

PRICE FORMATION OF LIQUEFIED NATURAL GAS MARKET

**ЦЕНООБРАЗОВАНИЕ НА РЫНКЕ СЖИЖЕННОГО
ПРИРОДНОГО ГАЗА**

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В данной статье рассматривается структура газовой отрасли и ценообразования на основных региональных рынках сжиженного природного газа, а также воздействие конкуренции на формирование цены. Также представлен сравнительный анализ мировых цен на газ, который транспортируется морем в виде СПГ, и трубопроводный газ. После сравнения мировых цен на газ, сделаны выводы и разработаны основные предложения для Украины по реализации проекта СПГ-терминала.

Statement of the problem. Nowadays there are four major regional markets, which price formation of gas affects to the price of liquefied natural gas (LNG) in the global gas trade. They are: North America, Great Britain, continental Europe and Northeast Asia. The two emerging markets - China and India are importers of gas with supplying through pipelines and also in form of LNG - own slender price formation system is not completely formed. The purpose of global efforts of liberalizing the gas market is to ensure that the price of this commodity is determined by market competition between gas suppliers. Ideally, competition will bring long-term equilibrium price to marginal cost offer goods to the extent necessary to satisfy the demand. Regional markets differ in sources of gas supply, the scope of the contracts and the degree of liberalization of the gas industry. These factors have a strong influence on the behavior of prices and thus affect the price formation of LNG, which ensures its competitiveness in the market.

Review of recent research and publications. The process of price formation in the gas sector and in particular the market of liquefied natural gas sufficiently described in scientific works by S. Baskakov [2], O. Brahynsky [3] M. Voitenko [5], etc. Many new information is in electronic journal "Vokruh Strip" [7], as well as in other Internet sources. However, competition in the LNG market grows rapidly, so rapidly changing prices. In connection with this, the world enters a new information that makes it possible to update and supplement information on the price of LNG.

The task of the study. The purpose of this article is a comparative analysis of world prices of gas that is transported by sea in the form of LNG and pipeline gas, as well as identifying the main proposals of Ukraine on the project of LNG terminal.

The basic material research. The structure of the gas industry evolved in many ways other than the structure of the oil industry. These differences generally caused by two industry characteristics.

At first, investment in gas transportation are highly capital intensity and required at the initial stage of the project, so they are dependent on debt financing. It's

usually required long-term contracts for guarantee debt service and to ensure separation of project risks between buyer and seller. Secondly, although the exploration and development of oil and gas in general are not a monopoly activities, gas is usually transported by pipeline systems, which in most cases shows visible signs of the subject of natural monopoly. As a result, transportation and distribution of gas traditionally regulated by the type or utilities in the U.S. and Japan, or the state gas monopoly in the UK and France.

For countries with inner gas supplying, as occurred previously in the U.S., Canada or the UK, regulation of marketing and processing ultimately resulted in government intervention in the price formation in the industrial sector.

Countries that depend on gas imports, virtually non-pricing in the industrial sector, and the price is negotiated between buyer and seller.

Perhaps this difference between using of internal sources and dependence on imports are most clearly defines the existing of pricing system in regional markets. Importers have traditionally used the practice of long-term contracts between buyer and seller, most of which are kept in force.

At the beginning, the dynamics of prices in markets of North America and UK, confirmed previous expectations that competition between gas suppliers will allow to separate price formation of gas from oil price. In view of the markets of North America and UK were liberalized, when these countries had substantial excess supply, they were characterized by severe price competition between manufacturers and their offered gas prices were actually far below oil price. However, both regional commodity markets show that shortage in competition between different energy sources may have fixed prices, that may be finally indirectly bound to the price of oil.

Separate price formation for oil and gas in in oversupply and restoration of bindings in the deficit seemed economically rational. In economic theory (Fig. 1) described the dynamics of price changes in demand and proposal. However, if gas demand is determined by its market share in competition between different energy, so it depends on the price of competing energy sources such as oil.

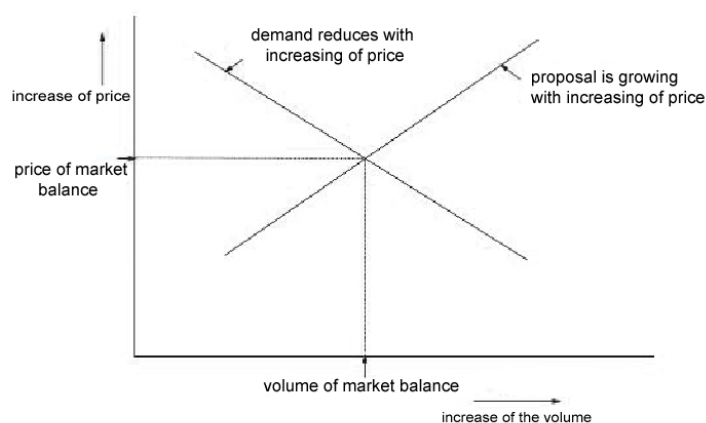


Fig. 1. Theoretical dynamics of proposal, demand and prices in accordance with the principles of economic theory. Source: Jensen Associates

Recently events in price formation of oil and gas in the U.S. and the UK may serve as an illustration of the economic factors driving price formation. Both regions have started with separate price formation, but both of them established gas prices that were higher than the price of oil. For both regions it is characterized the competition between different suppliers of gas, where gas prices below the price of oil, so they can threaten the price competition markets served by contracts linked to oil prices. In Fig. 2 there is a comparison of recent gas prices in the U.S. Henry-hub, with the price of oil WTI. In Fig. 3 it is conducted a similar comparison for the British NBP with the price of oil Brent.

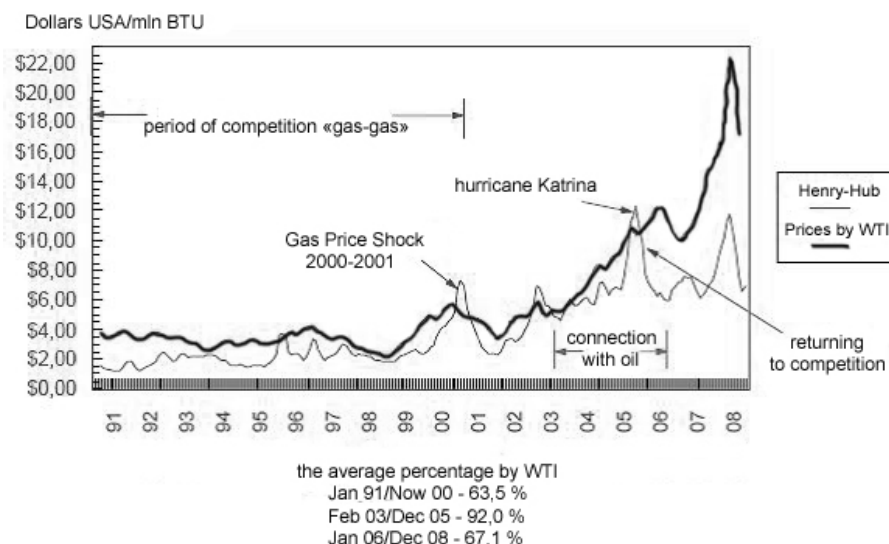


Fig 2. Gas prices in Henry-hub comparison with prices of oil WTI (rolling average over 3 months). Source: Jensen Associates

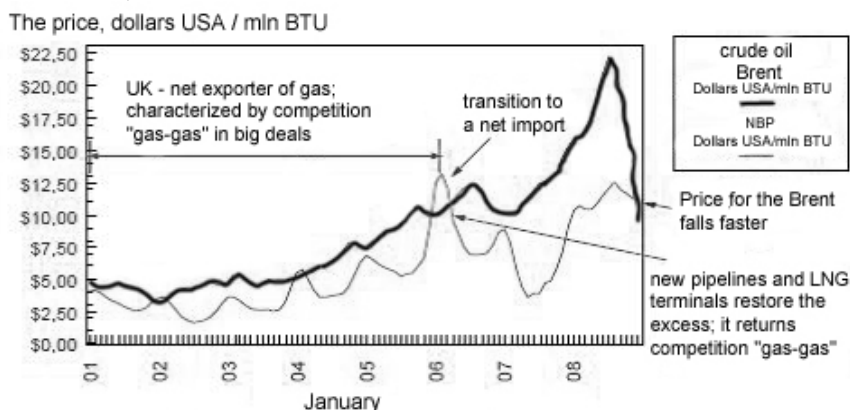


Fig. 3. The relationship between oil prices Brent and gas prices in the UK national balancing point (NBP) (rolling average over 3 months). Source: Jensen Associates

Today the world has six large regional import LNG markets: North East Asia, Continental Europe, North America, Britain, China and India. North East Asia and Continental Europe have a strong dependence on imported gas, which comes under the form of LNG and by pipelines, while in the U.S. and UK industry has developed on the basis of its own gas, but these countries are probably move in a category large importers of LNG. China and India - new LNG market participants, but now it is expected the significant increase based on imports.

Price formation of gas in North-East Asia and Continental Europe is the result of price negotiations conducted over the years with their suppliers. On the other hand North America and Britain liberalized its gas industry and gas prices show the competition between domestic suppliers for market. Theoretically, the concept of similar approach all over the world to price formation of liquefied natural gas, perhaps, is the ideal, but it is far from the realities of modern markets of LNG.

Although price formation by the principle of netbek was short episode in history of price discovery of crude oil, this concept is often used in determining the prices of other fuels than oil, such as a gas. Price formation by netbek in the oil sector was developed by Saudi Arabia in 1985.

In a flexible choice of destination suppliers may send the party into the market that provides the most reasonable price "netbek." Considering the flexibility characteristic of the market in the Atlantic basin between Europe and North America rapidly growing price arbitrage. In Fig. 4 shows the mechanism of such an arbitration agreement to supply from Nigeria as an example.

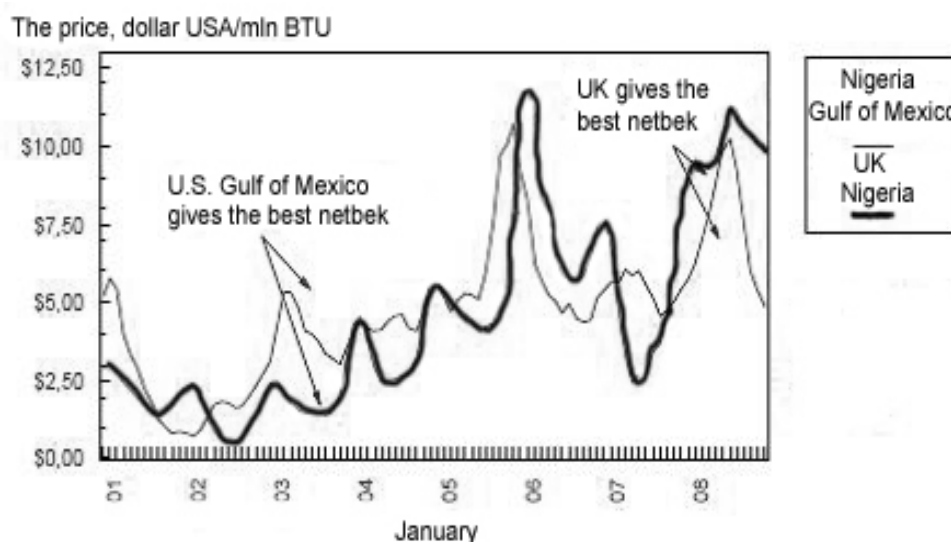


Fig. 4. The hypothetical price "netbek" in arbitration agreements with Nigeria LNG cooperation with audit-for delivery in the U.S. Gulf of Mexico and the United Kingdom. Source: Jensen Associates

The figure shows for "netbek" which got to the supplier of products from Nigeria when it send the Gulf Coast in the U.S. or the UK during 2001-2008 years. This example is hypothetical, because by 2005 the UK had no terminal facilities for

receiving imported products, but considering that the quotations in the UK NBP is a liquid and transparent, it is given to illustrate the European prices.

For a considerable time period of 2001-2006 for the Gulf of Mexico in the U.S. were characterized by higher prices "netbek." However, recently more attractive target market is the United Kingdom.

The following Fig. 5 shows the same comparison of prices "netbek" in terms of suppliers of Qatar. While the netbek lower due to the greater distance from the market, the system is very similar.

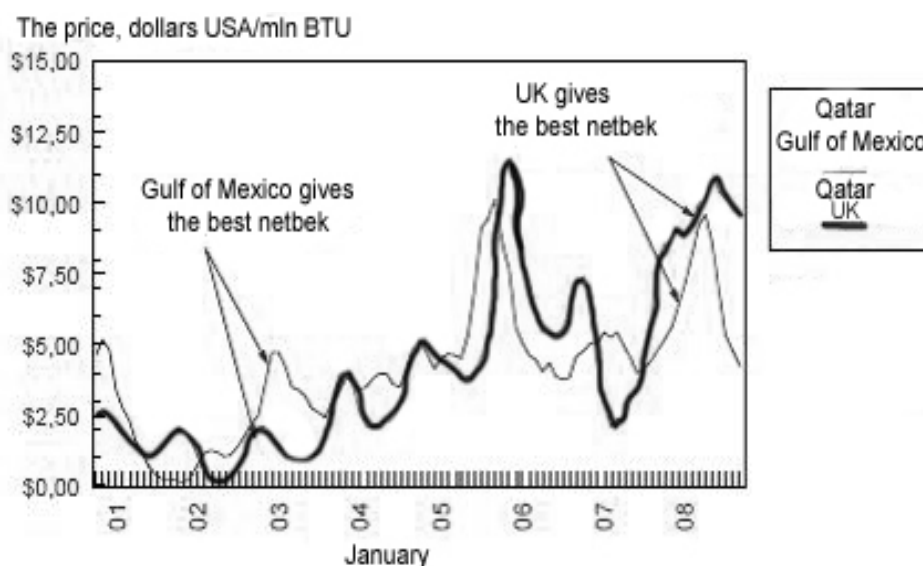


Fig. 5. The hypothetical price "netbek" in arbitration agreements with Qatar LNG for delivery in the U.S. Gulf of Mexico and the United Kingdom. Source: Jensen Associates

In Northeast Asia, where there is no any significant amount of local production, gas industry developed on the basis of imported LNG. At the conclusion of the first LNG suppling contracts with Japanese buyers of electricity generation in Japan heavily dependent on oil, and used as fuel crude oil and heavy fuel oil. At the initial stage in the provisions on cost-education provided for indexing the price of oil - "Japanese customs value of oil» (JCC, or "Japanese oil basket"). This precedent was used Korea and Taiwan, as well as some Chinese contracts. Although over time the system has undergone some changes, this precedent retains its importance in Northeast Asia, and from it difficult to refuse.

The basis of the basic contract is a typical Asian price formula "Price = constant + coefficient" steepness of the curve » JCC, where price and constant are expressed in dollars. U.S. million BtU, and the JCC - in dollars. U.S. per barrel. For a long time the price formulas for the Pacific remained fairly stable, and the main competition between suppliers was due to the constant changes or minor conditions such as minimum and maximum price limit.

This stability began to crumble with the entry of China in the early 2000's.

At this time there was a sharp competition between the following projects: Australian North West Shelf, Indonesian Tangguh and Qatar Rasgas, which led to substantial discounts in comparison with the initial conditions, as competitors have try for being first to enter this new market. North West Shelf was Shenzhen contract, and Tangguh - contract in Fujian Province. According to industry press, prices for both contracts were substantially below the prices of concluded contracts previously.

However, such discounts are applied for long. Sharp rise in oil prices that began in 2005, increased the pressure on the price of LNG and forced sellers review the value of discounts. This new contract with North West Shelf and Tangguh fixing competition, which coincided with the creation of shortages in the market. China failed to repeat the earlier achieved success and transition to market vehicles slowed down rate of adoption of new contractual obligations.

One of the characteristics of the market in the Pacific basin was the application of S-shaped curves as a means of reducing price risks. With the increased volatility of oil prices, the position of the anchor to the price of oil created a risk to the initial price expectations of the contracting parties.

For sellers the sharp falling of prices in oil threatened deprivation of enterprise profitability, and vendors have begun to show interest in setting a lower limit price. However, as compensation for such redistribution of risks buyer sought to obtain protection in the form of price-cap. In simplified form, it can be represented as a basic value (referred to as "the steepness of the curve"), which was present relationship between oil prices and gas with the option of adding the upper and lower limits for to eliminate the risk.

But more common is due to transformation changes the correlation of prices of oil and gas (or steepness of the curve) above or below certain price levels ("turning points"). Illustration of a typical S-shaped curve shown in Fig. 6.

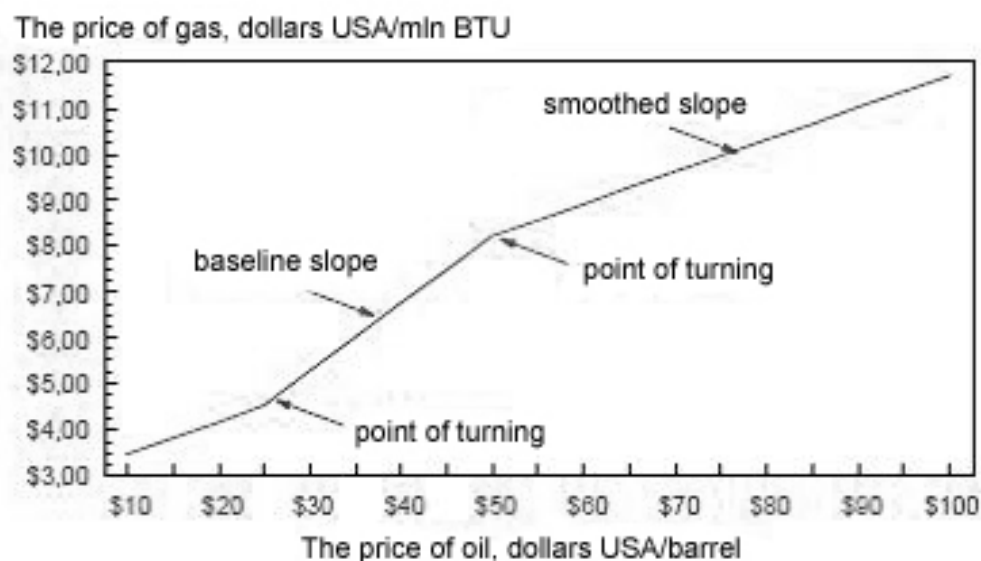


Fig. 6. Figure S-shaped curve (baseline slope of - 0.1485, turning points - 25 and \$ 50. USA). Source: Jensen Associates

Due to the fact that the S-shaped curves limit the response of prices when they are at high or low, they can promote separate pricing for oil and gas during periods when oil prices exceed the upper turning point.

Until recently, the fall in oil prices, suppliers complained about the use of S-shaped curves, arguing that the S-shaped curves are designed for "temporary" volatility in oil prices and high oil prices are the norm.

The essence of a separate pricing is illustrated in Fig. 7. One of its side effects is the possibility that buyers in Northeast Asia will be able to apply the practice cross-subsidization spot purchases of LNG parties in competition with consumers in the Atlantic. In the recent period of shortage of gas in the market, some consumers were forced to switch to the fuel oil.

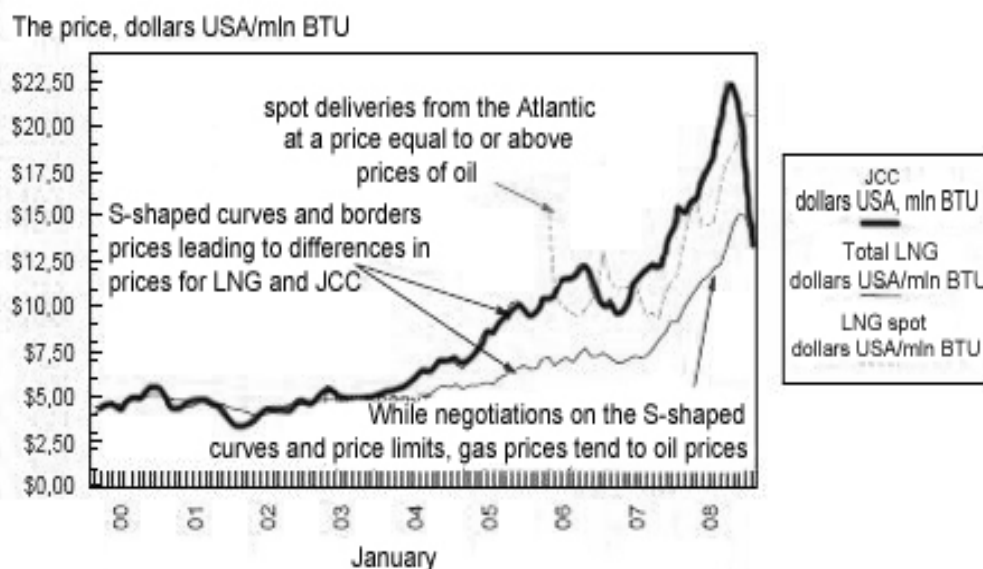


Fig. 7. Detachment for LNG delivered to Japan from the price of oil using the S-shaped curves and limits for the growth of prices for JSS. Compare prices for oil and LNG, including in spot transactions with delivery of the Atlantic. Source: Jensen Associates

This suggests that the price of oil served as the basis for pricing of competing energy "on margin". Japanese consumers, the price of much of the volume that was reduced the level of oil prices could therefore detect a certain freedom in the offer price to the spot party.

The Japanese statistics for specified amounts of by-exporting countries. Therefore, determining the value of imported products from countries with which no concluded long term contracts can be set for spot transactions. Such imports from sources which are not contracted, this is coming from Atlantic Ocean basin.

In continental Europe, an extensive gas network to transfer imported gas supplied through pipelines, which is complemented by several volumes of LNG. At the regional market practice of concluding long-term import contracts established at an early stage of development the industry, and many such contracts remain in force to this day.

The emergence of LNG in Europe sets a task to adaptation contracting practices of a wider world market for LNG to specific contracts in Europe. For this reason, in some European LNG supply contracts are included certain elements inherent in Asian contracts. For example, in some European contracts for the supply of LNG used S-shaped curves and determination of binding to crude oil prices.

However, international gas markets - and especially LNG markets - is still very far from the competitive ideal, and therefore the pricing is extremely complex. In addition, the degree of mismatch ideal conditions of competitive commodity markets largely varies by regions and is a goal of the international pricing of gas, in which world prices for gas established would be in the LNG trade, is illusory.

Investment in pipelines and LNG sector are a particular problem for the realization of competitive commodity model. Investment is a capital intensive and characterized by long terms from the beginning of the project to its completion. They need initially, while revenues usually begins to flow only after completion of the project. They are typical of low short-term marginal costs, even if long-term costs remain high. This is particularly true in the case of domestic supplies, which often determine the price, which is competing imported products.

Long time since the beginning of the project to its completion also complicate the price response. In the case of LNG terms of the decision to invest in construction of the plant to start the project, usually of four years or more. Thus, the current price signals that justify the implementation of the new project can not ensure timely supply necessary to balance the current demand. Formed as a result of suggestion may be, ultimately, returned in a completely different market.

Conclusions. On the basis of comparative analysis of world prices for gas that is transported by sea in the form of LNG and pipeline gas, we can conclude that the rationality of shipping LNG is based mainly on the conditions - namely, distance, terrain features, etc.. In addition, LNG provides truly global coverage of consumers. For this there is no such problem as the relationship between the transit countries.

The main proposals for Ukraine include the following:

1) building its own LNG terminal. Of course, this project needs to raise funds and even foreign engineering. In this case, you should prefer a country that will not only be interested in this project, but also offer the most favorable conditions for cooperation;

2) immediately begin their own transport LNG tanker fleet is not rational. This can be explained by the fact that the market sale and transportation of LNG already are large companies that will not only serious rivals, and actually not have the opportunity to break into the market. So it makes sense to support engagement parties, which already enjoys a prime position in the LNG market in the carriage by sea and become, so to speak, their agents;

3) to determine on which of the existing shipping companies can start regular transportation of LNG, it is necessary to tender.

Thus, the attempt to project an LNG terminal in Ukraine is advisable.

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Анотація

В даній статті розглядається структура газової галузі та ціноутворення на основних регіональних ринках скрапленого природного газу, а також вплив конкуренції на формування ціни.

На сьогоднішній день є чотири основних регіональних ринки, формування ціни газу на яких позначається на ціні скрапленого природного газу (СПГ) у світовій торгівлі газом. До них відносяться: Північна Америка, Великобританія, континентальна Європа та Північно-Східна Азія. На двох ринках, що формуються – у Китаї та Індії, які є імпортерами газу з постачанням по трубопроводах та у вигляді СПГ, – власна струнка система ціноутворення ще повністю не сформувалася. Мета всесвітніх зусиль щодо лібералізації ринків природного газу полягає в забезпеченні того, щоб ціни на даний сировинний товар визначалися ринковою конкуренцією між різними постачальниками газу. В ідеалі, конкуренція наблизить рівноважні ціни до довгострокових граничних витрат пропозиції товару в обсязі, необхідному для задоволення попиту. Регіональні ринки розрізняються за джерелами поставок газу, масштабом застосування контрактів і ступеню лібералізації газової галузі. Ці чинники справляють сильний вплив на поведінку цін і, тим самим, позначаються на формуванні ціни СПГ, що забезпечує його конкурентоспроможність на ринку.

На сьогоднішній день у світі налічується шість великих регіональних імпортних ринків СПГ: Північно-Східна Азія, Континентальна Європа, Північна Америка, Великобританія, Китай і Індія. Північно-Східна Азія і Континентальна Європа мають сильну залежність від імпортного газу, який постачається відповідно у вигляді СПГ і по трубопроводах, в той час як у США і Великобританії промисловість розвивалася на основі власного газу, проте ці країни, ймовірно, перейдуть в категорію великих імпортерів СПГ. Китай і Індія – це нові учасники ринку СПГ, проте в даний час передбачається їх істотне зростання на базі імпортних поставок.

На початковому етапі динаміка цін на ринках Північної Америки і Великобританії, підтверджувала колишні очікування, що конкуренція між різними постачальниками газу дозволить відірвати формування цін на газ від

ціни нафти. З урахуванням того, що ринки Північної Америки і Великобританії було лібералізовано, коли в цих країнах була істотна надлишкова пропозиція, для них була характерна гостра цінова конкуренція між виробниками і пропоновані ними ціни на газ були дійсно набагато нижче ціни нафти. Однак обидва регіональних товарних ринки показали, що в умовах дефіциту при конкуренції між різними енергоносіями можуть встановлюватися ціни, які можуть бути в кінцевому рахунку опосередковано прив'язані до ціни нафти.

Формування цін на газ в Північно-Східній Азії і Континентальній Європі є результатом переговорів за цінами, що проводилися протягом ряду років з їх постачальниками. З іншого боку, і Північна Америка, і Британія лібералізували свої газові галузі, і ціни на газ відображають конкурентну боротьбу між вітчизняними постачальниками за ринки збуту. Теоретично, концепція однакового підходу в усьому світі до формування цін на скраплений природний газ, можливо, і є ідеальною, але вона дуже далека від реалій сучасних ринків СПГ.

Проте міжнародні ринки газу – і особливо ринки СПГ – все ще дуже далекі від конкурентного ідеалу, у зв'язку з чим процес ціноутворення вкрай складний. Крім того, ступінь невідповідності ідеальних умов конкурентних товарних ринків багато в чому різниться по регіонам, і тому мета створення міжнародної системи формування цін на газ, в якій світові ціни на газ встановлювалися би у процесі торгівлі СПГ, залишається ілюзорною.

Інвестиції в трубопровідний транспорт і галузь СПГ являють собою особливу проблему для реалізації конкурентної товарної моделі. Інвестиції є капіталомісткими і характеризуються тривалими термінами від початку здійснення проекту до його завершення. Вони потрібні на початковому етапі, в той час як доходи зазвичай починають надходити тільки після завершення проекту. Для них типові низькі короткострокові граничні витрати, навіть якщо довгострокові витрати залишаються високими. Це особливо характерно в разі внутрішніх поставок, що нерідко визначають ціни, з якими має конкурувати імпортна продукція.

В даній статті представлений порівняльний аналіз світових цін на газ, що транспортується морем у вигляді СПГ, та трубопровідний газ. можна зробити висновок про те, що раціональність використання морських перевезень СПГ ґрунтується на умовах, а саме – відстані, характеристики місцевості та ін.. Крім того можна додати, що СПГ надає можливості дійсно всесвітнього охоплення споживачів. Для нього відсутня така проблема, як відносини між країнами-транзитерами. Також розроблені основні пропозиції для України щодо реалізації проекту СПГ-терміналу.