

THE DEVELOPMENT OF THE GAS INDUSTRY AND YOUR REFLEX IN THE EDUCATION

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The main motiv of this paper is to link the gas industry and education at technical universities with the efforts of the current generation and our expectations. Despite covering merely one specific area of activity, the gas industry, its relevance to the civilisation's development is obvious. At the dawn of the new millennium, specialists in all areas are engaged in strategic analyses to predict the probable or desirable evolution of our society over the coming century. The gas industry is no exception. However, it is easier to make forecasts about the availability and durability of natural gas reserves, for which experts are predicting a future extending well beyond the 21st century, than to decide how best to promote the industry's long-term development while taking account of the constraints affecting the energy sector as a whole. The rapid development of gas industry from the mid 20th century can be attributed to the emergence of natural gas, which possesses undeniable advantages over manufactures gas, and to the growing energy needs associated with economic development, in particular during the decade following the Second World War. The geographical distribution of natural gas sources throughout the world was also an important factor. Generally speaking, the development of natural gas met with few obstacles along its path. Today is the situation very different. For the future development of the gas industry, next five factor must be taken into account: energy demand in the emerging countries, will increase, and natural gas be called upon to help satisfy this demand; the energy industry as a whole is now responding to environmental concerns about climate change that have emerged over the last years; rapid progress in science and technology will provide new market openings, which will be of key importance in a context of increasing competition between energies; structural changes within the gas industry itself are accompanying the wave of market liberalisation now affecting all parts of the world; the relatively low energy prices call for particular caution in the development of all new projects. All strategies for the near future will necessarily take these factors into account, in the knowledge that all decisions taken today will have measurable consequences throughout the coming century. These developments will take place not only as a means to grasp market opportunities, but also in response to future,

advances in fundamental science, a fact that we tend to forget. The place of exploration and production, storage, transportation and distribution as well as utilisation, new technologies and new materials, information technology and marketing in today's world provides ample proof of this reality. And here in the education and new knowledges, there are bound to be many new opportunities that we are unable to foresee today.

The European gas industry has undergone dramatic development over the past thirty years. The intentions of European countries to diversify energy sources, discovery of new natural gas deposits, and natural gas's environmental friendliness – all of these were the underlying motivation for developing an extensive international gas pipeline network. The transit system that crosses the Czech Republic constitutes an important link in the gas transmission chain through which natural gas, lifted from the abundant Russian fields, flows to Europe.

The beginnings of the Czech gas industry date back to the mid 19th century when the first gas works in Bohemia was commissioned. On 15 September 1847, town gas manufactured at the Prague-Karlín plant was first sent into the gas network and the first 200 gas lamps illuminated Prague streets and squares.

From the historical point of view the Czech gas industry's development can be seen as undergoing. A period of town gas manufacture from coal in local carbonisation plants; in the second half of the 20th century this technology was replaced with town gas manufacture by lignite gasification under pressure and the cracking of liquid fuels or natural gas. The town gas era came to an end when the last town gas customer was converted to natural gas in 1996.

The current period of natural gas supplies; the Czech Republic has only negligible indigenous natural gas reserves, and therefore the gradual transition to natural gas was not launched in the Czech Republic until the 1970s when Russian natural gas supplies for the country were started.

The Czech gas industry's involvement in the European natural gas transit transmission system supported the notion of significantly increasing natural gas's share in

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the country's primary energy sources. For long years, the Czech Republic's energy sector had been based on the use of indigenous energy sources. After 1990, the transition to cleaner and environmentally more acceptable fuels and a reduction in energy consumption were set as the primary objectives of the country's energy policy.

Consumption of primary fuels dropped by 28 % between 1990 and 1999. This was also caused by the economic transformation process launched after 1989 alongside the move to cleaner fuels. A favourable aspect for the further development of the Czech gas industry is natural gas's share of primary energy sources increasing to 21 % in the above period.

In comparison with 1990, natural gas consumption in 1999 was higher 2.35 times in households, 2.92 times in the services sector, 1.13 times in industry and in heat & power generation.

The history of state-owned Transgas started unfolding by the signing of an agreement between the governments of Czechoslovakia and the Soviet Union on securing natural gas supplies to Austria, the German Democratic Republic, and the Federal Republic of Germany via Czechoslovakia. Under this agreement, executed in December 1970, state-owned Tranzitní plynovod (Transit Pipeline) was set up on 1 April 1971 as the developer and operator of the transit system i.e. the Czechoslovak section of the newly built international pipeline. On 1 January 1977, Tranzitní plynovod was included in the then established Ěeské plynárenské podniky Group (ĚPP) as one of its group enterprises.

When Czechoslovakia was split into two independent countries, the Czech Republic and the Slovak Republic, the system of transit pipelines continued to be operated as a single system until mid 1994 when the transfer and metering station at Lanžhot on the Slovak-Czech border was completed and commissioned. The allocation of the transit system into Czech and Slovak sections could then be completed on 1 July 1994.

Extensive restructuring and partial privatisation of the Czech gas industry came into effect on 1 January 1994. Part of this process was the fusion of Tranzitní plynovod (by then a ĚPP subsidiary) with the operating activities of ĚPP head office; thus, Tranzitní plynovod assumed responsibility for gas trade and the operation of underground gas storage facilities.

The Tranzitní plynovod subsidiary was later renamed Transgas and its transformation was completed in January 1998 when an independent state owned company bearing the same name Transgas was established. Transgas pursues the following core business: natural gas transit transmission for foreign partners, natural gas purchase and

sale to meet the Czech Republic's needs and natural gas underground storage.

Besides these primary lines of business Transgas is also involved in a number of capital investment projects and provides diagnostic, maintenance, and other services.

Transgas is an organically integrated entity. Its organisational structure is based on, and designed to carry out successfully, the main objectives of its core business and the role it plays in the Czech energy sector and national economy.

One of the mainstays of Transgas's business is natural gas transmission across the Czech Republic. Transgas is fully aware of the importance of the Czech transit system, which is a major component in the integrated European pipeline system. Transgas therefore continuously improves and reinforces its Transit pipeline system to create the best preconditions for the further development of natural gas transmission.

Natural gas is transported in three directions:

Lanžhot – Waidhaus; this direction is used by Gazexport supply Russian natural gas to Ruhrgas and Gaz de France.

Lanžhot – St. Catherine Mt; used mainly by German companies Wintershall and Verbundnetz Gas.

St. Catherine Mt – Waidhaus; under a new contract, Gazexport has been using this route since November 1999.

Natural gas volumes transported across the Czech Republic are steadily increasing. A total of 51.6 bcm of gas, i.e. 4.7 % more than in 1998, was made available at the transfer stations on the Czech Republic's national border with Slovakia (Lanžhot) and Germany (St. Catherine Mt) in 1999.

Approximately 99 % of the Czech demand for natural gas is covered by imports. The main supplier of natural gas to the Czech Republic is Moscow – based Gazexport under a long-term contract in place since 1 January 1999.

Another important foreign supplier is Norwegian producers associated in GFU. The long-term contract with GFU was signed in the spring of 1997 and natural gas supplies were started on 1 May 1997.

The above contracts provide for even deliveries of natural gas over the entire year. Regional gas distribution companies are Transgas's main customers. However, the large share offtake for space heating causes demand for gas to be considerably higher in winter than outside the heating season. Transgas bears the full responsibility for meeting this markedly uneven profile of natural gas demand.

Following steep year on year increases in 1994, 1995 and 1996, certain stagnation has been felt in natural gas sales since 1997, despite the constantly rising number of

customers of all categories. The stagnation in natural gas offtake in industry plays the most important role in this development, although there are other factors to be observed, such as the use of more economical gas appliances, reduction in specific heat consumption thanks to thermal insulation of buildings and other structures, and a higher average ambient temperature.

The Czech gas market has not been too successful so far in its efforts to improve the profile of the load curve. The increase in natural gas consumption in 1994 to 1996 was mainly caused by conversion to gas from solid fuels, until then burned in large quantities for space heating. However, natural gas consumption remains unchanged in summer months. This situation could be improved by broader use of natural gas in industry and growth in demand generated by modern technologies. Technically such equipment and appliances have reached a mature level of sophistication but they are still waiting to be applied on an adequate scale.

The transit system has been designed for the transport of natural gas intended for international partners as well as gas imports for the Czech Republic.

Natural gas is accepted and transferred, and metered in terms of volume and quality, at borderline transfer stations.

The transit pipelines have a total length of 2,421 km and nominal diameters ranging from 800 to 1400 mm, operating under rated pressures of 6.1 MPa, 7.35 MPa and 8.4 MPa.

The pressure of natural gas in the system of very high pressure lines is maintained with the help of compressors driven by gas turbines compress gas in the pipeline.

The transit system is connected with the Transgas inland system and regional gas distribution companies' distribution networks via inland transfer stations. At the end of 1999 the transit system had 20 such stations in operation, with a total capacity of 110 mcm/day. The Transgas inland system serves for supplies to regional gas distribution companies and direct customers. Underground gas storage facilities are also connected to the inland system. The inland system comprises 1,129 km of pipelines with nominal diameters from 80 to 700 mm, operated under rated pressures 4 MPa, 5.35 MPa and 6.1 MPa. Customers receive gas via transfer stations that serve for the commercial metering of the gas made available. As more and more communities are connected to gas supplies, and in order to provide for a higher level of reliability, the number of transfer stations is being increased. Underground gas storage facilities help to stabilise the Transgas system, five serve as seasonal sources, while the Háje facility sited in an excavated cavern is used as a peak shaving reservoir. Besides its own facilities

in the Czech Republic, Transgas has long term lease agreements on storage capacities in underground facilities outside the Czech Republic: in Láb/Slovakia and since 1994 in Rehden/Germany. Starting in 2001 Transgas uses a new underground natural gas storage at Uhřetice, which is operated by Moravské naftové doly Hodonín. Transgas devotes great attention to reinforcing both the storage and the daily export capacities of the storage system. An underground gas storage facility in a cavern excavated into granite at Háje was commissioned in 1998. It is intended to work as a peak shaving source supplying Prague and central Bohemia with natural gas. One of the pursued by Transgas in the area of underground storage is converting the Lobodice seasonal storage facility to a peak shaving mode of operation.

A key precondition for the proper performance of Transgas's and regional gas distribution companies operations is the required qualification of its employees. Employee training procedures have therefore been designed with a view to promoting their job competence and further professional development. Transgas and regional gas distribution companies devote special attention to new employees who learn about all the basic activities pursued as part of their adaptation period. The future managerial personnel need to be trained now. A system of training young talented employees has been devised, and includes a programme for their further training and professional development.

There is good opportunity for cooperation with technical universities. For example VŠB – Technical University of Ostrava cooperates with regional gas distribution company SMP (Severomoravská plynárenská). Cooperation involves special courses for employers, research and development problems as well as lectures for top professionals from SMP, Transgas, British Gas and Ruhrgas for students, excursions in hi-tech gas industry facilities and solution of actual problems in diploma-dissertations. This cooperation is useful for both sides – gas industry companies as well as VŠB – Technical University of Ostrava.