NEW GAS SYSTEM (MARKET) PLANING IN CROATIA

Main authors

R. Bosnjak B.Sc.
Energy Institute Hrvoje Pozar
Zagreb, Croatia

S. Vulama MSc
Energy Institute Hrvoje Pozar
Zagreb, Croatia
ABSTRACT

Croatia is a country with a transitional economy. The development of the gas market over the past thirty years has been determined by the locations of gas and oil fields and customer centres. Therefore, the geographical arrangement of the gas transport system was primarily connected to the development of domestic oil production and financed through the revenues from the sale of oil and oil derivatives, and initially targeted towards reducing flaring. Gas wholesale (production, import and transport) was, prior to energy sector reforms, a part of the vertically integrated company INA.

During the war, the increase of gas consumption stagnated and reached pre-war values in the second half of the 1990s. There were no investments made to the gas transport network in the 1990s. Even today, natural gas is available only in northwest and eastern Croatia, where gas distribution is well developed, but it is not available in the south and southwest of the country or in the coastal and littoral regions.

The Government of Croatia initiated the energy program PLINCRO with the aim of achieving an increase in gas use in the structure of energy consumption, as well as to create conditions for expanding the gas network in areas where it already exists and particularly in those areas that have not yet been gasified. The PLINCRO programme was followed by the “Master Plan for Natural Gas in the Republic of Croatia until 2025” and then by the “Energy Strategy of the Republic of Croatia” drafted during the late 1990s and formally adopted in early 2002. The objective of reforms to the natural gas market is to ensure the conditions for the development of a gas system in coastal Croatia, to ensure unhindered development of the gas system through a tariff system, create the conditions necessary for enlarging distribution companies and to achieve lower costs for the required level of security through regulations, while maintaining the quality of the energy distributed.

In order to achieve the mentioned objectives of the energy strategy, it was essential to design a proper organisation of the gas industry and of energy sector as a whole and then to include these within the regulations. This paper describes the process of how these objectives were met, and as such could be defined as the planning process of the development of a new gas system (market).

Economical optimization models are used in the process of new distribution systems planning. Description of the models and the necessary legal background changes taken to transform the gas distribution sector from communal to market oriented activity will be shown in the paper.

The results of the ongoing gas system (market) planning in the Croatian gas sector will be shown in the conclusion.
# TABLE OF CONTENTS

ABSTRACT

1. BACKGROUND
2. MASTER PLAN
3. ENERGY SECTOR REFORMS
4. GAS TRANSPORT SECTOR
   4.1. Gas transport planning
   4.2. Gas transport tariff system
5. DISTRIBUTION SYSTEM
   5.1 Existing distribution system
   5.2 Gas distribution tariff system
   5.3 New gas distribution systems
   5.4 Gas distribution concessions
6. CONCLUSION
7. REFERENCES
8. LIST OF FIGURES
1. BACKGROUND

Croatia is a country with a transitional economy. The development of the gas market over the past thirty years has been determined by the locations of gas and oil fields and customer centres. Therefore, the geographical arrangement of the gas transport system was primarily connected to the development of domestic oil production and financed through the revenues from the sale of oil and oil derivatives, and initially targeted towards reducing flaring. Gas wholesale (production, import and transport) was, prior to energy sector reforms, a part of the vertically integrated company INA.

During the war, the increase of gas consumption stagnated and reached pre-war values in the second half of the 1990s. There were no investments made to the gas transport network in the 1990s. Even today, natural gas is available only in northwest and eastern Croatia, where gas distribution is well developed, but it is not available in the south and southwest of the country or in the coastal and littoral regions.

The Government of Croatia initiated the energy programme PLINCRO with the aim of achieving an increase in gas use in the structure of energy consumption, as well as to create conditions for expanding the gas network in areas where it already exists and particularly in those areas that have not yet been gasified. The PLINCRO programme was followed by the "Master Plan for Natural Gas in the Republic of Croatia until 2025" and then by the Energy Strategy of the Republic of Croatia drafted during the late 1990s and formally adopted in early 2002. The gasification of Croatia in areas still without natural gas, as well as further gasification of already gasified areas, were set as the priorities of the energy strategy.

According to the Utilities Act, the responsibility for organizing natural gas distribution was on the municipalities and cities. Natural gas distribution was within the framework of the remaining utilities and it was common for the price of natural gas to spill over onto other communal activities, such as maintenance of cemeteries, water supply, waste disposal and the like. Gas distribution prices were approved by the local self-government unit where the gas distribution operation was located. Since the local self-government units were owners of the distribution companies, their Councils would determine the margins for distribution companies. Most often, the company suffered losses because there was no mechanism in place for automatic price increases.

The objective of reforms to the natural gas market is to ensure the conditions for the development of a gas system in coastal Croatia, to ensure unhindered development of the gas system through a tariff system, create the conditions necessary for enlarging distribution companies and to achieve lower costs for the required level of security through regulations, while maintaining the quality of the energy distributed.

In order to achieve the mentioned objectives, it was essential to design a proper organisation of the gas industry and of energy sector as a whole and then to include these within the regulations. This paper describes the process of how these objectives were met, and as such could be defined as the planning process of a the development of a new gas system (market).

Planning of the new gas system (market) development consist of several sections that are strongly interdependent: the gas sector master plan, gas transmission sector development and distribution sector development.

2. MASTER PLAN

The first result of the PLINCRO programme was the publication “PLINCRO – The Croatian gasification project – previous results and future activities”. This publication analysed: natural gas supply routes for Croatia and individual characteristics of the state; actual and planned production and consumption of natural gas; analysis of the energy potential; technical and technological characteristics of domestic production and an analysis of the supply stability and the need for diversification; ecological and economic characteristics (price and tariff policy); economic and financial aspects of construction of a transport system; institutional framework of the gas system and ownership and organization of the natural gas sector. These analyses were conducted at the national level. However, the need soon
arose to conduct individual analyses at the county level. In the first phase of the programme, the following tasks were set: to forecast natural gas consumption by county and by category; forecast the required new investments in the natural gas distribution system to the full gasification of the distribution area; a repeated assessment of the development of the transport and storage system; long-term marginal cost of transport and storage (at the level of a single national system) and distribution (by county).

These tasks were carried out in the late 1990s and described in the study “Master Plan for Natural Gas in the Republic of Croatia until 2025”.

Forecasts have been developed for the categories of households, industry, services and agriculture. The forecast for necessary amounts of natural gas for thermal power plants, public heat plants and public boiler plants, own-use consumption and NGL plants, non-energy consumption and hydrogen production, has been conducted at the national level.

According to the analyses conducted (by county), household consumption of natural gas could grow from $501.2 \times 10^6$ m$^3$ (in 1998) to $1534.5 \times 10^6$ m$^3$ (in 2025) with a growth of household connected on gas network from the current 20.9% to 47.4%. Consumption in industry could grow from the existing $675.9 \times 10^6$ to $1,791.0 \times 10^6$ m$^3$, in services from $132.4 \times 10^6$ to $432.1 \times 10^6$ m$^3$ and in agriculture from $20.6 \times 10^6$ to $66.5 \times 10^6$ m$^3$. Total consumption in the Republic of Croatia could increase from the current $2,550.7 \times 10^6$ to $6,300.6 \times 10^6$ m$^3$ (in 2025).

Anticipated investments in the distribution system up to full-scale gasification of the foreseen distribution area were determined for 15 of 21 counties. Total investments regarding the above-mentioned 15 counties amount to $350.8 \times 10^6$ euro. Anticipated investments in transportation and storage systems were estimated at a total of $719 \times 10^6$ euro (Referent scenario).

According to the Energy Development Strategy, total natural gas consumption to 2025 could increase to $5.07 \times 10^9$ m$^3$. According to the most recent energy need forecasts, which also take into account estimated natural gas consumption in the refineries at Rijeka and Sisak, total consumption of natural gas could grow to $4.47 \times 10^9$ m$^3$ in 2010, and $5.1 \times 10^9$ m$^3$ in 2014.

Though the result of the estimated growth of heat energy consumption from the Master Plan were revised by the Energy Strategy of the Republic of Croatia, reforms to the gas sector are necessary. Reforms to the gas sector are essential not only to achieve the mentioned objectives of the Master Plan and Energy Strategy of the Republic of Croatia. Croatia’s goal is to enter the European Union, and therefore it is necessary to recognize and apply the reform guidelines to the energy sector in the European Union and to ensure the gas sector is reorganized and ready for our accession to the EU.
3. ENERGY SECTOR REFORMS

In 2000, the European Union passed the Directive defining the opening of the gas market, thereby allowing for the open and non-discriminating access to the network by third parties. The objective of market liberalization is the introduction of competition to the gas market, thereby influencing a reduction of gas prices for consumers. The concept of competition implies both the direct competition of gas against gas and the competition of gas against other energy sources.

Taking into account the guidelines in the EU Directive, Croatia has passed a set of laws which define the energy market, including the natural gas market. The Energy Act is the general act addressing the basic issues within the energy sector. This Act creates the assumptions for opening the energy market and improving the quality of energy services.

The Regulation of Energy Activities Act established the Council for Regulation of Energy Activities, which has a legal successor, the Croatian Energy Regulation Agency (CERA).

The Natural Gas Market Act defines the activities carried out as market activities, as well as those activities carried out as public services. The Act defines the terms by which natural gas supply is conducted and establishes the responsibility for natural gas supply and the setting of import quantities for natural gas, responsibility for long-term planning and development of the natural gas transport system, the reliable and economical transport of gas to the final consumer and gas distributor as well as responsibilities for construction and maintenance of the gas pipeline distribution system and reliable and economical gas distribution to the consumer.

The passing of these acts was a necessary change in the organization and manner of planning of the gas sector, both as a transport activity as well as the distribution of gas. The passing of a new Natural Gas Market Act is planned to be passed in autumn 2006 which will take into account the provisions of Directive 2003/55/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in natural gas and repealing Directive 87/30/EC. The new Natural Gas Market Act will be harmonized with the concepts in the abovementioned Directive.

4. GAS TRANSPORT SECTOR

4.1. Gas transport planning

In the unbundling process, PLINACRO d.o.o. was established as an independent company through separation from the transport activities of INA - Croatian oil and gas company. PLINACRO is the fully state-owned Croatian gas transport company. According to the Natural Gas Market Act (OG 68/01), the gas transporter guarantees the reliable and quality transport of natural gas from the entry point into the transport system in the territory of the Republic of Croatia to the transfer to the authorized gate station of the gas distributor, and to the direct and authorized buyers. The gas transporter conducts the tasks of gas transport, development, construction, maintenance, management and supervision of the entire transport system and other tasks necessary for the technical functioning of the system.

The existing gas system is developed only in central and eastern Croatia. The existing capacities of the gas pipelines, with existing consumption, domestic gas production and imports from Russia have become the limiting factor in the development of the natural gas market, and particularly to the real opening of the market. For that reason, steps were taken to shape a new gas system which should secure:
- high quality and secure supply of gas;
- supply of gas to the coastal regions of Croatia;
- long-term increase of consumption of natural gas;
- diversification of the supply of natural gas;
- connecting the transport system with the systems of neighbouring countries.

The starting point for the formation of such a system are: expected consumption of natural gas (revised Master Plan, Energy Development Strategy, etc.), forecast domestic consumption, new domestic gas storage, long-term retention of the existing supply route from Russia, supply of gas from
domestic gas fields in the northern Adriatic and use of the same pipeline for gas imports from Italy and opening a new supply route from Hungary. Based on the above, PLINACRO has prepared the "Strategy of Gas Transportation System Development until 2011" which was adopted by the Government.

The time table for the development of the three regional groups of gas transmission projects is defined in the Strategy: the Pula-Karlovac transmission system, Lika and Dalmatia transmission system, and central and eastern Croatia gas transmission system.

The Pula-Karlovac gas transmission system is forecast to transport $1.5 \times 10^9$ m$^3$/year and is adapted to the gas production possibilities from the Northern Adriatic natural gas fields and addition imports in accordance with the needs of the Croatian market. The plan foresees the construction of a gas pipeline over four years. The 192 km long pipeline is to be constructed of steel pipes (500mm diameter) with a 75 bar working pressure. The pipeline is to start at Pula and connect to the Ivana A-Pula pipeline, and end at the settlement of Draganić near Karlovac at the end of the existing Zagreb-Karlovac pipeline. The plan also foresees the construction of a regional pipeline Pula-Umag which would ensure natural gas supply to the tourism towns on the western coast of the Istrian peninsula. Supply for the entire region would be carried out through 9 gate stations.

For the natural gas supply of Lika and Dalmatia, a pipeline will be built from Vrbovsko-Split. The capacity of this pipeline is planned for the purposes of mass consumption and industry in Dalmatia, as well as the needs of the 350 MW gas power plant at Obrovac. This pipeline, 290 km in length, is also planned to be constructed of steel pipes (500mm diameter) with a 75 bar working pressure. In addition to this main pipeline, 3 regional pipelines are planned with a total length of 97 km: Kaštela Žegarski-Obrovac, Benkovac-Zadar and Šibenik-Knin. Construction of 12 gate stations is planned. The plan foresees the construction of the pipeline within 5-6 years, with construction to be completed in mid 2010.

The gas transmission system of central and eastern Croatia requires the reconstruction of existing pipelines and construction of new pipelines which would permit the transmission of gas to underground storage facilities and long-term supply to the Slavonian counties. This new system structure is made up of the pipeline from Zagreb to Donji Miholjac, 240 km in length, with a 600 mm diameter and working pressure of 75 bar.

Figure 1. Existing and planed gas transportation system in Croatia
For all these projects, a detailed investment plan has been drafted and economic-financial analyses conducted. The level of transport tariffs for achieving the desired internal profitability rates has been calculated. An analysis of sensitivity of the transport tariff levels was also conducted as a function of changes to the desired level of internal investment return rate. The sensitivity of a reduced volume of gasification was also analysed in comparison to the full gasification plan. The real average transport tariff would be approximately 2 US¢/m³, with the necessity of bridging loans in individual years due to the time span between the forecast growth in gas transport quantities and the transport system investment dynamics.

Due to the favourable legal regulations, PLINACRO received a loan from the European Investment Bank in Luxembourg at a low interest rate for the financing of the development and modernization of the gas transport system in the Republic of Croatia.

4.2. Gas transport tariff system

Development of the gas system is financed through transport tariffs. The gas transport tariff system is developed. 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. The calculation of the transport tariff is based on the allowed revenue cap principle, which in the observed period consists of a return on assets (investments) at a rate of X%, and is in line with the foreseen investment dynamics as determined in the Strategy of the Gas Transportation System Development until 2011. The months in the year are categorised in three periods: peak months, off-peak months and shoulder months. Tariffs for each period are set before the beginning of the calculation year, based on peak daily load demand (capacity max. m³/day) and consists of three numbers. These values are equal for all transport system users (distribution companies, direct industrial customers and eligible customers) in the calculation year. Total transport cost in the same period depends on the peak daily load a customer effectuates in a particular period. Because the transport tariff in the observed year is equal for all users of transport services, this tariff system is ready to function in open market conditions.

The 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 transport for that calculation year).

Though it does not directly influence the development of the transport system, with the adoption of a tariff system for the supply of gas for tariff buyers, gas prices were no longer determined by the Government but by the then Energy Activities Regulation Council. The tariff system for the supply of natural gas is based on the cost of import and domestic gas and the exchange rate of the kuna against the dollar. Due to disparities of prices on the domestic and world markets, prices are monitored on a quarterly basis and when changes occur on the world market, gas prices are adjusted accordingly in Croatia.

5. DISTRIBUTION SYSTEM

5.1 Existing distribution system

During the process of reforming the gas transmission sector, activities on the gas distribution sector are conducted. As stated, the Utilities Act places the authority over the organization of gas distribution on the cities and municipalities. In the past, the splitting up of the gas distribution network and the creation of many small distribution companies was caused by municipalities, due to their inadequate size. As such, the Natural Gas Market Act passed the authority for concession granting over to the regional governments. Ownership of companies dealing with distribution through a concession is not defined under the energy acts, but by the Companies Act, which means that there are no special restrictions in the sense of ownership.
According to the Energy Act and the Natural Gas Market Act, the municipalities which to date have had the task of the utility service of gas distribution now become the owner of the company distributing gas as a company and no longer as a utility service, and conducts this activity with the goal of creating regulated profit. Competence and responsibility for the state of gasification of a specific region is currently in the hands of the county governments which grant concessions. Service tariffs for the distribution network are no longer determined by the county and city government but the Government in consultation with the Regulatory Agency which ensures that the tariffs are formed according to the approved methodology.

The energy acts have lead to the idea of enlarging distribution companies, separating gas distribution activities from utility services and privatization and recapitalization of distribution companies.

5.2 Gas distribution tariff system

Considering the characteristics of an energy supply network and a natural monopoly, the gas distribution service will be subject to regulations through a tariff system. At the time this paper was written, the tariff system for natural gas distribution had not yet entered into effect.

The Regulatory Agency establishes the methodology for establishing the tariff items for natural gas distribution, based upon which the distributors then calculate the tariff. The CERA regulatory agency supervises the application of the tariff system.

The tariff system is composed of two parts: the calculation of the distribution margin and the allocation to a specific consumer group.

The distribution margin is calculated in the following manner. The total revenues any individual distribution company can achieve for the following year (tariffs are calculated for the year ahead and are valid for one year) is made up of the amount for covering operating costs, depreciation and investment return. In short, the established total allowed revenues is divided by the forecast consumption of natural gas for that same year, which gives the mean distribution margin (which already includes the portion for investment return).

Through the mechanisms of allocation, this average price is divided into individual categories of consumers in accordance with consumption curves, in which consumers with constant curves (such as industry using natural gas for technological purposes) pay lower prices and consumers with a fluctuating curve, such as households, pay more. At the time this paper was written, the situation was opposite for certain distributors, i.e. industrial consumers were paying a higher gas price than households.

The Regulatory agency supervises the implementation of the tariff system through control of specific operative costs and analysis of the implementation of investment plans. In supervising application of the tariff system, CERA should also supervise specific investment and operating indicators, such that only those costs arising during the efficient provision of services are recognized in the price (tariff) and in that way transferred to the final consumer. Over time, comparative analysis can be used to apply pressure to increase efficiency.

5.3 New gas distribution systems

The law also defines the obligation of regional governments to draft energy plans for their counties, which includes a long-term plan of constructing the gas distribution network. Pursuant to such a plan, the county then issues a tender for the granting of a concession. The gas distribution system is developed in northern Croatia, while only two cities in the coastal region have a distribution system for city gas, with a limited capacity. At the end of the 1990s, the Energy Institute began with its projects for regional energy planning. These projects over time have grown into the project for the preparation and development of the natural gas distribution system. Development studies for the gas distribution system have been conducted to a larger or small extent in virtually all the counties where there is not currently a developed system: the southern non-gasified part of Sisak-Moslavina County, Karlovac
Regional energy planning is a methodological procedure, with a capacity to encompass all regional specificities and to devise a concrete long-term energy development plan of the area. Regional planning begins by taking into account the impact of long-range forecasts of socio-economic development on long-term heat energy demand by sectors of consumption. Energy consumption forecasts are developed separately for households, the service sector and industry.

Energy consumption analysis for households also analyses various other factors, such as geography, climatic, infrastructure, economic and other characteristics. The county is divided into several zones with similar spatial and climatic characteristics, types of residences, economic development, etc. In these zones, surveys are carried out on a representative sample of consumers. This survey includes questions relating to the characteristics of energy consumption as well as on socio-economic aspects which directly or indirectly influence energy consumption. Following this analysis in the base year, forecasts for energy consumption in households are calculated.

Each of the types of heat energy spent (heating, cooking and hot water) have their regularity and in general depend on various variables which change over time, thereby directly influencing future energy consumption and the calculation of energy needs forecasts for households to a given year in the future. As such, heating depends on the age of the structure, the size of the structure and the key variable, standard of living, which in terms of energy consumption means the share of the structure which is heated in comparison to total area: the higher the standard of living, the larger the area heated. This of course means that the entire structure is heated above a certain standard level. In the calculation for hot water for household use, two trends are in conflict, the reduction of the number of household inhabitants and the increased per capita need for hot water. Heat for cooking is calculated per capita and an increased standard of living means reduced heating for cooking per capita and a lower consumption of energy for the preparation of food in the household.

Based on a change of the total number of residents in a given area, the number of household inhabitants and the above mentioned regularities of energy consumption in households, a forecast is made for the useful household energy needs. In applying energy efficiency factor of various devices for energy transformation from useful heat to final energy, we calculate the final potential consumption of heat energy shown with the selected energy form; in our case, natural gas.

Though the average air temperature in coastal Croatia is relatively high, heat energy consumption in households is not small. In the northern coastal regions, which can be represented by the Primorje-
Gorski Kotar County, heat consumption will grow dependent on the zone from 850m$^3$ of natural gas in the base year to 1800m$^3$ in 2020. Heat consumption per household in the southern coastal regions, represented by the Split-Dalmatia County, will grow dependent on the zone from a minimum of 600m$^3$ in the base year to 1500m$^3$ of natural gas in the final study year.

In the service sector, assessment of useful heat energy consumption are carried out for tourism, trade, health care, education institutions and other public services based on the application of various norms (surface area of service sector, climatic conditions, specific energy consumption for heating, hot water and cooking depending on service branch, change of specific energy consumption over time, etc.). Larger facilities also include gas consumption for cooling.

In industry, the calculation of heat energy need forecasts is conducted based on the estimated growth of the GDP in the industrial branch in question and the changing values of energy intensity.

A location-based scheme of all energy consumption (household, services, industry, agriculture) is provided in a GIS database, with special emphasis on the heat energy demand by sector of consumption in all settlements individually.

The further procedure of defining the county energy plan begins with plans for gas network development. Plans are developed based on the heat energy demand analyzes and detailed maps and GIS and CAD tools. The gas network project is drafted onto 1:5000 maps for all settlements in the county. Though it is not economically viable to build a gas network in all settlements in the first years of gas distribution, the network is planned in such a way to enable the future development of the gas system for all settlements in the county. All the topology data and hydraulic calculation results were arranged in the MS Access database and connected with the GIS project, enabling simple and effective analyses and processing for further economic analyses.

Hydraulic calculation results are entered into a database tied to the GIS project, such that all budget data can be easily sorted and processed using various searches and search results are graphically depicted in space. For pipelines, the following data are required: pipeline code, settlement where the pipeline is located, code for starting node, code for final node, length of pipeline, internal pipe diameter, volume of gas flow through pipe, rate of gas flow through pipe, nominal pipe diameter, unit-based cost of pipe and total pipeline cost.

Figure 3 depicts the sections of the City of Zadar, with information regarding one pipeline.

Figure 3. Section of the model of the natural gas network for the City of Zadar and information for one pipeline

GIS and CAD tools allow for the very rapid configuration of the natural gas network and the repeated hydraulic calculation. With the economical optimization of the natural gas system, it is possible to optimize all the components of the natural gas system (transport system routes, high-pressure
distribution system routes, etc.) for the purpose of obtaining the greatest gas consumption with the lowest investment. An example of an optimized gas distribution system for Zadar County is shown in Figure 4.

The basic rule of gas network planning is that the gas network is brought to consumers only providing it is economically viable. Economic viability is a function of investment and demand development materialized in the investment (i.e., revenues realized by meeting such demand). As the gas network is laid in a street or settlement only once, the economic profitability of the gas network will depend on the (non)realization of foreseen demand growth dynamics. As the growth of heat demand in zones and sectors has already been determined, it is still necessary to work out the possible natural gas penetration dynamics. The survey gives insight into a series of influential values. In addition, a more active distributor approach to consumers, ranging from promotion to financial support, can accelerate the penetration of natural gas to the potential heat market.

When the price of gas paid by the distributor to the gas supplier and the sale prices for each consumption category are set, it is possible to begin the energy-economic analysis. The most adequate economic index is the internal rate of return and the time of return on investment. By defining the marginal rate of return, through the implementation of the economical optimization model, the gas distribution development time table phases are determined. Figure 5 shows the result of economic optimization of the gas system for Zadar County. The points represent smaller settlements, while the larger cities are divided into segments which are supplied with gas via the appropriate gate station. Red represents the areas of maximum profit. The area of maximum profit are larger urban centres with a large gas consumption density or smaller urban centres near a city gate station. Expansion of the gas network to more distant settlements, the brown, blue and green areas, reduces the calculation of internal return on investment.

Figure 4. Gas distribution system optimization for Zadar County
Due to the fact that the development of the gas transmission system will last at least 5 to 10 years, until the gas transmission system is complete, it would be good to develop the LPG-air mixture gas distribution systems. As the considered area is very far from an underground gas reservoir, the LPG-air mixture plant will be used upon completion of construction of the gas system to cover peak consumption. Economical feasibility of the LPG-air mixture project is determined through a very detailed economical feasibility model.

All the listed studies are used to define the gas system in the spatial planning documents of the surveyed area and as part of the documentation in concession tenders for gas distribution.

### 5.4 Gas distribution concessions

The concession granting terms and procedure for gas distribution activities are defined by the Amendments to the Natural Gas Market Act from 2005. In the past, gas distribution was carried out as a utility service, and therefore the majority of distributors do not have a concession for conducting gas distribution activities. For that reason, this Act defines that a concession may be granted for the provision of services in the distribution system in the existing distribution system and for the construction and development of the pipeline distribution system and provision of services of the distribution system. The Act defines the minimum and maximum duration of the concession. Concessions on existing distribution systems are granted for a minimum of 15 and a maximum of 30 years. Concessions for the construction and development of the distribution system are granted for a minimum of 20 and a maximum of 30 years. Concessions may be granted upon request or following the public tender process.

Concessions for gas distribution in existing systems is granted at the request of the gas distributor which is owner of the distribution system pipeline or the gas distributor using the distribution system pipeline pursuant to a lease contract or other usage contract signed with the system owner, only if the existing pipeline system has received a usage permit from the competent construction body. Concessions for the gas distribution services on existing distribution system pipelines can be granted upon request of the gas distributor provided that the distributor has sold a minimum of 15 million m$^3$ of natural gas annually.

In new distribution areas, the concession for gas distribution is granted following the public tender process. The concession for construction of the distribution system pipeline and gas distribution may, following the public tender process, be granted to a gas distributor which signs the Concession Contract and takes on the obligation of constructing the distribution system pipeline will allow for the sale of a minimum of 15 million m$^3$ of natural gas annually.
6. CONCLUSION

Gas transmission and gas distribution sector planning and development concepts are showing their initial results. Development of the new transmission pipelines has started. On the basis of the regional energy planning project, the privatization of the regional gas transmission company is conducted and the new investment cycle starts in the area where the transmission system will be developed in the near future.

According to the Energy Act and the Natural Gas Market Act, the municipalities which to date have had the task of the utility service of gas distribution now become the owner of the company distributing gas as a company and no longer as a utility service, and conducts this activity with the goal of creating regulated profit. Competence and responsibility for the state of gasification of a specific region is currently in the hands of the county governments which grant concessions. The energy acts have lead to the idea of enlarging distribution companies, separating gas distribution activities from utility services and privatization and recapitalization of distribution companies.

In several regions where the development of the gas transmission system for the next 5 to 10 years has been determined, development studies for the gas distribution system have been conducted to a larger or small extent. The legal bodies for the preparation of the gas distribution concession tender are established. The preparation of the legal and technical documentation is underway and the first tender is expected shortly. The LPG-air mixture gas system is expected to be developed and then replaced with natural gas following development of the transmission system.

7. REFERENCES


8. LIST OF FIGURES

Figure 1. Existing and planned gas transportation system in Croatia
Figure 2. Counties which have conducted a gas network development study
Figure 3. Section of the model of the natural gas network for the City of Zadar and information for one pipeline
Figure 4. Gas distribution system optimization for Zadar County
Figure 5. Economic optimization of the gas system for Zadar County