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The impact of a liquefied natural gas terminal on the gas distribution and bunkering network in Poland

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Abstract

The proximity of the sea has a strategic importance for Poland's security and economy. LNG (Liquefied Natural Gas) may play an important role in the Baltic Sea Region in the near future – it may create opportunities for dynamic international economic cooperation for Baltic countries. Access to the Baltic Sea enables sustainable development consisting of the comprehensive exploitation of the country's maritime potential, i.e.: the broad development of the maritime economy. In this paper the authors have given an overview of the benefits of a LNG terminal located in Świnoujście. Building a facility is a strategic investment that requires the involvement of all stakeholders at the local, regional, and national level. In this paper the authors have presented general information on the collection and transmission of natural gas. The aspects of trends in the LNG market have been discussed. Market conditions in the world and in Europe, concerning the investment in the Świnoujście LNG terminal, have been described. The implementation of the strategy has been aimed at supporting the pursuit of long-term development agreements integrating the maritime sectors with the other related sectors. The directions of gas distribution arising from the rational use of the LNG terminal in Świnoujście have also been presented. In addition, the economic impact of the location of the LNG terminal in Świnoujście on the development of the gas market in Poland was analyzed.

Introduction

Together with dynamic economic development, for which it shall be deemed to have started at end of the Second World War, which increased the demand for raw materials, the rapid growth of the American economy, after the war ravaged Europe, strengthened their value. Energy fuels have become the most valuable currency in the world. The development of energy-intensive heavy industry forced the expansion of trade including raw materials, semi-finished products, and finished products. This was influenced by the lack of availability of raw materials in all regions of the world and the non-uniform distribution of industrial districts. Natural gas has found wide application in various areas of the world economy. Thanks to its properties it may be subjected to a process of condensation which increases its capabilities for transport and storage. To customers located a long distance away gas can be transported by sea. Installations are also used for their transfer pipelines. Natural gas in the form of condensate-LNG, Liquefied Natural Gas, is a fuel which, because of its low sulfur content, significantly contributes to the reduction of pollution of atmospheric air. Environmental and economical applications of LNG have caused a significant increase in the demand for the fuel.

A LNG terminal located in Świnoujście will allow Poland to receive liquefied natural gas from anywhere in the world. The terminal was designed to receive and regasify liquefied natural gas. The construction of the terminal will be of great importance for determining the conditions for the import of gas

through Poland. As a result of this phenomenon, this will contribute to the reduction of the prices of raw material in the country and the region of Central and Eastern Europe. The launch of the LNG terminal will increase Polish energy security and will allow for the diversification of the supply of natural gas to the country. The construction is a strategic investment for Poland.

The recipients of natural gas

During the last forty years global production of natural gas has shown sustained growth. In the years 1970–2010 a three-fold increase in production has been recorded (Figure 1).

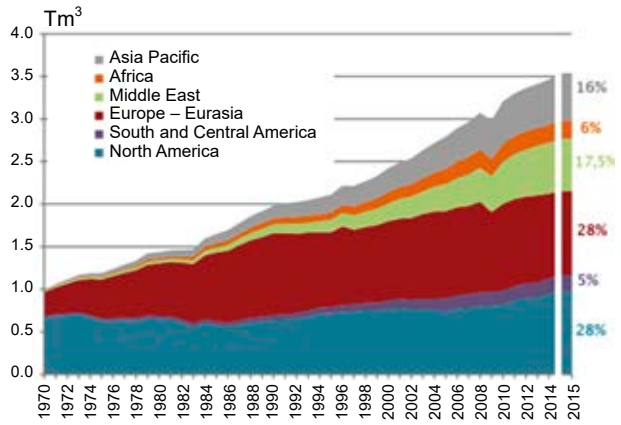

Figure 1. History of the world's production of natural gas (BP Statistical Review, 2016)

In the mid-20th century, natural gas consumption in Poland represented a small percentage of consumption relative to other energy sources such as coal or petroleum. The situation began to change from the year 1964 when the Bogdaj–Uciechów gas field was discovered, Wierzchowice and Wiry. (PGNiG, 2014) Increased gas extraction resulted in funding for the development of the gazociągowej network in Poland, and together with the discovery of new gas deposits in Poland, this has increased the consumption of gas. In view of Poland's limited resources of the raw material the need to import gas to meet the ever-increasing demand has arisen.

At the beginning of the 1990's the problem of energy intensity of Polish industry in carbon-based stone began to appear. The new basis of Polish energy policy had to rely on reducing the energy intensity of the economy. This objective intended to achieve this through increasing the share of hydrocarbon fuels (including gas) and reducing the use of solid fuels. In the year 1996 the contract for the delivery of 250 billion m^3 of gas to Poland over 25 years by the Jamal gas pipeline was started. This meant that the main source of the imported gas to Poland will be Russia. (money.pl, 2001).

Currently, the main supplier of gas to Poland is the Russian company Gazprom, which caters to 56% of Polish demand (source: 8.09 billion m^3). 23.9% of demand covers national mining (national provider: 3.44 billion m^3), while 16.1% is imported mainly from Germany (the source of the West: 2.9 billion m^3). The diversity of natural gas imports sources to Poland will strengthen national energy security to a very large extent (PGNiG, 2014).

The wide range of applications of natural gas results in its importation to the recipients who do not have natural gas resources. Due to its low density, the main method of transportation to consumers located a long distance away is transmission using the gas installation infrastructure. Transport is more cost-effective when the gas is condensed or compressed – considerably reducing the volume of the gas.

It is worth noting that the transfer of LNG regasification process will be possible in key directions, which include the Baltic States for example:

- Lithuania or Estonia;
- the North-South corridor from such countries as the Czech Republic and Slovakia;
- the Scandinavian countries: Denmark and Sweden.

Global delivery of natural gas mainly comes from countries that have substantial deposits of this raw material. The richest deposits of natural gas are located in the countries of South-East Asia, Africa, the Middle East, and Oceania. The biggest exporters are Indonesia and Algeria and then Qatar and Malaysia (approx. 70% share of world exports). Therefore, the difficulty of transportation or the complete inability to transport the raw materials using the installation of the pipelines in these countries requires the construction of offshore LNG terminals (for export). This is due to the high levels of LNG exports despite the fact that these countries are not in the forefront of the administrators of natural gas resources.

The natural gas market – current and prospective status

Energy production in Poland is closely related to fossil fuels. Natural gas accounts for 13% of total consumption and it is the third largest energy source (Figure 2). Due to the ever-increasing demand for valuable raw materials such as natural gas, the statistics presented may change dramatically.

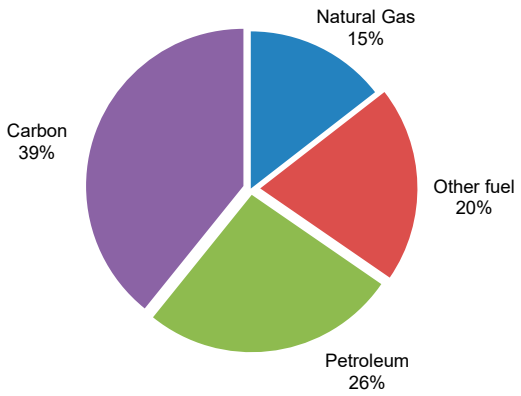

Figure 2. Structure of the demand for primary energy by sources in Poland in 2008 (Ministerstwo gospodarki, 2011)

In 2015 there was an increase in gas consumption by European Union countries (the first increase for four years). Gas consumption reached 426.3 billion m^3, an increase of approximately 4%, compared to 2014 (Figure 3). The factor influencing this phenomenon was the increased demand for raw materials for heating purposes. (PGE, 2016)

The expected increase in natural gas consumption is due to an increase in the importance of gas for the Polish economy. At present, demand in Poland is about 18 billion m^3. Forecasts show a steady increase in natural gas consumption in the country (Table 1).

Increasing demand for natural gas requires the proper safeguarding of supplies of raw materials to the country. The potentially most appropriate solution to diversify sources of gas supply to Poland is the purchase of liquefied gas transported by sea. This will lead to independence as regards the source of gas imports, which involves the construction of a specialized terminal for the reception of liquefied gas and a regasification station.

Table 1. Forecast of gas consumption in Poland in the years 2016-2020 (PGNiG, 2014)

Year	Consumption [billion m^3]
2016	18,303
2017	18,384
2018	18,455
2019	18,522
2020	18,596

LNG, for example, is used as a fuel for ships emitting less carbon dioxide and nitrogen oxides. Due to ever-increasing atmospheric pollution, the main emitter of which being marine and road units, LNG is increasingly being used as a low sulfur fuel. The popularity of LNG is also related to the lack of need to clean the fuel before the combustion process.

Another important feature having a significant impact on the demand for liquefied natural gas is its low price. The use of LNG reduces operating costs. In proportion to the quantity of thermal energy obtained, natural gas is a cheaper fuel. (Herdzik, 2014)

LNG fuel is:

- modern (clean fuel, conversion of gas into heat energy and electricity, air cooling, low running costs);
- safe (high quality gas and gas appliances);
- ecological (environmental policy – environmental protection).

Natural gas in liquefied form is a raw material with the following characteristics:

- very high energy efficiency level;
- low sulfur content;
- having influence on market development;
- low price.

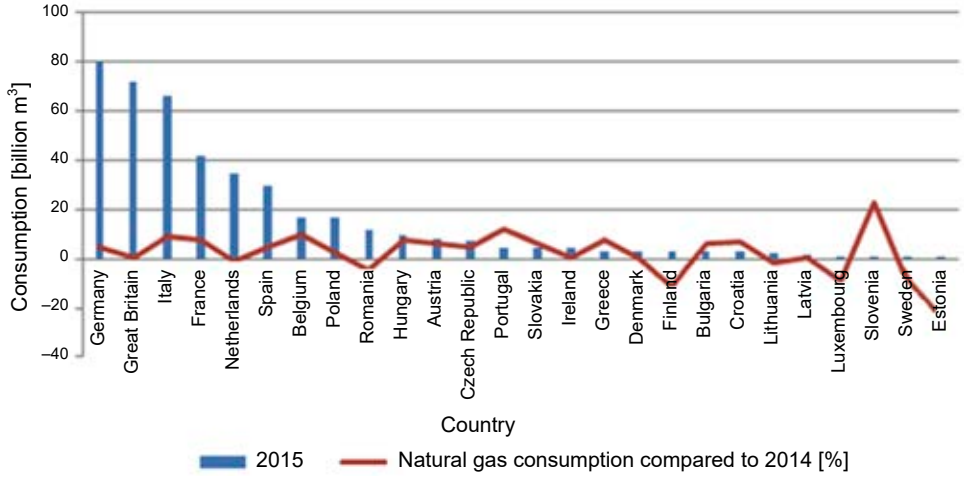

Figure 3. Consumption of natural gas in EU countries

Costs of the rapidly growing natural gas distribution are closely related to the construction of new piping and their limited capacity to force the change in its delivery. World distributors of gas, for the protection of the environment and the protection of human health, decide to use technology in your business with the use of LNG, which will enable the diversification of supply sources and ensure a favorable position during purchase transactions (negotiating). Versatility, economic aspects, and flexible access to LNG are factors that have led to the possible use of the fuel in small, medium, and large enterprises.

In 2008 he attempted resolution, which allowed for the construction of the LNG terminal in Poland. The place most suitable for this investment was considered to be San Francisco, inter alia because it is the most convenient place due to the proximity to the Straits linking the Baltic Sea with the other water basins (shorter delivery time, lower cost of transport).

The LNG Terminal in Świnoujście has three functions:

1. Regasification – changing the state from liquid to gas through liquefied heating fuel.
2. Unloading – return fuel with maritime unit to storage tanks in the Terminal.
3. Storage- special tanks are to be used for this purpose that provides the maintenance of the continuously low temperature fuel.

In the first phase of the work, the terminal will be able to receive 5 billion m^3 of gas per year. The ability to cover more than 20% of the demand for natural gas using gas imports by sea will give Poland huge independence and turn out to be a great project, which was carried out with a view to the diversification of import sources. (Maritime Authority in Szczecin, 2015)

Economic development in Poland – the impact of the LNG terminal in Świnoujście for the gas market

The development of the world gas market depends on eighty well-functioning LNG terminals. In Europe there are more than 20 terminals (Figure 4). The country with the largest imports of raw material is Japan. The number of ships that are used to send or receive natural gas in the form of condensate using the sea route is increasing. This is influenced by the growing demand for natural gas, which has a wide range of possible applications.

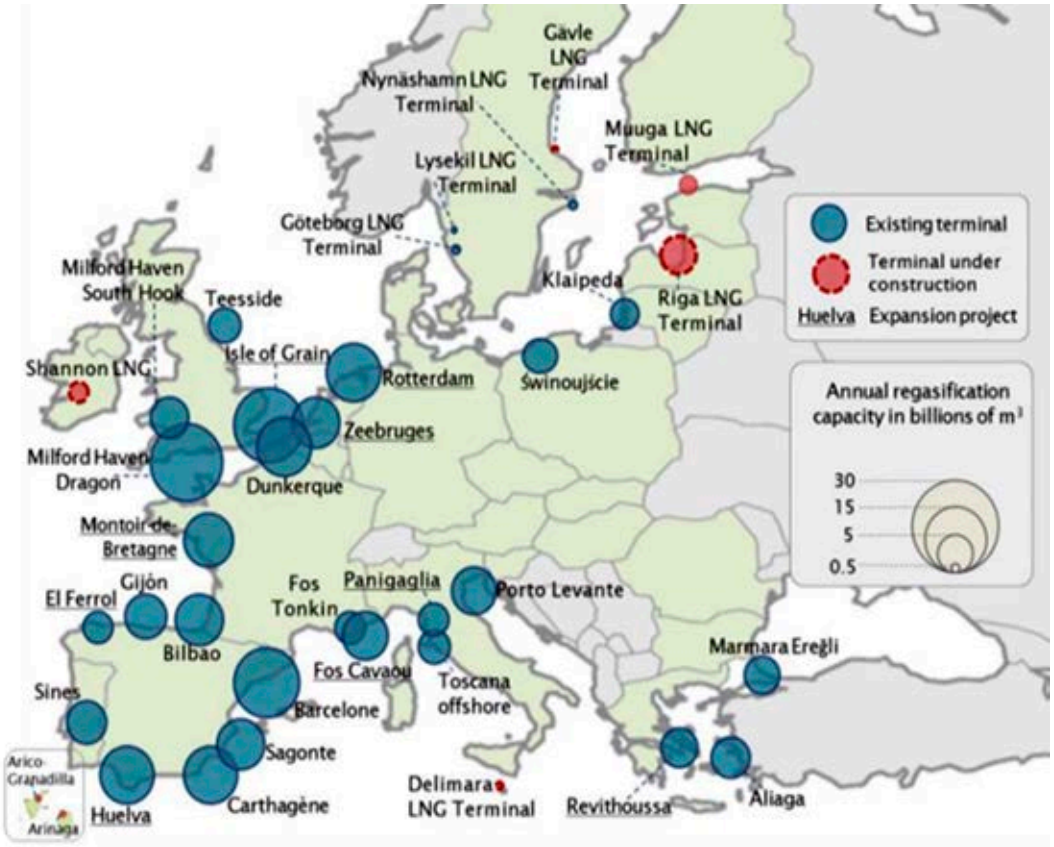

Figure 4. Existing and planned LNG terminals in Europe (GIIGNL, 2016; GLE, 2015)

Given the above, and the sources of the imported natural gas, Poland will contribute to the diversification of gas supplies to European Union countries. The main directions of the development of Poland is the strengthening of national sea ports, and increasing the level of competitiveness of Maritime Affairs together with employment and ensuring the safety of the marine waters and, above all, the use of the marine economic potential. This will result in the empowerment of the country in the regional gas market.

From a strategic point of view on energy policy, it is essential to have LNG terminals. Installations designed to export liquefied natural gas and the transit of raw material using gas pipelines increases the possibilities of the diversification of supply sources. Countries gain independence from gas. Member States wishing to ensure energy security have exactly specified energy policy and the import of natural gas, in particular, is based on the conclusion of long-term contracts. These contracts shall guarantee continuous income to the entities investing in the deposit, and transmission.

It is also detrimental to the suppliers, due to the time frame. The constantly increasing demand for gas increases its competitiveness on the market for gas which translates to its price. An increasing number of LNG terminals will strengthen the negotiating position of the countries that possess them relative to the gas-exporting countries which have the use of pipelines under these contracts. It should be noted that there is the possibility of the negotiation of the conditions for the supply of gas to the current market situation after the expiration of the agreement, which was mentioned in a long-term contract. It is worth noting that the more the LNG facilities a State will build, the greater their negotiating position on the market in relation to exporting countries. It is associated with alternative gas supply lines and the saturation gas derived from short-term contracts. This phenomenon contributes to pressure being exerted on countries exporting LNG, who eventually will be forced to lower gas prices or change the conditions of supply.

To provide bunkering services internationally, LNG terminals require connections between the gas systems of the so-called interconnectors. Construction and expansion of interconnectors is possible in the basic directions of LNG distribution (GAZ-SYSTEM, 2016):

- gas interconnector with Slovakia: construction of a gas connection with a capacity of 4–5 billion m^3, which will allow gas transmission in two directions;
- gas interconnector with the Czech Republic: extension of the existing gas connection and an increase of its capacity to 2.5 billion m^3, which will enable gas transmission in two directions;
- gas interconnector with Lithuania: construction of a gas connection with a capacity of 2–4 billion m^3, which will allow gas transmission in two directions;
- inter gas connection with Denmark: construction of a 3 billion m^3 submarine gas pipeline, which will allow gas transmission in two directions;
- gas interconnector with Germany: construction of the Police–Boernicke gas pipeline.

Access to the global gas market will be provided by Poland thanks to the LNG terminal in Świnoujście, which will ensure energy security and diversify the supply of natural gas. Construction of the facility is a key element that will have an impact on the future improvement of the position in the process of negotiating supplies of raw materials and increasing the number of sources allowing for the import of gas. The President Lech Kaczyński LNG Terminal in Świnoujście has opened new opportunities for import to the countries of Central and Eastern Europe with a breakdown of US export potential. The terms of the LNG supply agreements with US partners will change. The LNG terminal, which has provided commercial services since June 2016, is a viable option for a wide range of liquefied natural gas supplies, which has the potential to be exported from manufacturers around the world to European consumers. The Polish LNG terminal will enable the development of international gas connections and will initiate the creation of smaller terminals providing bunkering services for ships and LNG transshipment to ships (Figure 5).

The LNG terminal with a target of 7.5 billion m^3 will contribute to a visible drop in natural gas prices. The fall in wholesale prices will result from the most important goal of the strategic energy policy in Poland (gas supply stability), combined with its own production. There will be an improvement in the liquidity of the mass gas market in Poland. The quality of services provided will include the connection pipeline of the LNG terminal in Świnoujście and a direct connection to the gas network Gaz-System. The most important element in the chain will be gas recipients, i.e. enterprises and individual customers of the West Pomeranian province (e.g. Police Chemical Works). The main advantage is also the supply of customers not connected to the traditional transmission network – local gas consumers will have the possibility to transport it with the use of tanker trucks.

Figure 5. Planned and existing gas connections in Poland (Gabryś, Baj & Abramczyk, 2013)

The importance of the regional LNG Terminal in Świnoujście (Baltic Sea) is characterized by its regasification power and plans to expand the gas system in Poland and the connection to the other Member States. Taking into account the price efficiency the natural gas LNG terminal in Świnoujście will allow for the reduction in the demand for gas imports from Russia. Forecasts of an increase in gas consumption in the country indicate a reduction in the dependence on Polish imports of raw material from Russian suppliers, due to the operation of the LNG terminal in Świnoujście. Increasing the extraction of natural gas in the space of ten years will contribute to national production being significantly increased and shale gas operation will also start.

A contract with Poland and Qatar will guarantee a constant supply of natural gas. To increase the security of the gas supply an additional amount of raw material from such sources as Algeria and Norway must be taken into account (Figure 6).

Figure 6. The routes of possible deliveries of natural gas to Poland

Importing raw material from Algerian deposits is cost effective because of the high quality of the gas (high methane content) and the proximity of the deposits. Compared to gas from Qatar – the location of the deposit plays a significant role in the case for diversification of sources of natural gas – it has lower transport costs.

The indicated deliveries of LNG to Poland do not take into account the resources of Indonesia and Malaysia. Contracts are subject to the distance from the source of the raw material-the closer the source the greater the security of supply and the greater possibility for flexibility and changes in demand and supply. Deliveries of LNG to Poland that are resources from Indonesia and Malaysia are more favorable than the entire imported gas from Qatar because of the high transport costs and the duration of the voyage (approximately 30 days), which involves the use of a large number of vessels.

Conclusions

The LNG terminal is safe for the surroundings and for people. It does not pose any threat to the environment. Its use is not associated with long-term, adverse effects on people and the environment (fauna, flora, air, soil, water, etc.). The project can be considered the most important and the most strategic infrastructure investment in Poland. Construction of the LNG Terminal brings huge change in the Polish gas sector. This results in greater independence for the Polish energy system, and will increase the quality of the gas system and allow Poland to participate in the dynamic world LNG market.

Particular attention should be paid to the benefits of the construction of the LNG terminal in Świnoujście to increase the energy security of

the country and the region of Central and Eastern Europe. The LNG terminal in Świnoujście is a strategic investment in Poland's independence from the supply of gas from Russia.

A constantly increasing preoccupation with and demand for natural gas will lead to a significant increase in the quantity of LNG imported by sea. It will enable the diversification of sources of the supply of natural gas, and to a large extent, will help to reduce natural gas prices. The signing of agreements with countries exporting raw materials will allow for flexible adaptation to variations in the rates for fuel on the market in parallel with ensuring a high state of energy security. International gas sales in the form of condensate by LNG terminal installations in Świnoujście will be made possible thanks to the cross-border connections. Thereby, Poland will play an active role in the local market. Forecasts for future years shows that gas consumption in Poland will steadily grow. The potential expansion of the Terminal, which will allow it to receive 7.5 billion m^3 per year, is likely to turn out to be a very smart investment for Poland to increase the security of the gas supply.

It is also worth noting that with the construction of the LNG terminal in Świnoujście, there has been a parallel expansion of the transmission system and port facilities. There has also been significant development of fleet marine units used for the transport of LNG. This project will increase the importance of Świnoujście, which will be primarily due to its competitiveness. It will strengthen the local labor market and also the economy.

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