

PRICE FORMATION OF ENERGY SERVICES IN THE SPHERE OF NATURAL GAS IN BULGARIA

Anna Preshelkova

University of Mining and Geology "St. Ivan Rilski" Sofia; anna.preshelkova@gmail.com

ABSTRACT. At this stage (since the liberalisation of the gas sector in the European Union) a regulated gas market and a free natural gas market operate in Bulgaria simultaneously, and the country depends mainly on one source of supply. Local yield is negligible and there are no reverse connections to the neighbouring countries. Natural gas prices in Bulgaria are subject to regulation by the Energy and Water Regulatory Commission, in particular: natural gas price of natural gas sales from the Public Supplier to the End Suppliers and to the customers connected to a gas supply network; prices for distribution and supply of natural gas; prices for connecting customers to gas transmission or gas distribution networks; prices for balancing; prices for access and transmission of natural gas through gas transmission and/or gas distribution networks, except when the Commission at its own discretion approves a methodology for setting the price for access and transmission through a transmission network; price for access and storage of natural gas in storage facilities. The applied price-regulation methods are "rate of return on capital", "price cap" and "revenue cap".

Key words: natural gas, distribution, transmission, prices and tariffs

ЦЕНООБРАЗУВАНЕ НА ЕНЕРГИЙНИТЕ УСЛУГИ В ОБЛАСТТА НА ПРИРОДНИЯ ГАЗ В БЪЛГАРИЯ

Анна Прешелкова

Минно-геоложки университет "Св. Иван Рилски"

РЕЗЮМЕ. На този етап (от либерализацията в газовия сектор на Европейския съюз) в България функционират едновременно регулиран и свободен пазар на природен газ, като страната зависи основно от един източник на доставка. Местният добив е незначителен и липсват реверсивни връзки към съседните страни. Цените на природния газ в България подлежат на регулиране от Комисията за енергийно и водно регулиране, и по-конкретно: цена на природен газ при продажба на природен газ от Обществен доставчик на крайните снабдителни на природен газ и на клиентите, присъединени към газопреносна мрежа; цени за разпределение и снабдяване с природен газ; цени за присъединяване на клиенти към газопреносните или газоразпределителните мрежи; цени за балансиране; цени за достъп и пренос на природен газ през газопреносни и/или газоразпределителни мрежи освен в случаите, когато Комисията по своя преценка одобрява методика за определяне на цена за достъп и пренос през преносна мрежа; цена за достъп и съхранение на природен газ в съоръжения за съхранение. Прилаганите методи на ценово регулиране са "норма на възвращаемост на капитала", "горна граница на цени" и "горна граница на приходи".

Ключови думи: природен газ, разпределение, пренос, цени и тарифи

Introduction

Natural gas market in Bulgaria

Currently, both a regulated and a free market for natural gas are functioning in our country. Local extraction is insignificant, there are no reversible connections to neighbouring countries, the first natural gas supply deals at a virtual point were made in 2019. These factors determine the uncertainty of supply and the still insufficient competition in the gas market.

Public delivery

Public supply is the supply of natural gas of a specified quality and regulated price, determined according to a methodology approved by the Energy and Water Regulatory Commission. The public supply of natural gas on the territory of the Republic of Bulgaria is carried out by Bulgargaz JSC – a public supplier of natural gas, ensuring its supply at prices regulated by the Energy and Water Regulatory Commission (SEWRC). The

public service provider Bulgargaz JSC sells natural gas at prices regulated by SEWRC, with its share in sales for 2018 being 98.90%. The remaining 1.10% is realised by traders at freely negotiated prices.

Transfer and storage

Bulgartransgaz JSC, a combined gas operator, carries out two main activities – "natural gas transmission" and "natural gas storage". Bulgartransgaz JSC is an operator of the National Gas Transmission Network (NGPM) for the transmission of natural gas on the territory of Bulgaria to gas distribution networks and non-household customers of natural gas; natural gas transit transmission network (GMTP) for the transmission of natural gas through the territory of Bulgaria to the neighbouring countries Romania, Turkey, Greece and Northern Macedonia and the Chiren underground storage facility (Chiren UGS) for storage of natural gas intended to cover seasonal imbalances in consumption and to guarantee security of gas supply.

Distribution and supply of natural gas from a final supplier

The gas distribution companies carry out the activities of "natural gas distribution" and "supply of natural gas from a final supplier", supplying natural gas to customers connected to the respective gas distribution networks in the licensed territories.

At the end of 2017, 24 companies in Bulgaria were licensed for 35 territories, covering 172 municipalities and representing 65% of all municipalities in the country. The necessary infrastructure for distribution of natural gas in the country is in the process of construction and the connected household customers to the gas distribution networks are few. Nine companies carry out the supply of compressed natural gas to some municipalities that have no connection to the gas transmission network.

According to gas distribution companies, the total number of customers in the natural gas sector in 2018 is 107669, of which 100439 (93%) are household customers and 7230 (7%) are non-household customers. The total amount of natural gas distributed by gas distribution companies for 2018 is over 5446597,263 MWh or 17% of the total natural gas consumption in the country.

Natural gas pricing methods in European Union countries.

Directive 2009/73/EC of the European Parliament and of the Council of Europe of 13 July 2009 on common rules for the internal market in natural gas establishes common rules for the transmission, distribution, supply and storage of natural gas. It lays down rules relating to the organisation and operation of the natural gas sector, market access, the criteria and procedures applicable to the granting of authorisations for the transmission, distribution, supply and storage of natural gas, and the operation of systems. Directive 2009/73/EC does not specify pricing methods. Only the need for prices to be marketable is stressed upon and only in some cases to be regulated for the so-called "Vulnerable" customers. However, the experience of the Member States is shared and as a result it can be confirmed that prices for energy services in the EU are mainly determined by the following three methods:

Rate-of-return method

The "rate of return on equity" pricing method is a method by which the prices and required annual revenues of the energy undertaking for a regulatory period of not less than one year are guaranteed with a guaranteed return; a subsequent regulatory review shall be carried out at the discretion of the committee or at the request of the energy company, with significant deviations between the approved and reported elements of the required revenue.

Price-cap method

The incentive pricing method is considered to be the most compliant with incentive regulation requirements and is becoming more widespread.

In the simplest form, the incentive pricing method (or in this case, the price cap method) is expressed by the following formula:

$$\text{Price for the current year} = \frac{\text{Price in the previous year} * (1 + \text{inflation index}) * (1 - \text{efficiency factor})}{1}$$

For a period of several years (usually between two and five), a starting price is determined, (price in the previous year), which is indexed for each subsequent year by the inflation index and the company performance factor. The efficiency factor is introduced by the regulator and is related to the achievement of certain performance indicators of the company, which are not directly related to revenue and are more related to the quality of the service provided - e.g. provision of gas with certain qualities, transport and supply of natural gas at a certain quality of the service.

By applying the incentive pricing method, the company is incentivised to generate additional revenue within the regulatory period by improving its operating efficiency (reduce costs or increase sales).

This method is designed to encourage utility companies to reduce costs. This is partly achieved by setting prices and revenues so that the company earns profits over the years, regardless of the costs it incurs during the year. This is also achieved by allowing the company to retain at least some of the benefits realised by improving efficiency.

Revenue-cap/revenue-based method

Pricing based on average cost plus return implies that all costs included in the company's financial statements are covered by the price at which the product/service is sold. The method is the most widely used pricing method for gas distribution companies. In doing so, the regulator approves energy company prices that cover the costs and return on capital that is sufficient to maintain, replace and expand the assets. In this method, the price can be obtained by dividing the required revenue by the forecast volumes. The required revenue or prices are usually fixed every year or every two years, but no more than five.

Regulated/unregulated natural gas prices in individual countries in the European Union

In the European Union, most regulated end-user countries have a dual market structure where both regulated and unregulated markets exist in parallel (Table 1).

Table 1. Summary of the year in which the market is fully liberalised and the percentage of household and non-household customers with regulated prices - December 2014

Year of final market opening	Households		Switching in and out allowed		% with social tariffs		Non-households	
	E	G	E	G	E	G	E	G
Bulgaria	-	-	100%	100%	Yes	No	100%	100%
Croatia	2008	2008	93%	100%	Yes	Yes	33%	
Cyprus	-	nap	100%		No		100%	
Denmark	2003	2004	80%	n/a	Yes	Yes	n/a	n/a
France	2007	2007	90%	67%	Yes	Yes	8%	8%
Greece	2007	-	100%		No	9%	86%	40%
Hungary	2007	2007	99%	98%	Yes	Yes	61%	86%
Latvia	2007	2014	100%	100%	Yes	No		100%
Lithuania	2007	2007	100%	100%	Yes	No		21%
Malta	-	nap	100%		No		10%	100%
Poland	2007	2007	98%	98%	Yes	Yes		100%
Portugal	2006	2010	53%	35%	Yes	Yes	1%	12%
Romania	2007	2007	100%	100%	Yes	No	12%	54%
Slovakia	2007	2007	100%	100%	Yes	Yes		30%
Spain	2003	2003	48%	25%	Yes	Yes	9%	

In the European Union, most regulated end-user countries have a dual market structure where both regulated and unregulated markets exist in parallel. In these countries, household consumers have the choice of being delivered at regulated prices or below market price. However, in most countries where switching to an unregulated price is possible, the majority of household consumers remain (i.e. choose to remain) at regulated prices (for example, 100% of electricity households in Bulgaria, Latvia, Lithuania, Romania and

Slovakia and gas households in Croatia and Slovakia). It is also noteworthy that after so many years of formal liberalisation of the EU market, the option to switch to market prices does not yet exist for electricity households in Malta and Cyprus and gas households in Bulgaria, Greece, Latvia, Lithuania and Romania (i.e. there are no alternatives to regulated prices).

By contrast, the unregulated electricity and gas markets in Spain and Portugal are expanding. This may be explained by the fact that markets in these countries were open to competition earlier and that consumers had more time to adapt, while in countries that open their markets later, consumers need a longer "transition period". In addition, in Portugal regulated prices are set higher than the market price in order to stimulate the transition to an unregulated market.

Specific regulated prices for vulnerable consumers (often called "social tariffs") aimed at protecting consumers who spend most of their energy income exist in several countries (seven in electricity and one in gas), but the available data in Table 1 shows that the percentage of users of prices for vulnerable consumers is relatively low.

In some countries there is also a link between the price and the so-called competitive market. For example, Denmark, the marginal cost is set at such levels that the cost is not lower than the cost of the service. A similar approach was introduced in Spain in 2004.

In most countries, it is the regulator that sets regulated prices, while in France, Greece, Hungary and Spain the government sets them, and the regulator only gives an opinion.

Natural gas pricing in Bulgaria

In exercising its powers of price regulation, SEWRC may apply different methods of regulation, determine the performance indicators of energy companies, indicators of comparability between them, fulfilment of basic criteria.

Pursuant to Ordinance No. 2 of March 19, 2013, on the regulation of the prices of natural gas (NRCSPG), issued by the Chairman of the State Commission for Energy and Water Regulation, SEWRC applies the following basic methods of price regulation:

1. "rate of return on capital" at which the commission, after carrying out the regulatory review, shall approve the prices and required annual revenues of the energy undertaking for a regulatory period of not less than one year; a subsequent regulatory review shall be carried out at the discretion of the committee or at the request of the energy company, with significant deviations between the approved and reported elements of the required revenue;

2. "price cap" and "revenue ceiling", in which the regulatory period lasts from 2 to 5 years; following a regulatory review, the commission shall approve the prices and required annual revenues of the energy company for the first year of the regulatory period and may amend them at the end of each price year or at the end of the regulatory period.

For the purposes of price regulation, SEWRC may apply comparability indicators between energy companies and require the fulfilment of basic benchmarks based on analyses using data from good practices at national and international level.

Prices of a public natural gas supplier

The prices at which the public provider sells natural gas to final suppliers and to customers connected to the gas transmission networks shall be formed on the basis of the last demanded estimated quantities of natural gas from the final suppliers and customers connected to the gas transmission networks, and the cost of their supply from imports into the internal market, from local extractive industries, from natural gas reserves and from the component of the "public supply" activity.

The price of natural gas at the inlet of the gas transmission networks is formed by the public provider as a weighted average, taking into account the most recently requested estimated quantities of natural gas from imports into the domestic market, from local extractive enterprises and from natural gas reserves for sale in the next period, contracts for the supply and transmission of natural gas to the Bulgarian border and the average exchange rate of the Bulgarian National Bank in BGN against the foreign currency in which natural gas imported into the country is paid for the period of forty-five days preceding the months of the submission of the price confirmation proposal.

The cost of supplying natural gas also calculates the component of the "public supply" activity up to 2.5 percent annually from the approved average purchase price of natural gas. The component of the "public supply" activity includes the costs of storage of natural gas, which are calculated on the basis of a plan submitted by the company for the quantities of natural gas for injection and extraction, valued at the current storage price approved by the commission. The periodic change in the price of natural gas takes into account the difference between the estimated and actual reported storage costs.

Prices for distribution and supply of natural gas

Prices for the activities of "natural gas distribution" and "supply of natural gas from a final supplier" are regulated by the SEWRC through the "price cap" method according to Art. 3 of the NRCSPG. SEWRC approves tariff structures by customer group, reflecting the allocated annual revenue required to provide the service for each group based on a service cost survey submitted. The current tariff structures and prices for the end customers of the gas distribution companies are differentiated depending on consumption (household and non-household), uniformity and non-uniformity of consumption and corresponding consumption.

Prices are formed on the basis of the required annual revenue and the estimated amount of natural gas distributed and supplied over a period of 2-5 years, approved by the Commission.

The required annual revenues include the economically justified costs associated with the transmission of natural gas and the return on capital. Annual costs include all costs directly related to the licensing activities of gas companies and approved by SEWRC. Return on equity is defined as the product of the regulatory base of assets and the rate of return on capital. The regulatory base of assets is the recognised value of the assets on which the energy undertaking receives a return on its invested capital. It includes realised investments and working capital less accumulated depreciation and financing (income from accession, grant schemes, donations, grants, etc.). The rate of return on capital is equal to the

weighted average cost of capital. The weighted average cost of capital is the rate of return on the attracted and the equity of the energy enterprise, weighted according to the share of each of these sources of financing in the total capital structure.

$$WACC = E * \frac{Re}{(1-T/100)} + D * Rd \quad (2)$$

WACC – Weighted average rate of return on capital before tax;

- E – share of equity in total capital;
- Re – rate of return on equity after taxation;
- T – corporate tax (10%);
- D – share of debt capital in total capital;
- Rd – rate of return on attracted capital.

The rate of return on equity is calculated using the capital asset valuation (CAPM) method, which is the most appropriate to calculate because it is based on measurable inputs and is the most commonly used by European regulators. According to CAPM, the cost of equity should be considered as the sum of the risk-free rate of return paid by each investor plus the risk premium multiplied by the beta (β). The risk-free premium as a component of CAPM is applied to offset (compensate) the long-term risk in the economy inherent in the least risky (or practically risk-free) economic actor – the state.

The formula for calculating the return on equity using the model for assessing capital assets is:

$$E(Ri) = Rf + \beta (E(Rm) - Rf) \quad (3)$$

- E(Ri) – the expected return on equity;
- Rf – the risk-free interest rate;
- β – beta is a relative risk measure showing the risk of a company relative to the risk of all companies in the market;
- E (Rm) – the average return on the market portfolio;
- E (Rm) – Rf – the equity premium or the required return over the equity risk premium.

In regulating prices in the energy sector in connection with the calculation of the rate of return on equity, SEWRC applies the CAPM using data published on the official website of Aswath Damodaran - Stern School of Business and the Bulgarian National Bank (BNB).

The prices for distribution and supply of natural gas are formed as the ratio between the discounted required annual revenues and the discounted quantities of natural gas for the respective period.

Prices are formed on the basis of planned data on natural gas sales, investments and costs for a period of 2-5 years. Planned sales have an impact on prices, with lower volumes leading to higher prices and conversely higher volumes reducing prices.

Each year, SEWRC conducts a regulatory review of the implementation of the approved business plan parameters by the gas distribution company (GDC). In case of significant deviations between planned and reporting indicators, the regulator may request the GDC to submit a proposal for updating the business plan/prices. For its part, the GRC may also request an update of the business plan/prices in the presence of objective circumstances.

According to the NRCSPG, prices can be updated annually with an inflation index for the previous year and a coefficient for improving efficiency, as well as performance indicators for

natural gas quality and quality of service. These updates are not applicable as methodologies for their implementation by SEWRC have not yet been established.

Prices for connection of customers to gas distribution networks

According to the Law on Energy and NRCSPG, SEWRC regulates the prices for connection of customers to gas distribution networks, which are formed by customer groups depending on the declared maximum capacity and pressure and the corresponding recognised costs for the group. Prices for connection to the gas and gas distribution networks of extractive gas pipelines, gas storage facilities, liquefied natural gas facilities, gas production facilities from renewable sources, gas distribution networks and non-household customers outside the above groups are individual and include actual costs for the above mentioned groups and the construction of facilities for connection to the network of the respective enterprise.

In accordance with the provisions of the NRCSPG, consumers are charged a price for joining the Gas Distribution Network (GDN). It includes part of the cost of joining without profit. These are mainly the costs associated with issuing documents from different institutions, as well as the costs of performing construction and installation work for joining the network. These costs are capitalised and included in the assets' regulatory base on which the distribution prices are formed. The revenue from the acquisition represents the financing of the gas distribution company by the customers. Therefore, the regulatory base of assets is reduced in the calculation of distribution prices in order not to duplicate these revenues. Revenue from accession is treated as a type of "asset" that is depreciated and its value decreases the regulatory base of the assets.

Balancing prices

SEWRC adopted Rules for Balancing the Natural Gas Market and Methodology for Determining the Daily Imbalance Charge. The rules for balancing the natural gas market (promulgated State Gazette 99/13 December 2016, amended and supplemented SG 57/07, July 19, 2019) are of key importance for creating conditions for opening the natural gas market and ensuring unimpeded market access for all market players, including new entrants, by establishing transparent and fair market-based mechanisms for the supply and transmission of natural gas. These rules ensure that network users will be able to be responsible for balancing their balance portfolios to minimise the need for an operator to take balancing actions. The methodology for determining the daily imbalance charge (issued by the Chairman of the Energy and Water Regulatory Commission, promulgated SG 57/19/2019, effective 19.07.2019) determines the method of calculating the amount of daily imbalances and of prices for positive and negative imbalances, ensuring the formation of non-discriminatory imbalance charges for users and creating incentives for transmission system users across the country to balance their balance portfolios efficiently.

Prices for access and transmission of natural gas through gas transmission and/or gas distribution networks

The Bulgarian gas transmission system operator (GTSO) Bulgartransgaz JSC has been applying the input-output tariff

model since the beginning of October 2017. The tariff system developed by it is two-component and includes tariffs on the basis of reserved capacity (prices for access) and on the basis of the transferred quantity of natural gas (transmission prices).

The price for capacity (tariff element per MWh/day) is paid against the user's right to use the gas transmission system for the period of the contract concluded with the operator. The right to use the system is determined by the maximum daily amount of gas reserved by the user for a specified period. In addition, the user may be charged excess capacity if he exceeds these reserved values. The transmission price is determined on the basis of the actual use of the system or the actual consumption expressed in MWh, i.e. the value per unit volume of natural gas transferred from an entry point to an exit point/zone.

The prices are determined on the basis of the necessary revenue, including the costs of performing the licensing activity plus the return on the investments made, mainly in gas infrastructure. Two approaches can be applied to allocate the necessary revenue to the access price and the transmission price.

The first one is based on the rule that variable costs relate to the cost of transmission and conditional costs and returns on a regulatory basis to access costs. The other approach is to determine the ratio of payment of the total required revenue administratively: to those paid from the access price and to those paid from the transmission price.

The second approach is more widely used, since the major part of the variable costs (technological costs, fuel gas costs and electricity for the operation of the compressor stations) for the regulatory period are related to the so-called technological component - the component of the total cost of transmission. This approach is widely used in international practice.

Some countries in Europe apply both access and transmission costs - Belgium, the Czech Republic, Greece, the United Kingdom, Ireland and Portugal, and in these countries the access/transmission ratio shows a clear tendency to recover more than revenue from the cost of access. For example, in Greece and Portugal, 90% of the revenue is recovered from the cost of access. The observed ratio of revenue from access and transmission costs reflects the higher proportion of fixed costs (capital and fixed operating and maintenance costs) compared to the variable costs (variable operating and maintenance costs) of the gas transmission networks. In recent years, the trend for gas transmission system owners in the United States has been toward higher revenue ratios collected from cost of access to revenue from transmission cost than 90%:10% and 95%:5%.

Access prices are charged at the entry and exit points/zones of the gas transmission system owned by Bulgartransgaz JSC based on the allocated capacity of the respective points. Access prices are divided according to points/zones (input and output), interruption (solid and interruptible) and period (annual, quarterly, monthly, daily and intraday) of the product. Depending on the period of the capacity products, the access prices are set in BGN/MWh/day/(year, quarter, month or day).

The transmission price consists of: the transmission component - it is charged to all the input and output zones/points of the gas transmission system depending on the

allocated volumes of natural gas at these points/zones; technological component - it is charged to all input and output zones/points of the gas transmission system depending on the allocated volumes of natural gas at those points / zones; component of obligations to society - is charged to all national gas transmission system exit points/zones without exit points to natural gas storage facilities, depending on the allocated volumes of natural gas at those points/zones.

Prices for access and storage of natural gas

SEWRC regulates the prices for access and storage of natural gas in storage facilities in accordance with the Energy Act, the NRCSPPG and the Guidelines for setting prices for access and storage of natural gas in storage facilities using the method of regulation capital adopted by the Commission. The prices for access and storage of natural gas at which the operators of natural gas storage facilities, respectively combined operators, offer the same service to different customers under equal contractual conditions guarantee compliance with the principle of non-discrimination against all network users and at the same time, the specific characteristics of the national market are taken into account.

Conclusion

Most current studies and analyses of the role of natural gas in the global energy and economy have a significant place on tariffs and terms of supply contracting as one of the main parameters of the newly emerging gas market. Economic logic determines that the more developed and competitive a market is, the greater the lack of regulation and the right to apply free competition and the direct negotiation of service prices.

In parallel with the development of free trade in natural gas as a commodity, the demand for services related to the storage, transmission and access, distribution and supply of natural gas will increase. Whatever direct trade practices may be applicable to the designation of some of these services, those related to infrastructure investments will continue to be regulated, at least for the reason that they are a natural monopoly for a particular territory.

References

- Activity Report of the Committee on Energy and Water Regulation 2018.*
- Directive 2009/73. EC of the European Parliament and of the Council of 13 July 2009 on common rules for the internal market in natural gas.*
- Energy Community of Southeast Europe, Study on Tariff Regulation and Gas Quality European Energy and Water Regulatory Commission Annual Report 2018.*
- Radev, Y. 2007a. *Business Economics and Financial Management.* Publishing House "St. Ivan Rilski", Sofia (in Bulgarian).
- Radev, Y. 2007b. *Economics and Management of Mineral Resources.* Publishing House "St. Ivan Rilski", Sofia (in Bulgarian).