for seven operators the calculated losses exceeded the actual losses by more than 150%.

The calculated losses are evaluated by the Ministry and in most cases significantly downward-adjusted. On average the revised volumes are 46% lower than the initially submitted calculated losses. They are much closer to the actual losses; however the methodology for setting them is not entirely transparent. While adjusting the volumes the Ministry takes into consideration the current gas balance and actual losses in previous years, but a clear documented official procedure does not exist.

In the last step of the procedure, planned volumes of gas losses are evaluated by the National Energy and Utilities Regulation Commission (NERCU) and the tariffs are confirmed with the consideration of the set losses. In most of the cases, the projected losses are not changed significantly by NERCU, but rarely can be adjusted downward.

On average the losses confirmed in the tariff were about 11% lower than the actual losses; however the differences can be quite large for individual operators. For eight operators the actual losses were more than 30% higher than the confirmed ones. In such cases the companies have to cover the extra losses out of their own budget.

## 2.3 Problems with the approach

There are several problems with the current approach.

First, the setting of the tariffs is an overly complex procedure which requires three steps. The technical methodology has little predictive power and is generally disregarded in later stages. Two evaluation procedures by the Ministry and NERCU arrive at the same conclusion in the majority of the cases.

The second concern with the procedure is that it lacks transparency. While the methodology for losses forecast is very clear, it is completely disregarded in the next step. Both, the Ministry and NERCU set the volumes following a "rule-of-thumb" on the basis of historic data and current gas balance. While the approved volumes for losses are ultimately published on the website of the Ministry, no description of the procedure is disclosed to the public.

Finally, the actions of NERCU seem not to be bound by any methodology and the set volumes can be changed *ad hoc*. This practice may increase uncertainty among the operators and discourage investment in infrastructure.



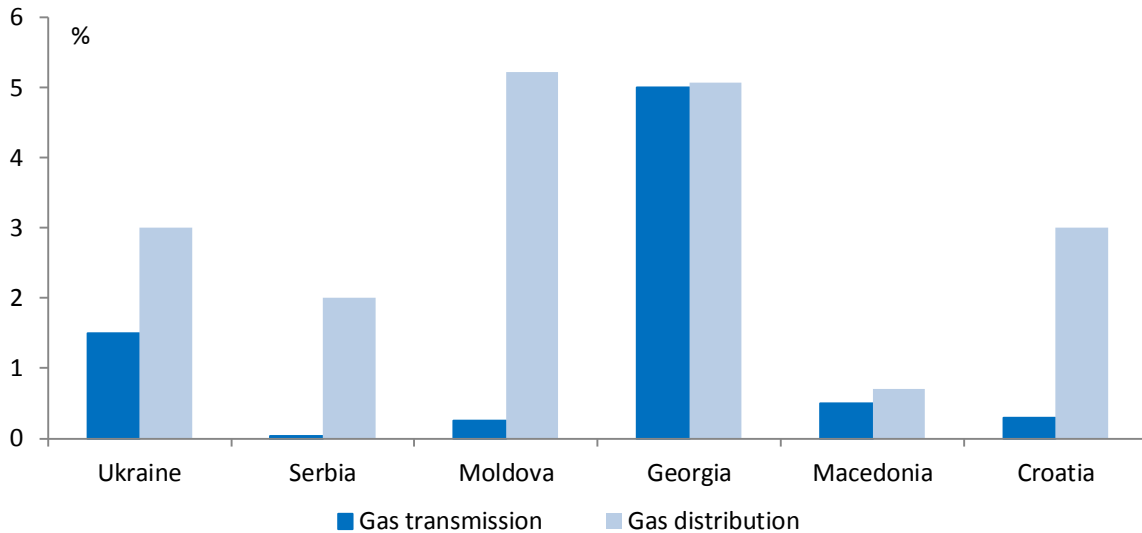
### 3. International experiences

#### 3.1 Ukraine in international comparison

While Ukraine operates somewhat older equipment its gas losses of 2.6% are not far from the international average. It is on par with other countries in Eastern Europe and somewhat higher than the average losses in the EU.

**Figure 4**

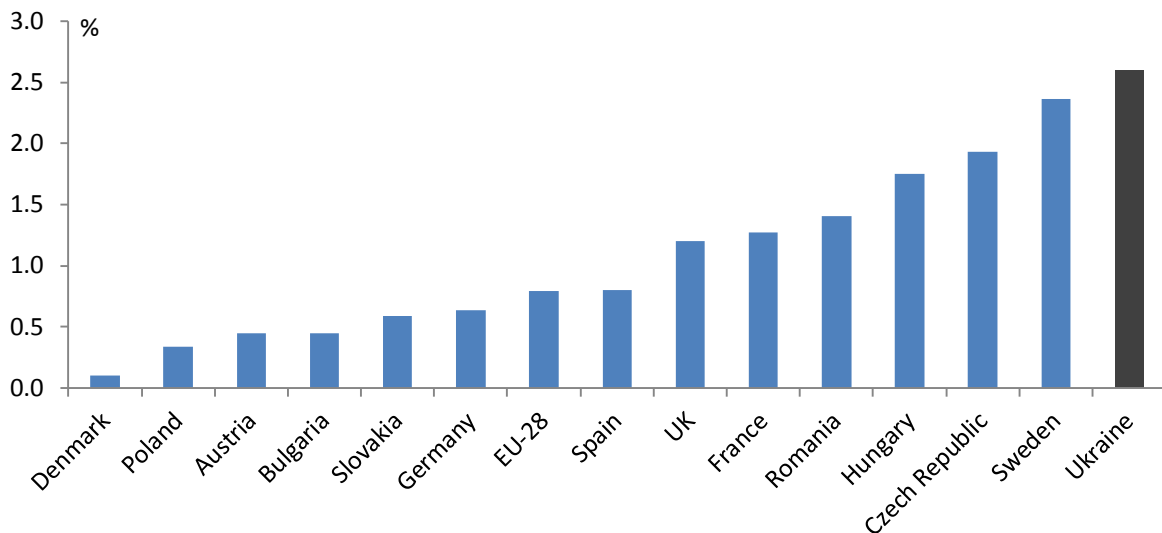
Allowed losses in gas networks



Source: ECRB (2013). Status Review of Main Criteria for Allowed Revenue Determination

**Figure 5**

Actual gas losses in Western Europe



Source: Eurostat

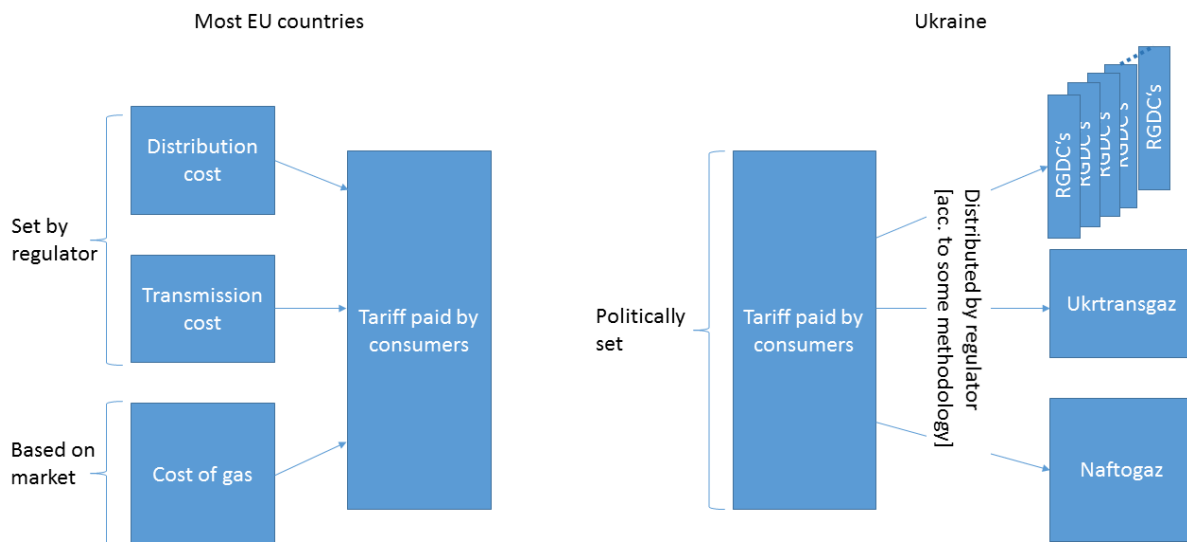
### 3.2 General pricing strategies

There is a major difference between Ukraine and, for example, Germany in how final user gas tariffs are determined. In Germany (and many other EU markets) the final user gas tariff is not regulated, but composed of a regulated and an unregulated component. The regulated component - the revenue of gas transmission and distribution companies - is set by the regulator to ensure continuity and quality of service while allowing financing of current and future activities. The unregulated component – the price of the gas – is determined by the market that features competing suppliers.

In Ukraine, the regulator faces the challenge that the final user tariff is politically set at a level below the actual cost<sup>5</sup>. So the regulator can only distribute the insufficient tariff revenues between the individual regional gas distribution companies, Ukrtransgaz and Naftogaz. If, for example, transmission and distribution obtain a larger share of the tariff revenues, the production side receives less.

These differences also translate into the approach of determining the distribution network tariff. Ukraine follows a cost-based approach. The regulator estimates the cost of each regional distribution company, which is in turn compensated through the tariffs. To discourage wastage, the calculation is not based on actual cost, but on a methodology to identify reasonable cost. Germany, by contrast, follows an incentive-based approach. The guaranteed revenue that a gas distribution company receives is established by comparing distribution companies among each other (taking into account differences in their characteristics). This proxy-competition is called benchmarking. The revenue cap is reduced by a certain percentage every year, to encourage increasing efficiency. If companies improve efficiency even further, they can make higher profits as they can keep this efficiency gain.

**Figure 6**  
Tariff composition in the EU and Ukraine



Source: own scheme

Note: RGDC=regional gas distribution company

<sup>5</sup> <http://en.interfax.com.ua/news/economic/268268.html>

### 3.3 Approaches to losses estimation in other countries

The above-discussed difference between cost-plus and incentive regulation translates into a different treatment of losses. Under incentive regulation, losses are only a problem of the distribution company. The regulated tariff is not adjusted for losses, so higher gas losses mean higher cost and hence lower returns for the company. Under cost-plus regulation, losses need to be somewhat considered as acceptable cost by the regulator. Otherwise this might impair the financial health of distribution companies.

The treatment of losses varies across the countries. Almost universally the network losses are allowed to be included in the cost<sup>6</sup>. However, the definition of allowed network losses may vary – some regulators allow for commercial losses (e.g. incorrect meter readings, consumption without a meter etc.) to be included, others allow only technical losses. Apart from the definition, regulators may also specify at what price the gas for losses may be recovered in case of price controls or fluctuating gas prices.

In the *United States*<sup>7</sup> the local and state regulators differ in their practices, but the most common approach is to set a cap for lost and unaccounted-for gas. The maximum allowed losses vary from 1.41% (Atlanta) to 5% (Texas) per year or in some cases maximum cap on longer period rolling averages. In case of losses reaching the limit the regulators may choose either economic means to punish the network operator or launch an investigation into its operations.

Another approach is benchmarking for losses. Here, the regulator compares the losses of different distribution companies controlling for uncontrollable structural factors (network length, share of different consumer groups, consumer density etc.). Based on that, a fair level of losses can be established for each distribution company<sup>8</sup>. By contrast, in *Spain* and *Romania*<sup>9</sup>, for example, network losses are the same for each distribution company.

Other examples<sup>10</sup>: In *Bosnia* the decision on allowed losses is made based on the analysis of actual losses, several benchmarks and condition of the network and the losses may be recouped at the procurement price. *Croatia* sets the allowed losses for transmission at the fixed level of 0.3% and for distribution – at 3%, but allows for upward adjustment in certain cases, while the recouping price is subject to regulation based on actual tariffs. In *Serbia* the decisions are based on the basis of the actual losses of the previous 3 years while accounting for condition of the network and benchmarks; the prices for losses are set as a weighted average of the recent purchase prices.

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<sup>6</sup> One exception is Hungary that does not accept distribution losses. See:

[https://www.eon.com/content/dam/eon.com/Investoren/Special\\_Topics/20140128\\_Distribution\\_Deep\\_Dive.pdf](https://www.eon.com/content/dam/eon.com/Investoren/Special_Topics/20140128_Distribution_Deep_Dive.pdf)

<sup>7</sup> <http://www.narucmeetings.org/Presentations/Presentation-on-LAUF-Gas%20-NARUC-Gas-Subcommittee-November-17-2013-Costello.pdf>

<sup>8</sup> Simplified example: There are three Distribution companies A, B and C. A has a network length of 10, B of 20 and C of 30 km. The losses are 1%, 3% and 3%. A simplified benchmarking model would predict that the allowed losses are: 1%, 2% and 3%. Hence, 1% of the losses of B will not be compensated, as they appear avoidable.

<sup>9</sup> The Romanian regulator accepts distribution losses of 4%: [https://www.eon.com/content/dam/eon-com/Investoren/Special\\_Topics/20140128\\_Distribution\\_Deep\\_Dive.pdf](https://www.eon.com/content/dam/eon-com/Investoren/Special_Topics/20140128_Distribution_Deep_Dive.pdf).

<sup>10</sup> <https://www.energy-community.org/pls/portal/docs/2768183.PDF>

### 3.4 Policy suggestions for Ukraine

In the medium term (next 2-5 years) Ukraine should move to some form of incentive-based regulation for its gas distribution companies as this improves investment and operation signals and reduces cost to customers<sup>11</sup>. In the current situation, such a step-change might be premature as the administrative capacity of the regulator and policy-makers is absorbed by more urgent tasks (new gas law, network codes, reform of Naftogaz etc.). In addition, we have to acknowledge that the ownership and business-model of the gas distribution companies is currently in flux<sup>12</sup>. And the current structure of the gas distribution companies would make the successful implementation of an incentive regulation system in Ukraine difficult. One important pillar of incentive regulation is a transparent proxy-competition for the best performance between gas distribution companies. But as long as most distribution companies belong to a single holding (the largest player currently holds 70% of the distribution business), it is hard to see how a functioning proxy-competition between them could be set up that incentivises them to cut cost and improve services. But until the necessary structural changes are implemented a transparent cost plus regulation appears to be the most robust way for regulating gas distribution tariffs. Having said that, the option to move to an incentive-based regulation for gas distribution companies should be actively kept open. Corresponding investments in data and methodology will be no-regret.

In the short term, accounting for losses should be made more transparent. Ukraine already did a first important step in this direction by reducing the norms for unmetered consumption and hence providing an incentive for gas distribution companies to install metering for all consumers. In addition, Ukraine should improve the regulators insights into the structural features of the individual gas distribution companies (such as network length, customer structure etc.). Such data will also be an essential precondition for moving to an incentive regulation framework at a later stage.

This data shall be truthfully provided by the gas distribution companies and the regulator shall conduct consistency checks. Failure to report or misreporting shall be sanctioned by the regulator, for example, by allowing the regulator to cut the allowed losses *ex post*. Based on an up-to-date account of the structural features and historic losses data, a benchmark<sup>13</sup> for allowed losses for each individual company should be developed. The corresponding methodology should be made fully transparent.

Should factors that cannot be properly controlled in the methodology (e.g., one time force-majeure events) make it advisable to revise the allowed losses for individual companies, the corresponding adjustment should be published and individually justified.

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<sup>11</sup> In Germany, incentive regulation allowed controlling the tariff level without reducing investments: [https://www.diw.de/documents/publikationen/73/diw\\_01.c.496372.de/diw\\_econ\\_bull\\_2015-06-3.pdf](https://www.diw.de/documents/publikationen/73/diw_01.c.496372.de/diw_econ_bull_2015-06-3.pdf)

<sup>12</sup> Currently, there is a highly politicized debate over the obligations of gas distribution companies vis-à-vis the state that will impact the whole structure of the sector. On the one hand, Prime Minister Yatsenyuk argued that distribution companies must pay rents for the distribution network (<http://www.kyivpost.com/content/ukraine/yatsenyuk-insists-on-obligatory-rent-rate-payments-for-gas-pipelines-by-firtashliovochkins-companies-385678.html>) on the other hand he wants to force them to install metering in 1.5 m households <http://www.kyivpost.com/content/kyiv-post-plus/andriy-andrushkiv-ukraines-politicians-stall-reforms-in-bid-to-reshuffle-a-corrupt-system-390321.html>.

<sup>13</sup> It should be noted that benchmarking companies against each other works only if they cannot collude or cooperate, i.e. healthy competition is present. If this is not the case foreign companies can be used as a benchmark.

#### **4. Conclusion**

The practice of allowing “reasonable losses” is universal in cost-plus regulation regimes and makes sense – compensating all actual losses incentivises wastage of resources and punishes the consumers who most likely carry the cost. Currently Ukraine’s methodology is complicated and non-transparent. While the losses of Ukraine’s network operators are still comparable with international levels, it is unclear if the current system encourages minimization of network losses. In its current state Ukraine could benefit from updating its methodology and increasing transparency in setting the maximum losses cap. This will require improving the regulators’ information on structural factors of individual networks.

## Annex

**Table 1**

Gas losses in Ukraine approved by different authorities in 2014

	% losses allowed by the Ministry to losses planned according to methodology	% losses allowed in tariffs to losses ordered by the Ministry	% reported losses to losses allowed in tariffs	% reported losses to total volume of distribution
Vynnitsagaz	43%	100%	127%	4.7%
Volyngaz	58%	100%	110%	4.8%
Gadyachgaz	36%	100%	81%	2.2%
Dniprogaz	40%	100%	251%	2.1%
Dnipropetrovskgaz	65%	100%	111%	2.8%
Donetskmiskgaz	79%	57%	101%	1.6%
Donetskoblغاز	61%	86%	141%	2.0%
Zhitomyrgaz	42%	100%	134%	3.5%
Zakarpagaz	69%	100%	105%	6.2%
Zaporizhgaz	46%	100%	142%	2.7%
Ivano-Frankivskgaz	56%	100%	103%	4.8%
Kyivgaz	11%	74%	130%	0.1%
Kyivoblغاز	52%	100%	112%	2.7%
Kirovogradgaz	70%	100%	89%	2.9%
Korostyshivgaz	13%	100%	46%	0.2%
Kremenchukgaz	71%	100%	100%	0.5%
Kryvorizhgaz	76%	100%	129%	1.3%
Lybnigaz	66%	87%	102%	4.0%
Luhanskgaz	66%	100%	67%	3.0%
Lvivgaz	73%	100%	102%	4.3%
Makiivkagaz	100%	74%	89%	1.9%
Mariupilgaz	53%	52%	198%	2.3%
Melitopilgaz	57%	100%	91%	3.8%
Mykolaivgaz	71%	100%	110%	3.6%
Odessagaz	39%	100%	95%	1.0%
Poltavagaz	64%	100%	100%	4.1%
Rivnegaz	44%	100%	123%	3.6%
Symigaz	67%	100%	102%	2.6%
Ternopilgaz	44%	96%	88%	2.9%
Ternopilmiskgaz	76%	99%	148%	3.1%
Tysmennitsagaz	51%	100%	137%	6.4%
Umangaz	58%	100%	103%	1.2%
Kharkivgaz	58%	98%	117%	4.6%
Kharkivmiskgaz	82%	100%	177%	1.5%
Khersongaz	40%	100%	100%	2.6%
Khmelnytskgaz	40%	100%	121%	3.8%
Cherkassygaz	49%	100%	100%	1.3%
Chernivtsigaz	51%	100%	119%	6.1%
Chernihivgaz	51%	100%	117%	4.3%
Shepetivkagaz	36%	100%	100%	2.1%
<b>TOTAL</b>	<b>56%</b>	<b>98%</b>	<b>111%</b>	<b>2.6%</b>

Source: National Energy and Utilities Regulation Commission (NERCU)

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