

TARIFF SYSTEM FOR GAS PURCHASE, TRANSPORTATION AND DISTRIBUTION IN THE REPUBLIC OF CROATIA

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1. INTRODUCTION

So far, the development and expansion of the gas transportation system in Croatia has been determined by the locations of gas and oil fields and customer centres. Therefore, the geographical arrangement of the gas transportation system was primarily connected to the development of domestic oil production and financed through the revenues from oil and oil derivatives sale, and initially targeted towards reducing flaring.

The development of the gas distribution system was based on the principle of solidarity, i.e., customers participated in gas network development. In addition to household connection charges, customers also paid for the contributions in gas distribution network construction (street gas mains, etc...). As the liquidity of the distribution network project was secured thanks to this customers' participation, the distributive difference (distribution margin) did not include the amount of capital return on investment but only the operating and depreciation costs. Today, however, the depreciation funds are generally not sufficient for replacement of the old gas network.

In 2000 the Croatian natural gas system consisted of: 28 direct industrial customers, with annual consumption ranging from $0.1 \times 10^6 \text{ m}^3$ to approximately $90 \times 10^6 \text{ m}^3$; 38 distribution companies whose annual natural gas consumption ranges from $1.6 \times 10^6 \text{ m}^3$ to $320.7 \times 10^6 \text{ m}^3$; 1 non-energy customer (petrochemical industry) with average consumption of $400 \times 10^6 \text{ m}^3$ a year; and one customer from energy transformation sector using $700 \times 10^6 \text{ m}^3$ of natural gas a year.

Gas wholesale (production, import and transport) was, before the energy sector reform, a part of vertically integrated company, INA. Therefore, the gas price at the exit from the transportation system reflected the price of commodity gas and the transportation service charge (all in one), and that price was different for distribution companies and direct industrial customers. Large customers (petrochemical industry and power generation stations) were charged contracted prices.

The price level as such did not allow for operation and expansion of the gas system, which as already mentioned was developed thanks to cross-subsidies and financial participation of customers. The price changes were the discretion of the Ministry of Economy.

Unbundling of activities and new arrangements targeting towards open gas market made evident the need for designing a particular tariff system for each activity i.e., for purchase, transportation and distribution of gas.

2. GAS PURCHASE TARIFF SYSTEM

Gas purchase tariff system was brought in August 2002. The price of gas (energy value 33.34 MJ/m^3) is same for all tariff customers, i.e., distribution companies and direct industrial customers (eligible customers negotiate the price) and can be adjusted four times a year, i.e., on a quarterly basis. The intention was to introduce the automatism in gas purchase price adjustments and, thus, to ensure the security of future gas market development. In a way, the tariff system is designed to enable all interested parties to set the sale price in the same way. It was taken into account that tariff system should not apply exclusively to INA, although INA is currently the only gas supplier at the Croatian gas market. This tariff system calculates the weighted price of gas bought by supplier (at this point established as an independent unit within INA Company), from domestic on-shore and off-shore production based on internal contract, or from import based on the current contacts with the Russian Gazprom. The price of import gas is plotted against the prices of competitive fuels at the Mediterranean market. The weighted price is adjusted automatically on a three months basis, if the difference between the new and old price exceeds the pre-set amount. By developing new supply routes, the weighted gas price can include the gas quantities from new sources.

The prospect that in the near future INA will not be a sole operator at the Croatian market was also taken into consideration. Hence, there is an open possibility left for another sole-source gas supplier, so it is sufficient to have only purchase (and not weighted) price in the formula. Presently, with INA disposing with gas from several sources, there is possibility left to use a weighted average of purchase gas prices from different sources.

At this point, characterised by the lack of competition (there is only one gas supplier at the Croatian market), the control over implementation of this tariff system is conducted by the Energy Regulatory Council. The supplier is bound to submit to the Council the calculation and all necessary elements within 20 days following the new prices coming into effect.

Currently there is no particular tariff system for storage services but they are included in the price for commodity gas. In this way customers with an unfavourable load curve who are principal users of storage services, can pass-through a share of the costs they incur to customers with a more balanced consumption.

It should be noted that at the time of writing this paper, the activities on designing a tariff system for gas storage were initiated.

3. TARIFF SYSTEM FOR GAS TRANSPORTATION

The Government of the Republic of Croatia has adopted the tariff system for gas transportation in August 2002. At the same time the Government adopted the Strategy of Gas Transportation System Development until 2011, proposed by the gas transportation operator. The Strategy includes the plans for developing a new supply route for import of gas from the Italian portfolio, with concurrent connections of the North Adriatic gas fields with on-shore consumption centres, development of an additional supply route when a need appears, and connecting some areas which are not yet gasified. Total foreseen investments in the observed period amount to approximately 460×10^6 US\$.

The tariff system should accomplish these fundamental targets: to convey proper signals to customers (each customer bears the costs incurred on the system) and to ensure the means for secure operation and development of the gas system in line with the Strategy of Gas Transportation System Development until 2011.

It is envisaged that the developed program tools, in addition to modules for calculating tariffs for individual participants of the gas chain (in this case, transportation, storage and distribution), include the elements allowing easier follow-up of the status and regulation of the gas industry. Further, the tariff system must be set for immediate functioning in conditions of open market.

The Croatian Ministry of Economy has selected two British consultants: PDC (Petroleum Development Consultants) and ECA (Economic Consulting Associates) for designing the tariff systems for transportation, storage and distribution of gas. On Croatian side, the Energy Institute "Hrvoje Pozar" was engaged to work with PDC/ECA on the project.

In addition, representatives of the Ministry of Economy were also involved in this activity, as well as representatives of gas supplier, gas transportation operator, the most important distribution companies, and eligible customers (petrochemical industry, power stations). The project participants provided the necessary data for calculation of pilot tariffs.

Tariffs for gas transportation are calculated and verified on the basis of the data provided by gas transportation operator and they include investments envisaged by the Strategy. The tariff calculation was carried out for a 10-year period.

As the gas transportation costs are primarily related to infrastructure, it was envisaged that annual costs of transportation system (investments, costs of operation, depreciation) be covered by employed (demanded) capacity and not per m^3 of transported gas, in addition to signals to customers to adjust (if possible) their consumption by switching to lower load periods. In this allocation the model applies the marginal approach.

The calculation of transportation tariff is based on the allowed revenue cap principle, which in the observed period consists of return on assets (investments) at X% rate, and is in line with the foreseen dynamics of investments as determined in the Strategy of Gas Transportation System Development until 2011. The depreciation and operating costs are added. In other words gas transport operation is enabled to receive the return on investment through tariffs. Thus, the sector is enabled to finance its investments through a credit of even or lower rate.

In this way the gas transport operator is guaranteed the return on investment, which allows for further development of the system. In situation so far, where Ministry of Economy exercised the price control, the required transportation tariff (namely, the gas price did not include the transportation) did not follow the dynamics of necessary investments. Thus, the Oil and Gas Company INA had no decision-making power regarding the system development. As the gas commodity price did not reflect the changes at the world market, the result was a long time stagnation of the Croatian gas sector.

Due to a lower risk rate in comparison with gas distribution operation, the return rate for the transport operator in tariff calculation, is also low and, as a rule, not sufficient for use of commercial loans, but it is high enough for other sources of financing, like e.g., World Bank loans. For these

reasons, among others, transportation system is set as unique, national (as is the case with PLINACRO company, gas transport operator) and government-owned.

We shall best illustrate the way the system functions is to describe a specific case. Firstly, the months in a year are categorised in three periods. They are peak months, off-peak months and shoulder months.

The observed unit where this tariff applies is a peak daily load (max. m³/day). This worth has been selected because it shows the capacity usage rate, due to the assumption that it can be corroborated by two ways, through data on hourly or monthly load.

Tariffs for each period are set before the beginning of the calculation year, based on demanded peak daily load (capacity) and consist of three numbers only (tariff for demanded peak daily load in the peak months, tariff for demanded daily peak load in the off-peak months and tariffs for shoulder period). Of course, the higher loads the system is exposed to, the higher the tariffs, while the shoulder period was introduced in order to enable to some customers a smooth transition from peak periods (basically winter months) in to shoulder period (basically, spring and autumn season) because it is not realistic to expect that customers can simply switch their consumption from winter to summer period.

The three mentioned numbers in the observed calculation year are equal for all transportation system users (distribution companies, direct industrial customers, and eligible customers), while the total transportation cost in the same calculation year depend on a peak daily load a customer effectuates in a particular period.

Because of the fact that transportation tariff in the observed year is equal for all users of transportation services, this tariff system is ready to function in conditions of open market as of today.

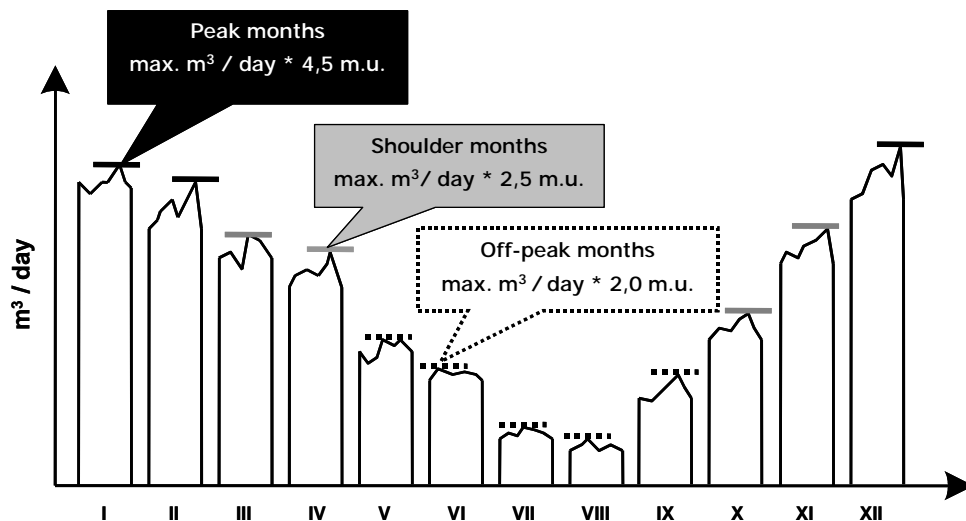


Figure 1. Calculation method for gas transportation costs – a specific case (m.u. = monetary units)

Tariffs mentioned in Figure 1 are fictional and used for illustration purpose only.

In order to calculate transportation costs in the coming year a distribution company needs the information on probable peak daily load in each month of the coming calculation year.

Of course, there will be only one peak day in each month and this data is essential (referring to probable peak daily load realised during the observed month in the day in which the peak is reached and not for all 30 days, while a distribution company does not have to know specifically which day it is).

In other words, a distribution company must determine 12 numbers, which represent probable peak daily loads in each month of the next calculation period. Shoulder periods consist of months of March, April, October, and November. The off-peak months are May, June, August, and September.

Given the fact that transportation system load does not depend solely on temperatures, at the end of each period a somewhat modified month categorisation is applied where peak months (i.e., system loads) are: January, February, November, and December; shoulder months are: March, April, June and October; off-peak months are July and August (basically, the shoulder period is somewhat longer).

Total gas transportation costs in the coming calculation year can be calculated by multiplying the expected peak daily load in each month of a specific period by the relevant tariff for this period. An example of this calculation is given in Figure 2.

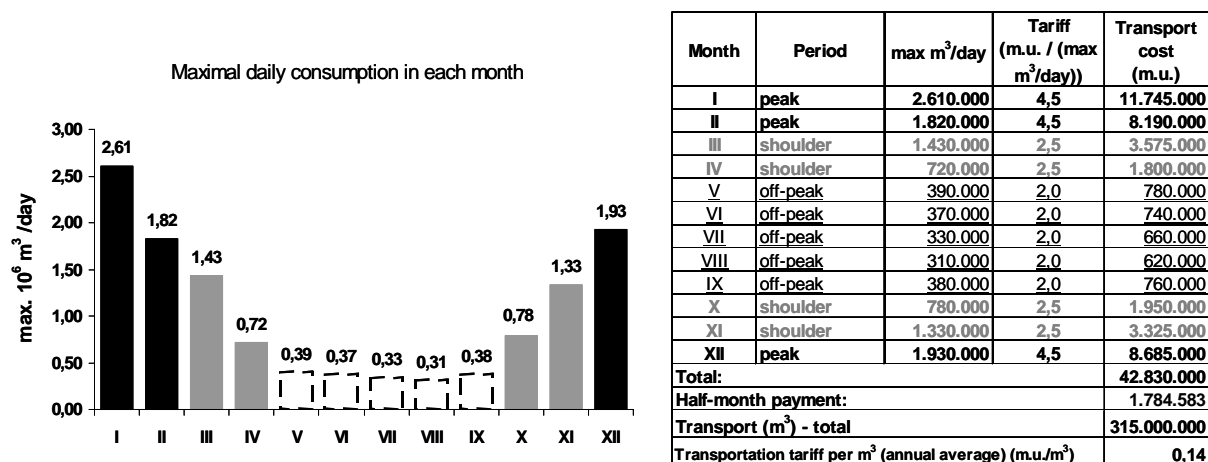


Figure 2. Transportation costs calculation - a distribution company case

It is evident that a user of individual transportation services will have lower total transportation costs if its load curve is well balanced, i.e., if the consumption is realised in the period of a lower system load. Contrary to this, the transportation service users with predominantly seasonal load curve will have higher transportation costs.

The above method is used for calculation of total gas transportation costs in the coming calculation period. Billing of gas transport, as defined by new tariff system as a document, will be carried out through 24 equal instalments. A half-month instalment is determined by dividing calculated total transportation costs with 24.

Gas transport operator measures the realised daily peaks in each month and at the end of year breaks even against the forecast (demanded) quantities (defined calculation of gas transportation for that calculation year).

Control over implementation of gas transportation tariff system will be in the hands of the Energy Activities Regulatory Council. The Council exercises the supervision over the implementation of the tariff system through control of specific costs of operation and analysis of investment plan execution (in case the transport operator fails to carry out the investment for which the tariff was approved, it will be reduced).

3.1. Current situation in Croatia – introduction of transitional period

Given the fact that at this moment the gas transport operator is not in a position to measure the daily peaks, but only supplied quantity (m³), gas transportation costs are being calculated in the old way and are expressed in m³ (100% “commodity charge”). The mentioned calculation procedure will be applied within a year from announcing the new tariff system, and that period is marked as a “transitional period”. In this period PLINACRO, gas transport operator, is responsible to provide the facility to measure daily peak loads at delivery and receipt points.

Transportation tariff of 0.122 kn/m³ for eligible customers and direct industrial consumers, and 0.182 kn/m³ (1 EUR = 7,35 kn, kn = Croatian Kuna) for gas distribution companies respectively, which will be applied during the transitional period, is determined in a way that there are three tariffs calculated for this period (kn per m³/day for peak and off-peak and shoulder periods) on the basis of expected total load of the system (daily peak loads within the national transportation system as a whole). After that, total transportation costs have been set for four categories (distribution companies, direct industrial consumers, power generation sector, and petrochemical industry) by their load curves.

By dividing total transportation costs of each category with forecast annual gas consumption of respective category, we calculate the average transportation tariff per m³ of each category. Direct industrial users and eligible customers have the same transportation tariff because their load curve is almost identical (balanced load), while distribution companies have a higher transportation tariff due to seasonal character of their load.

At the end of the transitional period all transportation users shall submit to the transport operator their information on expected monthly (not daily) consumption in the coming calculation period. Having gathered all the information, transport operator shall mathematically calculate the expected peak daily load of all transportation users, out of their monthly consumption. By summing it, the operator shall establish the system peak load in the coming calculation period, based on which he will calculate, by applying this model, the three relevant tariffs (kn by max m³/day), for peak, off-peak and shoulder periods. These tariffs apply to all system users and must be approved by the regulatory Council. In the coming calculation period the measurement of daily loads will be carried out with comparison of measured values against the mathematically forecast ones, and the final settlement will be made (final transportation costs calculation).

For the first following calculation period, the transportation users will dispose with data on effectively measured peak daily loads by months of the previous year. Of course, the ideal is to have, for example, peak load measurement over a period of 10 years, which will make forecasts for the following calculation periods much easier because the historical data will include the impacts of temperature (warm/cold year), etc.

What is, therefore, the procedure in the second year upon expiry of transitional period and in each following year? The suppliers will represent tariff customers before the transport operator and will conclude transportation contracts on their behalf, while eligible customers can either authorize their supplier to conclude the contracts or negotiate directly with the transport operator.

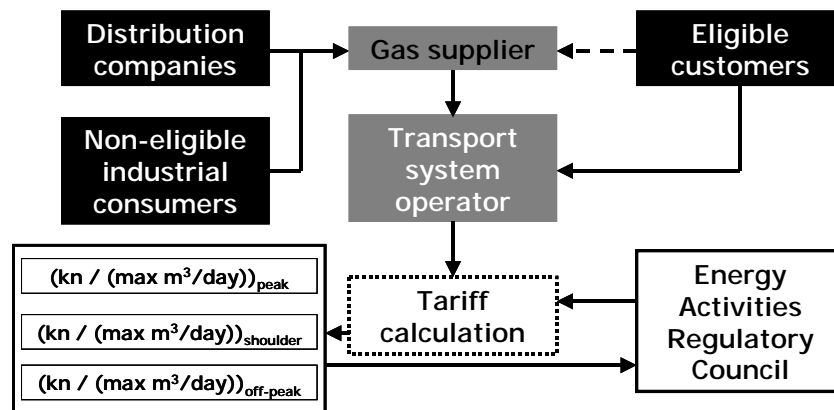


Figure 3. Data submission on expected monthly load (transitional period) and on expected peak load by months (after the transitional period) for transportation tariffs calculation

Therefore, gas distribution companies and direct industrial customers submit the data on expected peak daily load in the subsequent calculation period to their suppliers. The suppliers forward these data to transport operator. Eligible customers provide the data either directly to transport operator or through their supplier. Users must submit 12 numbers (expected peak daily load in each month of the following calculation period) 60 days prior to beginning of the period at latest. After that, a transport operator shall, not later than 30 days prior to the calculation year, publish in the Regulatory Council's Bulletin (upon approval by the Council) the three tariffs (kn per max m³/day) for peak, off-peak and shoulder months. These tariffs apply to all transportation users in the following calculation year. After that, a transportation user, e.g., a distribution company applies a very simple mathematical calculation (Figure 2) for calculating total transportation costs in the subsequent calculation period or (by dividing total transportation costs with 24) or for calculating the amount of half-month instalment for settling transportation costs.

Therefore, the system is simple. It is necessary to provide 12 numbers, read three and multiply them, depending on which month falls in which period, and to divide the product of multiplication with 24.

It is the transport operator who carries out this calculation. At the end of the year the settlement of accounts (final calculation) is carried out, against the effectively measured peak daily load. In case that the realized daily peak load within an observed period comes lower than anticipated (demand), transport operator shall calculate the transportation costs in amount not lower than 80% of the forecast peak daily load (demand). Namely, the analyses so far showed that the gas sale in distribution companies was lower, as much as 20%, in case of a very warm year.

4. TARIFF SYSTEM FOR GAS DISTRIBUTION

In the framework of the same project a new tariff system for gas distribution has been designed. Initially the project included five distribution companies, which were served for designing the pilot tariffs. In selecting the distribution companies, several criteria were considered. Firstly, the selected companies were those which are involved only in gas distribution, and not public utility companies, which in addition to gas distribution carry out other activities as well (garbage disposal, water supply, cemetery management, etc.). In this way, it was ensured that the costs shown are related to gas distribution activities only. Of course, the adopted energy laws put the distribution companies under obligation to separate accounts of gas distribution from accounts of other activities. Further, this pattern encompassed the largest and the smallest distribution companies in Croatia, assuming that the tariffs for all other companies will range between these two extremities.

This model as well is based on maximum allowed revenue (cap-revenue) methodology consisting of return on assets (investment) by Y% rate, where depreciation and operating costs are added. By dividing total allowed revenue in the observed year by forecast gas quantity we obtain the average distribution difference (distribution margin), which is then allocated to individual customer categories within the distribution system (households, industry, services, agriculture, boiler plants...) against their load factors, and by applying the marginal approach. The model output is, therefore, a distribution difference for each of the mentioned categories, which is calculated and applied at the annual level. In case that a distribution company incorrectly forecasts gas consumption in the next year (in case of exceptionally warm year) and its actual revenues turn out to be below market values, the model shifts the "allowed-actual" difference to the next year and allows the distribution company to increase its tariff in that year (distribution difference). If its actual revenues come higher than the value of allowed maximum revenue (exceptionally cold year) the model will lower the tariff (distribution difference) in the following year. Should the distribution company have such costs that final price with calculated tariff (distribution difference) exceeds the price of competitive fuels, it can use the return on investment rate (assets minus customers' contributions), lower than Y%.

Due to a higher risk rate comparing to gas transportation, the return rate for a distribution company in tariff calculation, is higher than one allowed to the transport operator.

However, it should be noted that there is one specific element in the development of Croatian gas distribution sector. It has been already mentioned that this system had been developed following the solidarity principle, i.e., all customers participated in gas network development by paying the contributions for gas network construction, due to which they had cheaper gas. In this way, gas distribution companies already operate at some extent on somebody else's distribution network.

Due to that it was necessary to avoid the risk of double collection when designing the tariff system. Namely, if a customer (e.g., a household) already paid contribution for gas network construction, this amount must not be included in the base on which a distribution company is allowed to earn the return on investment of Y% (regulatory asset base). Otherwise, a customer shall pay twice for the same amount, once through gas network construction contribution and again through gas price.

This is why within this model a distribution company will be allowed a return on investment only on invested assets, and not on the amount raised from the customers. In case that the whole distribution network was funded solely by customers (which is not the case in reality, but a customers' portion of funds in total investment was usually 60% because of time gap between investment realisation and collection of contributions for gas network or customers' connections and gas consumption increase), a distribution company only operates on someone else's property and the tariff covers its costs of operation only.

On the other hand this tariff system makes it possible to revitalise the old gas network in situation when a new contributions collection from customer is not feasible. Gas network construction contributions ensure the liquidity of the project in the initial period while gas consumption was still undeveloped. Today, with the new tariff system and well developed consumption, a distribution company is in a position to replace the old network thanks to loans with return (interest) rate below Y% as guaranteed, and pass through in the gas price. In other words, customers' charges for gas network construction in this case are treated as "pre-payment".

Further, in this way, a gas distributor, i.e., gas network owner is motivated for gas network expansion outside the high-density consumption areas as well towards the lower density areas as long as the return on investment of Y% is assured, and the distribution difference (distribution margin), or final gas price is competitive to other fuels (in terms of their market values).

The supervision over tariff system implementation will be carried out by the Regulatory Council, as in the case of tariff system for gas purchase and transportation. Given the fact that tariffs (distribution difference) are calculated on the annual basis, the Council has a possibility to verify the

tariffs before the next calculation period. The filled-in model, with data about asset value (minus the customers' contributions for gas network construction), costs of operation, forecast investments and gas demand in the next year, in addition to 9-year forecast (hence, a total 10-year forecast) should be forwarded by a distribution company to the Council. The Council will control the level of individual specific costs i.e., investments, and allows a total or partial cost pass-through to tariffs, or to end-user. Also, as in the case of transportation system, the Council observes the dynamics of the investment program realisation. If the investment for which the tariff has been approved fails to be realised, consequently the level of allowed revenue, i.e., tariff can be reduced in the following year.

The Council can apply the "benchmark" analysis for control of specific costs, by observing the worth of the same specific indicator (as, for example, the worth of cost of operation by employee) in all 38 gas distribution companies in Croatia. The companies, whose costs are above the average, will not be able to pass through the difference to tariffs (at least not entirely), i.e., to end-users but will have to recourse to their internal reserves, or to increase efficiency. The companies where the costs are below average can transfer the difference in the profit. This provides an incentive to efficiency improvement. Mainly, the Regulatory Council can allow that cost levels which emerge when the service is provided in an efficient way. On the other hand it can exercise pressure aimed at efficiency improvement through reduction of allowed costs level. This applies to specific investments as well. While in the case of gas distribution, only Croatian gas distribution companies will be benchmarked, while in case of gas transportation (considering the fact that there is only one gas transport operator in the country) the international benchmarking will be applied.

In time of writing this paper, the tariff system has not been adopted as a document yet. The set of energy laws determines that the Government of Croatia should enact the tariff system, and drafters would be the energy sector entities. As in the case of gas purchase and gas transportation tariff system, which were drafted by gas supplier and gas transport operator respectively, the gas distribution tariff system is expected to be drafted by one distribution company. Based on this draft the Government of Croatia would adopt the given methodology and assign the supervision over implementation of the tariff system to the Regulatory Council (hence, all other gas distribution companies will forward their tariff system drafts for their respective distribution areas to the Council).

As already mentioned, pilot tariffs for gas distribution have been drafted for 5 distribution companies. The Energy Institute "Hrvoje Pozar" organised and conducted the training for all gas distribution companies in Croatia. At this occasion all distribution companies were given the program model, documentation and presentation and the Institute's staff continue to provide their expertise to the companies in mastering the tariff calculation and model implementation.

Maybe, the most important is to describe the responses to the proposed methodology coming from the field. The initial resistance to the changes expressed by distribution companies was present practically at the beginning of each course where they were getting familiar with the new tariff methodology. The reason for this usually was the lack of information, which is confirmed by the fact that so called large distribution companies, which had shown interest for reform of the gas sector, were already partly informed about the subject. The resistance was stronger among the public utility companies, with mainly low gas consumption, as they did not have all necessary information. That is why every course was used for broader dissemination of knowledge about the gas sector reform. After providing necessary information, a positive assessment was given to the possibility to transparently show the return on investment through the gas pricing, where the supervision and control now shifts from local authorities (which were not adequately staffed for this task) to the regulatory Council.

Some problems were noticed as well, regarding the tariff calculation as such (distribution difference). These problems primarily relate to present asset value. Namely, when considering so called book asset valuation, if the Y% rate-return on this value were allowed through gas price (reduced by a share of customers' contributions), the tariffs between individual distribution companies will not be worked out on comparable bases (the companies have applied different depreciation rates, legally-prescribed or accelerated ones, very often not reflecting the inflation, etc.). This brings the need for market evaluation of assets, but, again, uniform criteria must be applied in each of the cases described. The Regulatory Council should outline these criteria.

5. CONCLUSION

The Croatian gas system has undergone a several changes recently. They are a part of the process of reforming the country's energy sector targeted, among other, towards approximation with the EU regulation. This is one of the conditions of joining EU. In accordance with Article 13 of the Directive 98/30/EC, the companies in gas industry should have separate accounts for transport, distribution, and storage of natural gas, but consolidated accounts for non-gas activities. In other words, the separation of accounts for these activities, transportation and distribution services as well as transparent cost records or calculation of individual tariffs, are essential. The end-user must know what portion of the price is a commodity charge, and what are the charges for storage and transportation through transportation or distribution networks. In addition to account separation, physical separation of purchase and transportation has been conducted, by establishing a separate company for gas transportation, PLINACRO.

By enacting the tariff system for gas purchase activity it has been enabled that gas commodity charge automatically follows the changes at the world market. This allows for unhindered future development of the gas system. Since the tariff system for gas purchase enables the multiple resources supply of eligible customers, it opens the way for introduction of open market. This process is endorsed by the tariff system for gas transportation, which is ready to function in open market conditions. Both tariff systems were adopted in August 2002.

In time of writing this paper the tariff system for gas distribution was not adopted yet but all necessary preparations were conducted (training of gas distribution companies). After all three tariff systems have been adopted, and their supervision assigned to the Regulatory Council, the gas pricing in Croatia should be as described in Figure below.

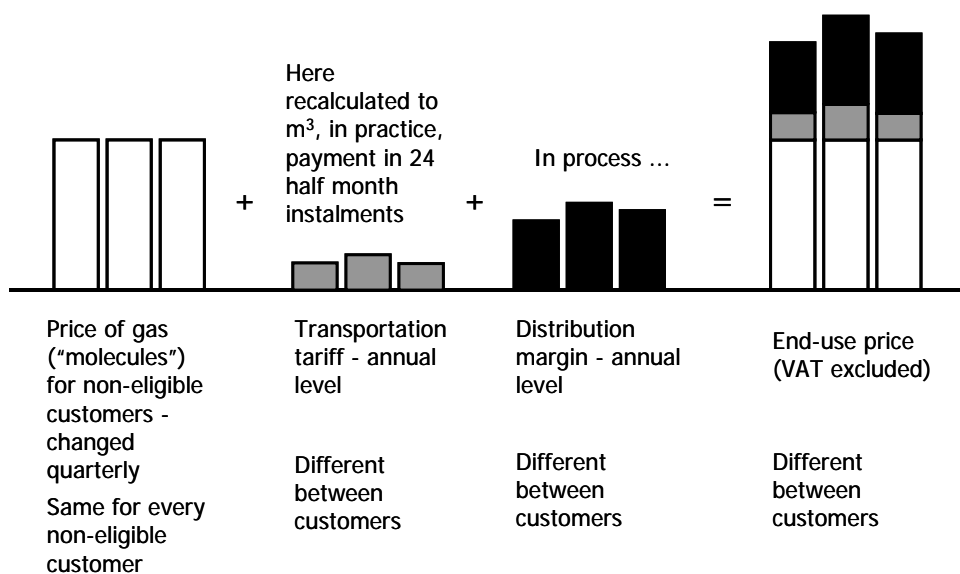


Figure 4. Pricing (tariff setting) for individual segments of the gas chain in case of a gas distribution company

The preparations for gas storage tariff system were also under way in time of writing of this paper.

With regard to tariff systems implementation, the practical experience has pointed at some problems, which are primarily results of unresolved problems in the past (inherited costs, asset values as base for return through gas price evaluated by different, often incomparable methods, etc.) which requires additional measures, like e.g., determining market values of assets by uniform criteria.