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# IMPROVEMENT OF EFFICIENCY OF GAS DISTRIBUTION SECTOR IN THE REPUBLIC OF SERBIA: SOME RECOMMENDATIONS*

## Unapređenje efikasnosti sektora distribucije gasa u Republici Srbiji - neke preporuke

## Abstract

This paper aims to investigate the possibilities for improvement of efficiency of the natural gas distribution sector in the light of supporting the competitiveness of the domestic companies. The gas distribution network operated by distribution system operators (DSOs) is an important link of the value chain in delivering natural gas to industrial consumers and households. DSOs are in a position of natural monopoly that is economically and socially acceptable. Because of their importance for the competitiveness of national economy, we analyzed their technical efficiency and financial condition. We found that many of those companies have a low level of technical efficiency and ruined financial health and investment potency. Several possibilities for improving this performance were analysed, and as the most viable seemed to be mergers of these companies into a fewer number of DSOs. The main DSO-specific sources of value that could be activated through merger transactions were identified and analysed in depth. The process of mergers should be initiated by government, and its implementation should be supported by local authorities if they founded the DSO.

**Key words:** *gas distribution, technical efficiency, consolidation, mergers, economies of scale, DEA*

## Sažetak

Cilj ovog rada je istraživanje mogućnosti za unapređenje efikasnosti sektora distribucije prirodnog gasa u svrhu podsticanja konkurentosti domaćih preduzeća. Gasna distributivna mreža, kojom upravljaju operatori distributivnog sistema (ODS), predstavlja važnu kariku u lancu vrednosti u isporuci prirodnog gasa industrijskim potrošačima i domaćinstvima. Operatori su u poziciji prirodnog monopola koji je prihvatljiv sa ekonomskog i društvenog stanovišta. Zbog njihove važnosti za konkurentnost nacionalne ekonomije analizirali smo njihovu tehničku efikasnost i finansijsku situaciju. Pronašli smo da su mnoga od ovih preduzeća slabe tehničke efikasnosti i narušenog finansijskog zdravlja i investicione potentnosti. Analizirano je nekoliko mogućnosti za unapređenje ovih performansi i kao najodrživija odabrana opcija spajanja tih preduzeća u manji broj ODS. Identifikovani su i detaljno analizirani za ODS specifični izvori vrednosti koji bi se mogli aktivirati u transakcijama spajanja. Proces spajanja treba da bude iniciran od strane nacionalne vlade, ali i podržan u implementaciji od lokalne samouprave ukoliko je lokalna samouprava osnivač.

**Ključne reči:** *distribucija gasa, tehnička efikasnost, konsolidacija, merdžeri, ekonomija obima, DEA*

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## Introduction

In order to improve competitiveness of domestic companies it is important to ensure a secure energy supply at an affordable price. Natural gas is an important energy source in Serbian economy; in the structure of total final energy consumption in 2015, gas accounted for 14%, and the industrial buyers accounted for 71% of the total gas consumption (1.19 billion $m^3$, which is an increase by 10% compared to 2014) [19]. Gas is also an important raw material for some companies. Finally, safe and convenient gas supply is also important for households. In this paper, we directly deal with the sector of natural gas distribution.

Gas distribution companies, i.e. distribution system operators - DSOs have the responsibility to ensure safe and reliable delivery of natural gas to end-users and to maintain the distribution networks. Gas distribution is considered to be a "natural monopoly", meaning that in the specific geographic area one DSO can generate a desired output at a lower social cost than two or more DSOs because of high fixed costs and economies of scale. Including one more customer on the network will increase a DSO's revenues, and lower the average cost for customers. Consequently, larger firm serves a customer base more efficiently. Additionally, DSO can plan investment in the long run. However, monopolies are in constant position to exploit their advantage at the expense of their customers. Because of that threat, regulations are needed. The gas distribution prices (tariffs) are regulated by the national regulatory authorities, who define or approve the level of tariffs (and/or profits) that DSOs are allowed to remunerate. DSOs should be allowed to have a sufficient rate of return to recover the investment in gas network and related operational costs.

Currently DSOs in Serbia are not in a favourable position, neither with respect to their technical efficiency nor in terms of their financial sustainability. For the purpose of helping enhancement of comparative advantage of national economy, the gas distribution sector should pass through consolidation and efficiency improvement.

In order to recommend appropriate strategic changes of the gas distribution sector, first of all, we have to describe a problem, and then to review the current situation. We chose to analyse the sector in terms of technical efficiency of DSOs as well as through analysis of their financial condition, e.g. financial health and investment potency. Rising technical efficiency and strengthening the financial health could be achieved through merging processes. Those processes would lead to cost savings, strategic alignment, savings in capital expenditures, financial synergies, and control gains. The final result would be lower distribution tariffs and consequently lower energy costs for domestic industry, and stronger competitiveness of the national economy.

## Problem background

To protect its national interests, reduce dependency on imported energy, and assure the overall health and welfare of the local population, sound environmental practices and the responsible use of energy are carefully considered by every country [2]. On the other hand, the anti-crisis program of the national economy should have two major tracks: systematic actions (leading to macroeconomic stability) and sectoral activities (leading to bolster priority sectors). Energy sector of the Republic of Serbia is seen as sector in which programs can enhance the comparative advantage of its national economy. As a sector with dominant characteristics of natural monopoly, it should pass through the programs of consolidation and efficiency improvement [4].

After oil, natural gas is the second primary energy source in Europe. That is a consequence of its relatively lower prices in relation to other energy sources and because of the fact that it is more environmentally friendly fuel. Europe is strongly dependent on gas delivery from Russia and North African countries, and in the future, it is expected to be a great importer of gas from Middle East [13, p. 3]. The world's largest producers of natural gas in 2014 are the United States (730 billion $m^3$ or 20.7%), the Russian Federation (644 billion $m^3$ or 18.3), Iran, Canada, Qatar (all together around 487 billion $m^3$, or 13.9%). The biggest net exporters are Russian Federation (179 billion $m^3$), Qatar (119) and Norway (107). The biggest net importers are Japan (128 billion $m^3$), Germany (68), Italy

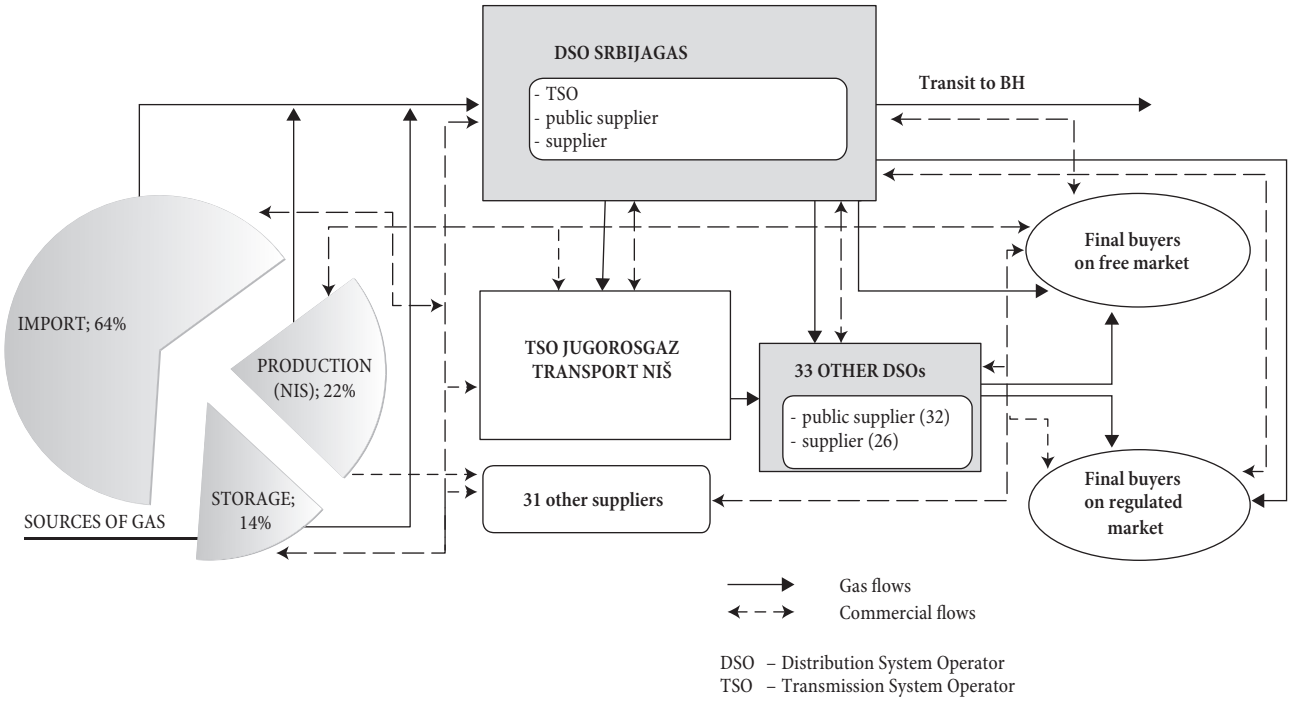
(56), PR of China, Korea, Turkey (every country around 49 billion $m^3$) [14].

Natural gas will remain an important energy source in the future; it is envisaged that at the global level the future natural gas demand could increase in future years, after the consequences of economic crises are mitigated. This increase will be influenced by the natural gas prices, among other factors. This particularly goes for the industry, especially large industry which uses natural gas as raw material, that their consumption will be largely dependent on the future gas prices. It can also be expected that natural gas consumption could be increased in the areas where distribution networks are still underdeveloped.

In Serbia, natural gas industry includes import, processes of domestic reserves exploitation, refinement, transportation and distribution of natural gas to final consumers is performed [18]. Oil and gas remain the primary energy sources, supplying 70% of Serbian energy demand 40 years ago, and supplying 70% today. The quantities of natural gas available for consumption in 2014 were 2,166 billion $m^3$, and they were provided from import, domestic production and from the underground gas storage. Most of these quantities were imported from the Russian federation according to long-term supply contract. These imported quantities in 2014 amounted to 1,393 million $m^3$ out of which 1,346 were overtaken from the transmission system in Hungary and 47 million were taken from the underground gas storage. Domestic production of natural gas in 2014 was almost the same as in 2013 and amounted to 467 million $m^3$ and its share in total quantities available was 22%.

Serbia is not largely dependent on energy imports as whole (about 33%), but its dependence is significantly obvious in the natural gas industry (86%). This problem could be solved by forming adequate reserves and diversifying sources of supply [17]. Security of supply is significantly increased by activating the underground gas storage Banatski Dvor, with a withdrawal capacity of 5 million $m^3$/day. Also, an agreement for the construction of interconnector Niš-Dimitrovgrad-Dupnica was signed in 2012, and some activities have been undertaken in preparation phase for the construction of this pipeline, which is supposed to increase Serbia's' security of supply. This pipeline should be 150 km long and have the capacity, in the first phase, of around 1,8 billion $m^3$/year. If other potential interconnections with other countries come to realization, such as with Romania and Croatia, the security of supply situation would also be improved [8].

**Figure 1: Place of DSOs in the natural gas market in the Republic of Serbia**




DSO – Distribution System Operator
TSO – Transmission System Operator

Source: [6, modified by authors]

The natural gas industry of Serbia operates as a bilateral market which means that gas is bought and sold directly between market participants. The gas market participants are: manufacturers, suppliers, public suppliers, end users, operators of transportation systems, distribution system operators, and operator of storage facilities (see Figure 1).

It can be seen that in the gas distribution sector, there are currently 34 companies. However, they differ significantly in their physical indicators and their financial performance. Observed through the dimension of distributed quantity, around 70% of the whole amount is distributed by only one distributor. In 2014, only 3 DSOs delivered more than 30 million $m^3$, while 23 DSOs delivered less than 10 million $m^3$ [8]. Based on these facts, it could be assumed that distribution sector is too much fragmented. Bearing in mind the amount of distributed gas, there is a concern that some DSOs have a low technical efficiency. Size of DSOs, quantity of gas they distributed and their technical efficiency may adversely affect the amount of distribution tariffs, as well as on the final price of gas and, consequently, on the competitiveness of industrial customers. Currently there is a significant difference in the distribution tariffs which are practically built into the final price of gas paid by these customers; the lowest price of access to the gas distribution system is 1.38 RSD/$m^3$ and the highest price is 12.56 RSD/$m^3$. The participation of the distribution tariff in the final gas price ranged from just 3.15% up to 20.90% [9]. Apart from the fact that more than 2/3 of DSOs are of small size, what we can conclude from the previous data, there is another disappointing fact that some of them are financially weak and do not have the ability to invest, which will be the subject of analysis in the next section.

Gas distribution, transport and public supply are regulated activities in Serbia. Methodology for regulated price setting is at the moment determined to be "cost plus method". Under this method the maximum allowed revenue in the regulatory period is set for each of DSOs i.e. the price of the service is set in a way that it provides (distribution tariffs) a return on justified operating costs as well as a return on assets employed [5]. This type of regulative is also used for example in Belgium. Other countries use a different type of regulation. For example, "incentive based" regulation is implemented in the Czech Republic, France, Germany, the Netherlands and the UK. Italy uses a combination of the two types of regulation. Finally, some countries use a third type of regulation – "revenue cap" – such as Finland, Greece, Poland (with "cost plus"), and Turkey [12].

## Current financial condition of companies in gas distribution sector

Analysis of the financial situation of companies that operate in the gas distribution business we performed in an abbreviated form based on data from their annual reports for 2014.[1] Except these companies perform activities in gas distribution sector, they also operate in the gas supply sector (as we have seen in Figure 1), and some of them are also engaged in other businesses. Since the information in the financial statements does not relate solely to the distribution of gas, our analysis did not go into the details of their operational efficiency and profitability, but we focused on the analysis of their financial health and investment potency.

After examining the financial position, financial results and cash flows of companies it can be concluded that many of them are not in good financial health. About 32% of the total number of companies ended the fiscal year with a negative net income (totalling - 40.15 billion RSD), negative profit margin and negative ROE. Operating Cash Flow (OCF) for the sector was negative, and consequently the indicators of current liabilities and total liabilities were negative (see Table 1). The overall picture of the solvency, liquidity and investment potency of the sector is very unfavourable. And yet, the sector average is largely affected by unfavourable results of one large company. In order to isolate the impact of this company on the results of the analysis, we calculated selected performance indicators for each of the companies and grouped them into four groups according to the their quality (rank 4 is the worst, and rank 1 is the best). After performing this

1 The data were retrieved from the business portal CUBE Risk Management Solutions - http: //cube.rs. For six of 34 DSOs data were not available for the year 2014, and for five of the 28 there were not available information from the Cash flow statement.

**Table 1: Selected financial indicators**

| | Sector average | | Rank 4 | Rank 3 | Rank 2 | Rank 1 |
|---|---|---|---|---|---|---|
| **Financial health** | | | | | | |
| OCF/Total Liabilities | **- 0.05** | *Range of values* | *<0* | *0.01-0.10* | *0.11-0.20* | *>0.2* |
| | | % of total DSOs | **34.8%** | **17.4%** | **21.7%** | **26.1%** |
| Total Debt / EBITDA | **9.59** | *Range of values* | *<0* | *10.1+* | *1.1-10.0* | *0-1.0* |
| | | % of total DSOs | **17.9%** | **7.1%** | **39.3%** | **35.7%** |
| EBITDA/interest coverage | **1.55** | *Range of values* | *<0* | *0.1-2.0* | *2.1-4.0* | *>4* |
| | | % of total DSOs | **17.9%** | **28.6%** | **7.1%** | **46.4%** |
| **Liquidity** | | | | | | |
| OCF /Current liabilities | **- 0.04** | *Range of values* | *<0* | *0-0.2* | *0.21-0.4* | *>0.4* |
| | | % of total DSOs | **34.8%** | **39.1%** | **21.7%** | **4.35%** |
| **Investment potency** | | | | | | |
| OCF /(Long Term Assets + working capital) | **- 7.33%** | *Range of values* | *<0* | *0-0.06* | *0.061-0.12* | *>0.12* |
| | | % of total DSOs | **34.8%** | **22.7%** | **18.2%** | **24.3%** |

Source: Authors' calculations

kind of grouping, the performance indicators of the sector are better, but still unfavourable.

Illiquidity is obvious - even 34.8% of companies operated with negative OCF. Only 4.35% of companies had a ratio of OCF/Current liabilities greater than the recommended of 0.4. On the side of solvency, almost ¾ of them had OCF/Total Liabilities below the recommended 0.2. About 10% of the total number of companies did not use debt. As a result of this, picture of solvency is slightly better from the perspective of the Total Debt/EBITDA and EBITDA/Interest coverage ratios. Unfortunately, 17.9% of the total number of companies operated with negative EBITDA, and 46.4% of the total number of companies have EBITDA/Interest coverage ratio below 2. The same percentage of companies had this indicator above the level of 4. The number of years for loan repayment from EBITDA for the whole sector amounted to almost 10, but it is encouraging that more than one third of the companies had this indicator between 0 and 1. Finally, when investment indicators potency is considered, a little bit less than ¼ of the companies had this indicator at a relatively high level of above 12% (it roughly indicates the possibility of replacement of property, plant and equipment and other long term assets and working capital from OCF within about 8 years).

The reasons of poor financial health and investment capabilities of a large number of companies can be considered in a few lines. Current legislation can present a significant burden in terms of personnel costs: salaries of a regulatory prescribed number of technical staff maintaining the network, and compensation for DSOs' corporate governance structure (board of directors, committees at the board, etc.). Purchase and maintenance of IT software and hardware for small and financially weak companies may also represent a high burden. Purchase of pipes, metering devices and other equipment necessary for the maintenance of the network are to be made in small procurements, which leads to generally weak negotiating power in relation to the suppliers of those inputs. Consequently, it leads to higher purchase price. Furthermore, some companies have big network losses. Their financial capability is often insufficient to obtain favourable loans from banks, and capability to attract equity are more than limited. Keeping all of the above in mind, it is obvious that the risk of entry of some companies into financial distress, bankruptcy and liquidation is not negligible.

In other countries DSOs are also not very successful despite their monopoly position. The return on invested capital of natural gas distribution in the USA was generally lower than their cost of capital in the past decade [22]. Nevertheless, there are differences between different DSOs. For example, in Turkey public companies compared to private ones, non-tender companies compared to tender ones, large companies compared to small ones, and

**Table 2: Choice of input and output variables**

| Variables | Operating expenditure + losses provision | Total quantities delivered | Quantities delivered to households' | Quantities delivered to industry buyers |
|---|---|---|---|---|
| Model 1 | Input | Output | | |
| Model 2 | Input | | Output | Output |
| Model 3 | Input | | Output | |
| Model 4 | Input | | | Output |

Source: Authors' choice

companies operating in more developed areas compared to companies operating in underdeveloped areas are more efficient in cost manner [11].

## Current technical efficiency of DSOs

Current technical efficiency of DSOs was assessed applying Data Envelopment Analysis (DEA) methodology. Because of the data availability, we made analysis for 17 out of 34 DSOs. We used four models of efficiency analysis (see Table 2).

The results of the analysis are calculated by the application of software for Data Envelopment Analysis EMS v 3.1, under variable returns to scale (VRS) assumption, are given in the Table 3.

The results show high variation in efficiency scores in all four models used, whereby the lowest scores had DSOs with the smallest amount of gas distributed. In order to confirm our assumption we continue the analysis, dividing the DSOs in three categories according to the scale of the quantities delivered - the ones with the throughput of natural gas below 5 million $m^3$ a year, from 5 to 10 million $m^3$ throughput a year, and over 10 million $m^3$ a year. The average efficiency of these three groups is given in Table 4.

The results presented in Table 4 and also in Figure 2 below confirmed our previous assumption within all models. One of possible explanation is that new and small DSOs cannot increase neither the number of customers neither the quantities they consume in order to improve its efficiency. Sometimes the minor operating expenditures are due to the fact that the maintenance and repair of the network and calibration of metering devices are not performed in a timely manner.

Technical efficiency can be analysed in other ways. For example, according to some empirical research recommended minimum acceptable ratio for quantities delivered in comparison to the network length should be $60m^3/m$ [21].

From the results presented in previous table it can be concluded that there is a very large variation in ratio

**Table 3: Technical efficiency according to DEA**

| | DSO 1 | DSO 2 | DSO 3 | DSO 4 | DSO 5 | DSO 6 | DSO 7 | DSO 8 | DSO 9 | DSO 10 | DSO 11 | DSO 12 | DSO 13 | DSO 14 | DSO 15 | DSO 16 | DSO 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model 1 | 0.07 | 1.00 | 0.11 | 0.08 | 0.33 | 0.18 | 0.33 | 0.23 | 0.32 | 0.38 | 0.09 | 1.00 | 0.10 | 0.39 | 0.16 | 0.58 | 0.12 |
| Model 2 | 0.25 | 1.00 | 0.11 | 0.22 | 1.00 | 1.00 | 0.44 | 1.00 | 0.65 | 0.62 | 0.31 | 1.00 | 0.10 | 0.40 | 0.16 | 0.66 | 0.20 |
| Model 3 | 0.25 | 1.00 | 0.11 | 0.22 | 1.00 | 1.00 | 0.25 | 1.00 | 0.50 | 0.40 | 0.31 | 1.00 | 0.10 | 0.11 | 0.16 | 0.28 | 0.07 |
| Model 4 | 0.05 | 1.00 | 0.11 | 0.07 | 0.17 | 0.08 | 0.29 | 0.03 | 0.23 | 0.30 | 0.09 | 1.00 | 0.10 | 0.40 | 0.16 | 0.56 | 0.20 |

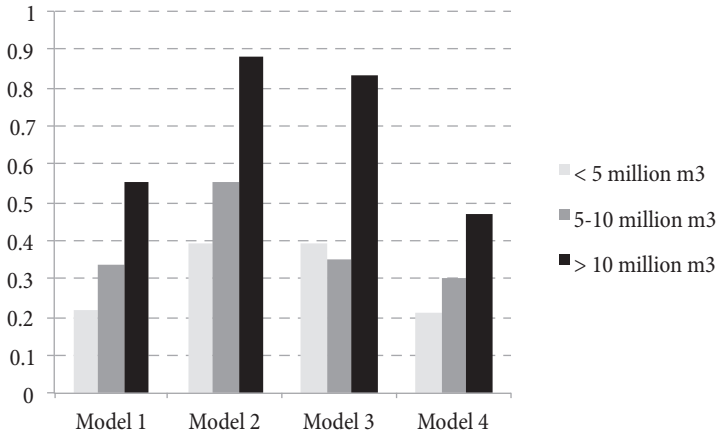
Source: Authors' calculations

**Table 4: Average efficiency of the groups according to the quantities delivered**

| Quantities delivered | < 5 million $m^3$ | 5-10 million $m^3$ | > 10 million $m^3$ |
|---|---|---|---|
| Model 1 | 0.22 | 0.34 | 0.55 |
| Model 2 | 0.39 | 0.55 | 0.88 |
| Model 3 | 0.39 | 0.35 | 0.83 |
| Model 4 | 0.21 | 0.3 | 0.47 |

Source: Authors' calculations

**Figure 2: Average efficiency of the groups according to the quantities delivered**




Source: Authors' calculations

Q/l across DSOs and also that only one DSO achieved the recommended level of min. 60 $m^3$/m. Comparing those results to the results of the other study [see 21] when the data for 2008 were used, and 1/3 of all DSOs did satisfy this recommendation, the decline in this ratio is significant. This can be caused by the decline of quantities delivered in the past years.

## Some recommendations

The results of our previous analyses emphasise the need to consider measures for the improvement of technical and economic efficiency of DSOs. It is in the interest of the DSOs, but it also could ensure better preconditions for the competitiveness of the industry that uses gas as an energy source or raw material as well as in the interest of the companies that might use the network if it would be further developed. Although the possible actions in case of natural monopolies are in a way limited, there are few alternatives which could support the competitiveness of Serbian industry.

Potentially the most effective alternative to support the competitiveness of industry is diversification of sources of gas supply at the national level. But, domestic resources of natural gas are limited and nowadays, chances for diversifying external sources of natural gas are even less than several months ago. South Stream is cancelled in December 2014, Turkish Stream is uncertain and there is a huge risk of interruption of transit of Russian gas through Ukraine after the expiry of their contract in 2019. Since Serbia cannot play an active role in the design and building the streams, in the short run it can only look for the opportunities for making cost savings and making the whole gas network more efficient. Below, we discuss three alternatives to improve efficiency of gas distribution sector in the Republic of Serbia.

The first alternative is the change in the regulatory framework, i.e. introduction of incentive based and revenue

**Table 5: Quantities delivered in relation to distribution network length (in 2014)**

| | DSO 1 | DSO 2 | DSO 3 | DSO 4 | DSO 5 | DSO 6 | DSO 7 | DSO 8 | DSO 9 | DSO 10 | DSO 11 | DSO 12 | DSO 13 | DSO 14 | DSO 15 | DSO 16 | DSO 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quantities delivered (000 m3 ) | 2,620 | 2,412 | 1,115 | 2,677 | 23,190 | 2,881 | 5,267 | 5,785 | 15,138 | 9,387 | 2,237 | 945,099 | 1,995 | 8,991 | 259 | 9,108 | 5,153 |
| Network length (000 m) | 198 | 105 | 50 | 150 | 511 | 170 | 183 | 267 | 454 | 333 | 121 | 7,514 | 59 | 205 | 20 | 172 | 127 |
| Ratio Q/l ($m^3$ /m) | 13.22 | 22.96 | 22.46 | 17.82 | 45.42 | 16.91 | 28.78 | 21.71 | 33.37 | 28.18 | 18.46 | 125.77 | 33.63 | 43.92 | 12.93 | 52.95 | 40.71 |

Source: [8, derived data]

cap regulation, which forces the DSOs to perform their activities in an efficient way. When incentive based regulation is applied the efficiency of the company becomes very important because it directly influences the charges DSOs are allowed to charge. Although this kind of regulation is very successfully applied in well developed countries, for our case it would be inappropriate for the reason that such strict regulation could additionally weaken the position of small and financially non-viable DSOs and because it could have the adverse effect on further network development.

Second, nowadays there are tendencies to open up almost every type of market through the gradual introduction of competition. But in the case of gas distribution, a monopoly is both economically and socially acceptable; DSOs are in a position of natural monopolies. It is logical to have just one network to distribute gas to consumers, because of avoiding duplication of sunk costs. Although, there is a potentially efficient way of controlling the natural monopoly in the gas distribution sector as it could be a system of multi-criteria tenders. In that case regulator creates a kind of "competition for the market", as it was, for instance, implemented in Italy [3] and Turkey [11]. These criteria may include: verification of DSO's references, ex-ante control of DSO's capabilities, ongoing inspection, and ex-post control of quality of DSO's service delivering.

Finally the third alternative is in encouraging the consolidation of the natural gas distribution sector. There is more than one way of action in this respect. First of all, the conditions for obtaining DSO license or the conditions to conclude the contract on the right to perform the activity of common interest which is to be signed with the Government, as two preconditions to perform distribution of natural gas, should be more strict, i.e. the minimum number of delivery points and minimum quantities to be delivered should be defined. By raising the entry barriers, further fragmentation of the sector would be avoided. The already existing DSOs should be encouraged to restructure themselves. These measures can go into two directions: financial and asset restructuring. Financial restructuring should be aimed at debt to equity swaps that would in turn lead to a reduction in debt burden and increase of equity making insolvent and financially weak DSOs viable. Business restructuring should be focused on incentivizing the mergers of DSOs. In case of many existing companies in gas industry, it would be opportune to separate a distribution part of companies before their possible merger. It could be done for example through the spin-off, spin-out, split-off and other transactions [see 15]. The announcement of introduction of incentive based regulation in the medium term could also encourage managers of DSOs to think about mergers.

Below, we discuss the potential benefits that could be achieved as a result of the consolidation of the distribution sector through mergers of DSOs. Having in mind that the DSOs are often not aware of these benefits, the emphasis on sharing know-how and spreading the information about it is very important and can also impede the activities of merging.

## Potential benefits of consolidation of fragmented gas distribution sector

The merger of DSOs is a type of horizontal integration. From a broader social perspective, a common problem resulting from mergers, especially the horizontal integrations, may be an excessive strengthening of market power and decreasing the degree of competition (increase of market concentration), which on the basis of market dominance can lead to greater opportunities to control the sales price (or/and the quality and size of supply). Sales prices can, however, be controlled even though the company does not dominate the market, if there is collusion, illegal coordination and cooperation between two or more competitors, whereby mergers, due to the reduction in the number of competitors, increase the likelihood of such incidents. Those socially harmful activities – excessive strengthening of market power and collusions – are especially unfavourable in a situation when customers have no or few alternative sources of supply. These disadvantages of mergers would not be reasonable to expect in the case of integration of the gas distribution companies, since they are already in a position of natural monopoly.

By DSOs mergers numerous potential gains could be achieved both for the DSOs themselves, but also for their customers and for a national economy as well. Synergies are the most important potential gain and source of value

in mergers. Synergies can be operational and financial, wherein the first ones are more likely and they are more significant. Operating synergies are mostly manifested through increased free cash flow to the firm (FCFF) and financial ones through a reduction of weighted average cost of capital (WACC). The main operating synergy is identified in the area of cost savings based on the activation of economies of scale. Besides, merger of DSOs can bring other cost savings, facilitate strategic alignment of the company to changes in regulation and technology, but also a positive change in investment strategy, capital expenditures and performance of these investments. The potential benefits of mergers can be also achieved on the basis of the effects of enhanced control and through the influence of a takeover premium that the company could achieve in a potential future sales transaction of DSOs.

*Economies of scale.* Cost savings could be realized on the basis of activating the economies of scale, but also through a reduction in other operating costs. The concept of economies of scale is usually linked to the ability to conduct activities at a lower cost per-unit of product or service with the increasing scale of activities; the greater the quantity of a gas that is distributed, the lower the per-unit fixed cost because these costs are shared over a bigger number of units ($m^3$) distributed.

In order to substantiate the effects of economies of scale we performed additional DEA analysis in which small DSOs were merged. The model 1 was applied. Firstly, two DSOs with the lowest efficiency scores were merged, then five DSOs, and finally all nine small DSOs were merged. The results are shown in the Table 6.

The results show explicitly that mergers of DSOs lead to the increase of the technical efficiency of that virtually merged DSOs (M2, M5, M9). Ignoring all expected cost savings that would occur as a result of mergers, after M2 merger technical efficiency DSO has more than doubled compared to the initial situation, and after M9 the score grew at a level of 0.35 which is significantly higher than efficiency levels of the DSOs before their hypothetical merger.

Mergers can be promoted in close geographical areas. Merging processes gave significant results in Italy between 1970 and 1998, especially when local DSOs operating at small scale were participants in that process. The recommendation was that distribution companies serving less than 20,000 customers and delivering less than 40 million $m^3$ should merge [10]. This recommendation is in some ways valid for the Republic of Serbia too, but it should have in mind that this recommended level is very high since there are only three DSOs which distributed more than 30 million $m^3$.

*Other operating expenses (OPEX).* DSOs mergers can not only reduce fixed costs per $m^3$ of gas distributed, but also the total amount of fixed costs. Cost savings could be realized by performing activities of two or more previously separated companies now under a single corporate umbrella i.e. under centralized management. For example, new economies can be activated by reducing administrative costs of concluding sales contracts, lowering the cost of debt collection, research and development costs, general administration costs, costs of finance and accounting department, human resource management costs and the costs of IT support (hardware and software). It should not be forgotten that the reduction of fixed costs by itself reduces the level of business risk, i.e. brings the benefits of stabilization in operating profit.

Cost savings can be made in some other ways, too. Larger DSO's size could provide the benefits of obtaining pipes, metering devices etc. that have better (or known) quality, at a potentially lower purchase price, on time

**Table 6: Technical efficiency after the hypothetical merger of DSOs**

| DEA scores | DSO 1 | DSO 2 | DSO 3 | DSO 4 | DSO 6 | DSO 11 | DSO 13 | DSO 15 | DSO 17 | After the merger |
|---|---|---|---|---|---|---|---|---|---|---|
| Current situation | 0.07 | 1.00 | 0.11 | 0.08 | 0.18 | 0.09 | 0.10 | 0.16 | 0.12 | |
| M2 - merger of two | / | 1.00 | 0.11 | / | 0.18 | 0.09 | 0.10 | 0.16 | 0.12 | 0.15 |
| M5 - merger of five | / | 1.00 | / | / | 0.18 | / | / | 0.16 | 0.12 | 0.19 |
| M9 - merger of nine | / | / | / | / | / | / | / | / | / | 0.35 |

Source: Authors' calculations

and without conditioning. In comparison to purchases in small amounts, how they are carried out now, centralized procurement after mergers promises an opportunity for savings. Legislation in force envisages that every DSO must have at least seven staff persons in charge of technical management, operation and maintenance of the system, with professional exam passed, in order to obtain a license [20]. For small and financially weak DSOs it presents an excessive financial burden, therefore, through the integration, companies could relieve themselves from the part of those operating costs. In the area of personnel costs, after the merger savings could be achieved in board members' compensation. Furthermore, some DSOs have difficulties to ensure funds for maintaining the network. Theoretically, it could jeopardize the security of supply of existing customers, and in the practical domain certainly endangers those DSOs who have gas losses in the network above the regulatory acceptable level. In this regard, twelve DSOs submitted data about their significantly high network losses in 2013 (in the range from 2.6% to 11.8%) and the average percentage of losses for these 12 DSOs is 6,2%, which is rather high value [7]. Since every company has its own maintenance team, their possible mergers could bring savings in maintenance costs of the entire network at all.

*Strategic alignment*. With regulatory changes and changes in technology applied, strategic alignment is often a necessary precondition not only for successful growth and development, but also for the survival of the company. Small DSOs are not necessarily able to do so. In this respect, enlarging the DSOs through their mergers creates possibilities for better compliance with legislation in force and the latest technological improvements, especially in the field of IT.

*Capital Expenditures (CAPEX).* In the theoretical domain, merger transactions can lead to the reduction in CAPEX. DSOs with negative cash flow from operating activities have no ability to raise debts and are not able to invest in gas network i.e. they cannot develop the network, but also experience difficulties in replacement of worn-out elements of the existing network. The inability to further develop the network leads to the situation that potential industrial buyers in remote areas cannot be connected to the network. As a consequence, these companies have to use other sources of energy that might be more polluting.

Some DSOs have rounded network without the possibility of profitable expansion, while the others have network that could be expanded a lot. If some distributors in the first group have a positive operating cash flow, in the absence of profitable investment opportunities managers could be prone to invest cash in projects with negative net present value – known as the destruction of free cash flow – FCF [16]. The extent to which the problem of destruction of FCF will be manifested depends on whether the ownership structure and corporate governance structure are such that the owners can ensure control over the use of their cash (insisting on high payouts or by withdrawal of capital i.e. purchase of shares) or not. On the other hand, a DSO with a negative operating cash flow has often a problem of underinvestment i.e. loss of return on missed profitable investments. Therefore, mergers of DSO with positive FCF and without good investment opportunities, on the one hand, and DSO who does not have sufficient cash to fund network expansion may make the sense. Sources of value in this combination lie in the net present value of the projects that would not be undertaken in DSOs with a lack of cash. On the other side, the value is "preserved" in the amount of the present value of agency costs arising from destroyed FCF in non-merged DSO with cash surplus/ no attractive projects.

*Financial synergies*. Sources of financial synergies can be the following: utilization of unused debt capacity, reduction of the risk of financial distress and reduction of DSO's WACC.

Debt capacity, in terms of the amount of debt that a DSO can obtain, may be increased after the merger on two grounds: 1) if one or some of the DSOs that are joining have a low level of debt compared to the value of assets that could put as debt collateral or to the FCF that will generate and 2) due to reduction in volatility in operating profit, FCF or business risks of combined entity compared to individual companies. The first ground is clear in itself - when some of the companies that are included in the combination have valuable assets unpledged as collateral or high future FCF they can be used to obtain new debt for the combined entity. Moving the capital structure in

the direction of greater use of debt can sometimes lead to reduction of WACC and to increase the value of the company. With regard to the second ground, the fact is that different DSOs achieve different levels of profitability and FCF at different points of time. Therefore, as a rule the combined profits and FCF have less volatility than the volatility of individual companies. Reduced volatility of profits and FCF caused by the integration of DSOs promises greater security for creditors that interest and principal of loans will be paid. Creditors would consequently be able to lower the required rate of return i.e. it would enable a lower cost of debt for DSOs. Credit availability can also be increased due to the increasing size of the debtor.

This reduction in the volatility of the profits in addition to the aforementioned reduction in business risk from the effects of reductions in fixed costs could reduce the risk of entering into financial distress. Financial distress can be terminated by the bankruptcy and decay of DSOs. The bankruptcy procedure is expensive and complicated and results, even in the case of successful completion, in suffering significant costs for the DSO and also can threaten the security of supply to gas end-users. The collapse of the DSO could lead to the problem of finding new companies who would be interested and able for gas distribution in a given area, the problems of buying gas network from the bankruptcy procedure and the like. Therefore, a big potential gains from DSOs integration can be a reduction in the risk of bankruptcy and collapse of the DSOs that are financially weak. Because the distribution of natural gas is defined as activity of common interest in Serbia, according to the Law on public enterprises, if it happens that a company loses its license due to the bankruptcy, the Government decides and makes it obligatory for another company to perform the activity of distribution on the network of the bankrupted company. In such cases the problem of the ownership and corresponding rights and fees based on this ownership as well as distribution tariffs raise many problems to be solved.

Reduction of the cost of second component of DSOs capital i.e. the cost of equity is questionable in literature. However, the general position is that if the equity investors cannot easily, accurately and cheaply manage their exposure to systemic risk, reduction of systemic risk at a company level could lead to reductions in the cost of equity. Combining DSOs may improve management of systemic risk, reduce cost of the equity, but also enable obtaining additional equity (recapitalisation) or facilitate the fulfilment of assumptions for their listing on the stock exchange (Initial Public Offering - IPO) which would significantly expand the range of potential equity providers.

Transaction costs related to raising capital affect the company's WACC. Since these costs are largely fixed in nature, raising debt and equity in larger volumes after the DSOs' mergers could bring some kind of benefit of economies of scale in the field of transaction costs.

*"Control gains".* In the case of poorly managed companies, i.e. companies with poor management and/or board of directors, value through mergers can also be created by better management and/or control of corporate assets in the future. Although the owners of DSOs can make removal of inefficient and opportunistic-minded management teams themselves, problems related to the inefficiency of the board and other imperfections of mechanisms of corporate governance, especially in small companies, make the changes in management teams (and the board of directors) rarely occurring, even in the case of very poor performance. Gains from enhanced control after the merger may occur on several grounds e.g. by improved business strategies, better monitoring of the management team and making managers more focused on the goal of maximizing owners' value. That is achieved through more efficient corporate governance mechanisms (e.g. more suitable managers' compensation incentive systems), firing of the managers with poor performance, changing the structure, mode of operation and efficiency of the board of directors etc.

Like any other regulator, the national energy regulatory authority (Energy Agency of the Republic of Serbia - AERS) is in the informational asymmetry with respect to entities that are subject to regulation. Information asymmetry reduces the possibility of adequate in-depth controls, particularly in situations where the information risk is amplified due to lack of or inadequate audit of financial statements of regulated subjects. The problem increases if the regulator does not have the sufficient capacity or the authorizations in relation to the number of entities

to be regulated when, in some way, the regulator is forced to accept the amounts of operating costs and regulated assets value as stated in books and in DSOs' financial statements. For example, a DSO can state in financial statements assets that do not exist, the assets that exist, but DSO has no right to those assets, cause assets are not in DSO's ownership (e.g. assets taken into an operating lease) or state assets at values that are not in accordance with IFRS (especially if assets are measured at fair value). In addition, it is also known phenomenon that companies in regulated industries are naturally prone to moral hazard in the sense of avoiding or relaxing externally imposed constraints. In connection with that, the rate-of-return regulation reduces the motivation of companies to reduce costs if they know that the increased costs will be accepted by the regulator, and at the same time increases their motivation to increase regulated assets - Averch-Johnson effect [1]. Therefore, this regulation gives incentives for regulated companies to overcapitalize themselves, enabling in that way higher absolute profit. Increase in regulated assets can be achieved not only by the new investment, but also by the use of fair value accounting in measuring property, plant and equipment, as well as creative use of other options permitted under IFRS, for example, capitalization of interest expense and foreign exchange differences which do not fulfil the prerequisites for capitalization. The problem of creative accounting can be particularly pronounced for those DSOs that are not obliged for statutory audits. Energy regulation per se does not impose an obligation on the audit, i.e. audited financial statements submitted to AERS only by those DSOs that have that obligation by other laws, primarily by Low on Audit. Integrating DSOs may therefore bring additional control gains, both through the dimensions to facilitate monitoring by the regulator, as well as through mandatory audits of financial statements.

*Preventing the acquisition of DSOs at low price and by unwanted buyers.* High fragmentation of distribution networks reduces the intrinsic value of DSOs and allows that some of them, even the most successful, become the subject of takeover at a low price or by investors who may be considered as undesirable. Low selling price in this case would not be a result of poorly managed businesses, but result of poorly informed owners, current financial problems faced by owners or bargaining superiority of a potential buyer. Merging DSOs certainly reduces this kind of danger or increases the potential selling price that could be obtained in the event of a future sale of DSO.

## Conclusion

The question of natural gas supply is one of the most important issues in energy strategy. The distribution network is an important link of the value chain in delivering natural gas to end users. DSOs are in a position of natural monopoly, but in a monopoly that is economically and socially acceptable. As in any case of monopoly there is a necessity for its controlling as well as necessity for making them more efficient because of final aims – sustainability of the gas industry and competitiveness of the national economy.

Since distribution tariffs constitute a part of the gas price that industry pays in the end, in order to make companies competitive and to lower their production costs we had to look deeper into the value chain. We investigated technical efficiency of DSOs and the financial condition of those companies. It was concluded that the vast majority of these companies has a low level of technical efficiency and they are generally weak in terms of financial health (solvency), liquidity and investment potency. Also distribution sector is too much fragmented. Since Serbia cannot easily diversify sources of natural gas, it is necessary to look for the possibilities for cost savings and making the gas network more efficient. Three alternatives for improvement of DSOs' efficiency were analysed: introduction of incentive and revenue cap regulation, the introduction of multi-criteria tender system and, finally, consolidation of the fragmented gas distribution sector.

Due to potential further weakening of small and financially non-viable DSOs and the adverse effect on network development, introduction of generally superior and stricter incentive based or revenue cap regulative should be postponed. Controlling of the natural monopoly in the gas distribution sector could be achieved also through multi-criteria tenders to choose the best operators for

the parts of distribution network. Finally, in regard to consolidation of distribution sector, it could be enforced by raising the sector entry barriers (e.g. with stricter conditions for licensing), financial restructuring of DSOs (e.g. debt to equity swaps), and asset restructuring aimed to separation of a distribution part of companies before the merger (e.g. spin-off, spin-out, split-off). The main DSO-specific sources of value that could be activated through merger transactions are economies of scale, savings in OPEX, increase of investment potency, enhanced control of DSOs etc.

Since managers and/or founders of distribution companies did not recognize the need for DSOs mergers to date, the consolidation process should perhaps be encouraged by the government itself. We should not forget that the distribution of natural gas represents an activity of public interest and that therefore the Government of the Republic of Serbia can have a great impact on these processes. The greater involvement of the energy regulator and the local authority could help remove some of the technical obstacles that these merger processes could face.

## References


1. Averch, H., & Johnson, L. (1962). Behavior of the Firm Under Regulatory Constraint, *American Economic Review, 52*, 1052-1069.
2. Bukurov, M. Z., (2010). Finding the Balance between the Energy Security and environmental protection in Serbia. *Thermal Science, 14,* 15-25.
3. Dorigoni, S., & Portatidino, S. (2009). Natural gas distribution in Italy: When competition does not help the market. *Utilities Policy, 17,* 245-257.
4. Djuričin, D., & Vuksanović, I. (2014). Quest for new development model and economic policy platform for Serbia: The role of industrial policy. *Ekonomika preduzeća, 62,* 229-250.
5. Energy Agency of the Republic of Serbia. (2012). Methodology for setting prices of access to natural gas distribution system. http://www.aers.rs/FILES/Metodologije/2012-12-25_Metodologija%20distribucija%20GAS%20SG%20123-12.pdf
6. Energy Agency of the Republic of Serbia. (2014). Natural gas market, http://www.aers.rs/Index.asp?l=1&a=42.01&tp=TEG
7. Energy Agency of the Republic of Serbia. (2015). Price regulation http://www.aers.rs/Index.asp?l=1&a=22.05&tp=TarifeG
8. Energy Agency of the Republic of Serbia. (2014). Energy Agency 2014 report. http://www.aers.rs/Files/Izvestaji/Godisnji/Eng/AERS%20Annual%20Report%202014.pdf
9. Energy Agency of the Republic of Serbia. (2014). Price approvals and argumentations ttp://www.aers.rs/Files/Odluke/OCenama/Vazece%20cene%20pristupa%20sistemu%20za%20distribuciju%20prirodnog%20gasa.xls
10. Erbetta, F., & Rappuoli, L. (2003). Estimating optimal scale and technical efficiency in the Italian gas distribution industry. *Hermes*. Working paper 6.
11. Ertürk, M., & Türüt-Aşık, S. (2011). Efficiency analysis of Turkish natural gas distribution companies using data envelopment analysis method. *Energy Policy, 39,* 1426-1438.
12. Ernst & Young. (2013). Mapping power and utilities regulation in Europe, http://www.ey.com/Publication/vwLUAssets/Mapping_power_and_utilities_regulation_in_Europe/$FILE/Mapping_power_and_utilities_regulation_in_Europe_DX0181.pdf
13. Gilardoni, A. (2008). *The World Market for Natural Gas: Implications for Europe*. Springer.
14. International Energy Agency. (2015). Key World Energy Statistics http://www.iea.org/publications/freepublications/publication/KeyWorld_Statistics_2015.pdf
15. Ivanišević, M., & Todorović, M. (2014). Rearranging Residual Claims: Choosing the Right Transaction to Unlock Hidden Value, in *Contemporary Management and Marketing Methods in Improving Competitiveness of Companies in Serbia in the Process of its Integration in European Union,* N. Janićijević (ed), Faculty of Economics University of Belgrade, 87-101.
16. Jensen, M.C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *American Economic Review, 76*, 2, 323-329.
17. Kaličanin, Đ., & Kuč, V. (2013). Industrial policy in the energy sector: The example of gas sector in Serbia. *Ekonomika preduzeća, 61*, 492-505.
18. Ministry of Energy, development and the Environmental Protection of the Republic of Serbia. (2013). Energy sector development strategy of the Republic of Serbia for the period by 2025 with projections by 2030 - draft.
19. Ministry of Mining and Energy. (2014). Serbian energy balance sheet for 2015. http://www.mre.gov.rs
20. Ministry of Mining and Energy. (2015). The rulebook on energy activities licensing and certification. „Službeni glasnik RS", br. 87/15.
21. Tubin-Mitrović, B. (2011). Model of strategy selection for development of natural gas distribution. Conference: *Gas 2011*, Kladovo.
22. Weijermars, R. (2012). Regulatory reform options to revitalize the US natural gas value chain. *Utilities Policy, 21*, 50-58.

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