INSTITUTE FOR FINANCIAL STUDIES

Forecasts of the world LNG market development

K.K. Lebedev

Under the conditions of the world economy growth and increasing demand for energy products the question of energy alternative to conventional energy products becomes more essential. The most promising product of the world energy market is liquefied natural gas (LNG). Despite the factors stimulating LNG market development, it's early to speak about its competition with conventional gas.

The market of alternative energy products began to develop in 1941, when the first world natural gas liquefaction factory was built in USA to cover peak loads in winter time. Though there was the emergency on the factory several years after, the foundation of the commercial use of LNG was laid. The first tanker for LNG transportation was constructed in 1959 in Louisiana (USA), in 1969 the first lot of LNG was delivered from Alaska to Japan. Liquefaction factory in Kenai (USA) operates at the present time.

Today the annual capacity of all world liquefaction factories exceeds 158 million tons of LNG, total annual capacity of regasifying receiving terminals is 312 million tons. Since 1993 the volume of the world trade has tripled, the list of exporters and consumers continues to expand. In other words, LNG confirmed its attractiveness, and its market has stable development trends. There are at least three reasons for it: 1) the cost of liquefaction capacities construction accounted for 1 ton; 2) the growth of the world energy consumption; 3) the convenience of transportation together with the desire of the consumers to diversify energy products and suppliers.

If diversification of energy products is caused by the fact that the largest oil reserves are concentrated in economically and politically unstable regions, diversification of exporters is caused by the fact of maldistribution of natural gas reserves. In particular, the Russian share (more exactly, OAO "Gasprom"), which gas reserves are the largest in the world, takes 25% of Europe natural gas market, that makes Europe consumers anxious. Diversification will be fostered by the way of transportation, that will also foster market flexibility, which is often based on long-term agreements due to pipeline aspect.

LNG production cost. Despite the fact that LNG production doesn't require construction of expensive pipelines, LNG self cost rises considerably due to two additional stages – liquefaction and regasification. Their share in the production costs structure takes up to 40 and 15 % respectively (Table 1).

Table 1. Production self cost of 1 ton of LNG

Process	Range, doll/t
Exploration and production	25,95-51,90
Liquefaction	41,52-62,28
Transportation	20,76-51,90
Regasification and storage	15,57-25,95
Total	103,80-192

**1 t of LNG = 1.38 billion m^3 of conventional gas*
Source: University of Houston Law Ceter, Institute for Energy Law & Enterprise.

Liquefaction and regasification require construction of expensive infrastructure, and, if we consider all the capital inputs in its creation, LNG cost will rise to 250 doll/ton.

However price factor is one of the main factors stimulating the development of the world LNG market. Speaking about LNG self cost decrease over recent years, we should pay attention to the fact that the author means reducing expenses for infrastructure building accounted for 1 ton of the product. This index has decreased on 30% during 1990-2000, moreover, total decrease during 2000-2010 is likely to reach 20%. In total the amount of expenses for infrastructure building has halved for more than thirty years' period (JSC "Sovkomflot").

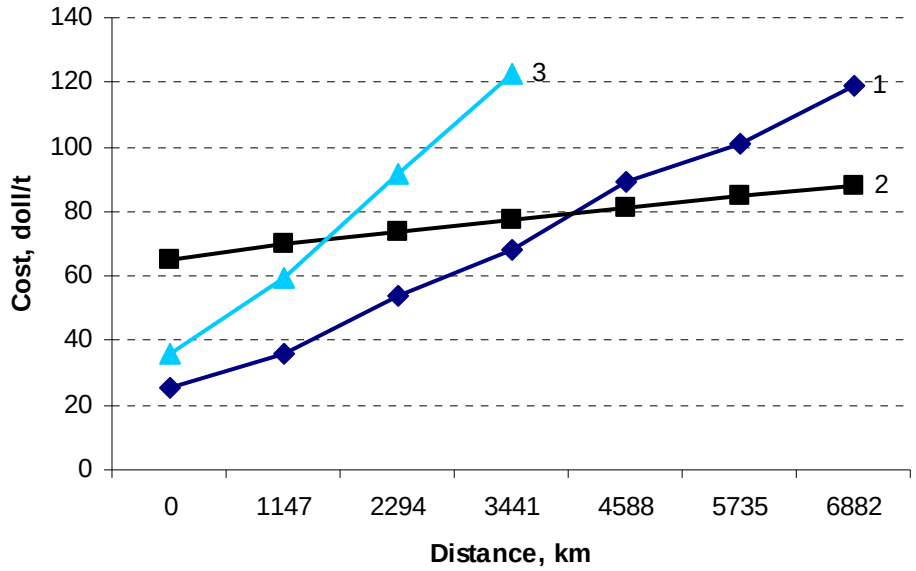
This fact has at least three reasons. The first - gradual reduction of idle capacities volume. The excess of capacities volume over world trade volume during 2001-2004 amounted to 18.6 million tons, while during 1997-2000 it was more than 20 million tons. According to the results of 2005 the gain of LNG consumption volume was expected to be 14.6%, that is up to 149 million tons. In 2005, considering that Egypt realized first export deliveries from the factory of Damietta, total world capacities volume was 158.75 million tons. In case of the forecast realization the expected difference between capacities' and consumption volumes will halve – to 9.55 million tons. This fact allows considering options of further reduction of the volume of expenses for infrastructure building accounted for 1 ton.

The second reason for reduction of the volume of expenses is the growth of productivity of liquefying units (lines) during 1970-2005. Retrospective survey allows estimating the average productivity of one liquefying line which has increased in 2.5 times for 35 years. Regarding the results of 1970-1980, the average productivity amounted to 1.5 million tons. After 10 years according to the results of 1980-1990 the analogous index increased 33.3% and amounted 2 million tons, during 1990-200 – 50% and 3 million tons, and 2000-2005 the indexes equaled to 26.6 and 3.8 million tons respectively (the author's calculations according to EIA and World LNG Map 2004 Edition).

The third reason lies in the sphere of transportation. Transportation costs take up to 30% in LNG self cost structure. Thus, transportation costs reduction can influence the final cost of the product. We should note that transportation costs include not only territorial expanse from supplier to the importer, but also the aspect of tanker fleet building.

The first aspect of LNG transportation costs - direct relationship distance growth – costs increase is more attractive for the importer which is located far from the supplier, because the more is the distance, the slower is LNG costs increase, while there is reverse situation concerning surface and underwater transport (Fig. 1).

Fig. 1 The dependence of LNG and conventional gas cost increase on the distance



1 – surface gas pipeline; 2 – LNG; 3 – underwater gas pipeline

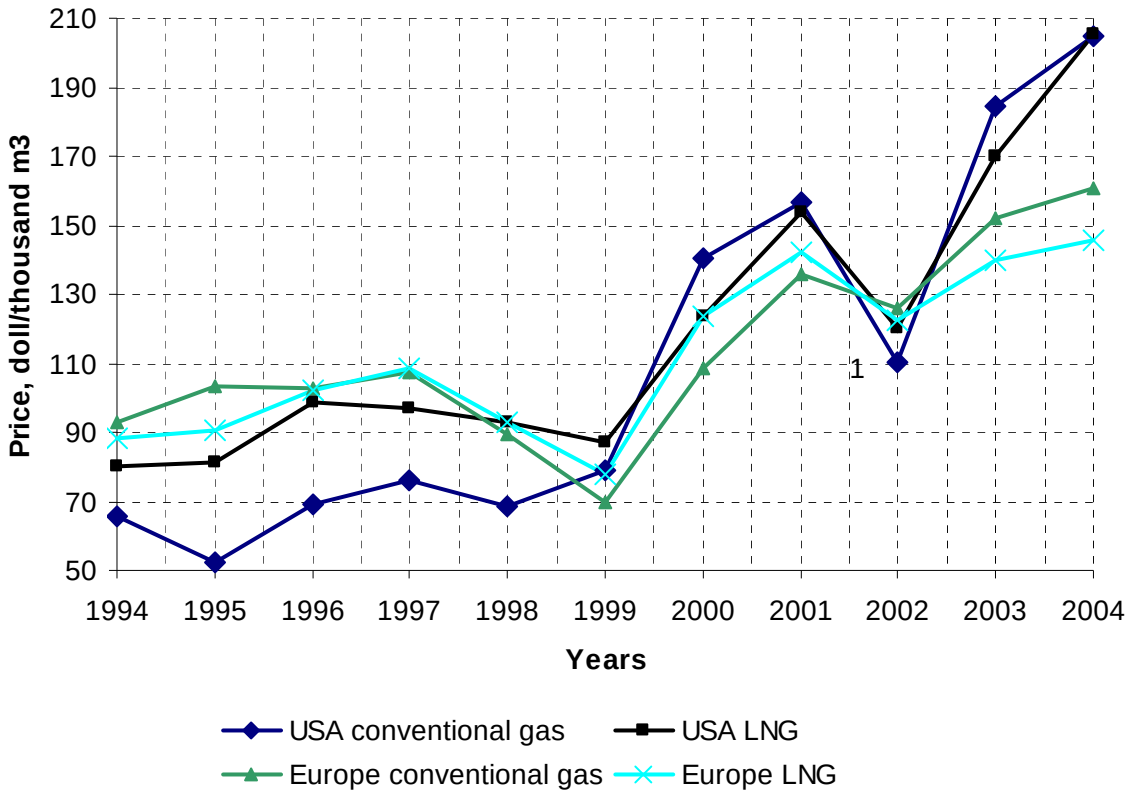
Source – JSC "Sovkomflot"

The second aspect of transportation costs which allows reducing the self cost following the calculation of infrastructure building expenses is the sphere of building LNG-tankers or LNG carriers. Their cost continues to slide during the recent years. The cost of the most popular 125-140 thousand m^3 deadweight (its share in total tanker fleet is up to 50%) has halved for the last 15 years (Chevron Texaco). Despite the fact that in 2004 the cost of the LNG-carrier grew 13% in relation to 2003 (at the end of 2005 14% cost increase was expected), this index halved for the period of 1990-2004. In 1990 the cost was near 260 million dollars, in 2004 – approximately 175 million dollars (JSC "Sovkomflot"). Reduction can be explained by the fact that this deadweight was the most popular in past and it is today. The large share of this deadweight in the world fleet structure means saturation of the gap in the market. LNG-carriers with deadweights of 200 and 250 thousand m^3 are still 31 and 53% relatively more

expensive for the companies (JSC "Sovkomflot"). But when new importers enter the world market transportation distances can increase. This will make deadweight up to 140 thousand m^3 uneconomic[1]. Moreover, as today the saturation of the market by deadweight up to 140 thousand m^3 leads to costs reduction, in prospect it can result in reducing costs of tankers of greater volume which are more expensive today.

For the recent years capacities building costs reduction accounted for 1 ton of LNG defines the market dynamics of prices for LNG and conventional gas. For the last years in USA and Europe markets LNG market price is on the same level or even lower (in relation to the prices of pipeline gas), while in middle 1990-s LNG price was consistently higher (Fig. 2).

Fig. 2 Dynamics of the prices for LNG and conventional gas in USA and Europe markets



Source –Center of Strategic Research (CSR)

Unlike USA, in Europe in middle 1990-s LNG became cheaper than conventional gas that is caused by smaller distances of transporting the product from production centers. There is a reverse situation in USA. Canada, which is the largest supplier of conventional gas, is

[1] According to the data of JSC "Sovkomflot", deadweight of 200 thousand m^3 is 20% more profitable than deadweight of 140 thousand m^3 at the distance of 5.5-14.5 thousand km. Deadweight of 250 thousand m^3 is 25% more profitable than 140 thousand m^3 at the distance of 9-20 thousand km.

bounded by USA, and the closest exporter of LNG – Trinidad and Tobago is located at a distance of approximately 4 thousand km. Moreover, till 1999 Trinidad and Tobago didn't have liquefying capacities, and transportation distance from Nigeria and Middle East countries to USA was even more immense.

Thus, in spite of the reduction of the volume of requires expenses accounted for 1 ton, market prices for all energy products rise, and there are many reasons for it. Firstly, it is demand increase, secondly, worn-out state of some deposits and the necessity to use new, thirdly, location of deposits in faraway regions, including areas with harsh weather conditions (Siberia, Yamal). Moreover, extraction on continental shelf (North Sea) and transportation costs lead do price increase.

Importers. At present 13 countries have LNG receiving terminals. Japan is the world largest LNG consumer, yet its share in the world trade structure is decreasing. The shares of South Korea and USA are growing, for the last two years USA have increased LNG import volume 2.8 times. Despite the fact that for the last 11 years USA import volume decreased three times – in 1994, 1995 and 2002, at the end of 2004 import volume amounted the record 13.48 million tons, and USA share was equal to 10.3 % of the world LNG consumption (BP: Statistical Review of World Energy, 2005).

LNG import volume to South Korea decreased only once – in 1998. In relation to 1993 South Korea raised import volume 4.7times, while Japan didn't show stable dynamics of import volume growth for the recent years. At the end of 2004 LNG import fell in relation to the previous year for the third time, in 2004, 3.5 % less (towards 2003) LNG was imported. Europe increased LNG import volume more than twice over 1993.

Except the listed importers, we should note that in 2004 India has imported LNG to Hazir receiving terminal for the first time (74% is owned by Shell, 26% - by Total). Australia has also become the importer: the volume of the supplied feed amounted to 2 million tons (IA "Interfax", 21.04.2005, AK&M, 21.04.2005). At the end of 2004 the consumption of LNG in PRC increased by 6.8% and exceeded 21 million tons (IA "Interfax", 03.02.2005).

Exporters. Export of LNG is realized by 13 countries. Their geographic location makes the market local. The matter is that the main consuming regions are close to production regions. For example, the demand of Japan is supplied by Malaysia and Indonesia. The main feed suppliers to Europe are Algeria and Middle East countries. Island state of Trinidad and Tobago supplies LNG to USA. The fact of small distances has caused the dominance of tankers with deadweight of up to 140 thousand m^3, commercially viable at distances no more than 5500 km (Table 2).

Table 2. Activity of LNG exporters according to the results of 2004

LNG exporter	LNG volume, million tons
Indonesia	24,4
Malaysia	20,2
Algeria	18
Qatar	79
Trinidad and Tobago	17,56
Nigeria	18,21
Australia	9,19
Brunei	8,88
Oman	6,93
UAE	6,59
USA	5,38
Libya	1,22

Source: BP

The largest exporters are APR countries (Malaysia and Indonesia), the least volume is supplied by Libya and USA. In 2004 Egypt has for the first time exported LNG, produced on the capacities of the factory in Damietta. The owner of the factory is SEGAS, the founders of which are Union Fenosa (Spain) and Eni (Italy). The first supplies were delivered to Spain – the largest Europe consumer.

Forecasts. What are the reasons for the positive forecast of LNG market development? Today we can list the following factors stimulating the development of the new market:

- Self cost reduction of 1 ton of LNG production based on building of capacities;
- Growing demand for the new energy product;
- Mobility and transport “flexibility” of supplies;
- Ecological cleanness of this energy product.

The demand stimulates the aspiration of the countries to diversify energy products, caused, firstly, by the desire to reduce the dependence on oil supplies. Secondly, in the conditions of environmental pollution the value of the ecological cleanness rises, particularly in Europe. Moreover, Europe, anxious of the dependence on the Russian gas, strives to diversify not only energy products, but their suppliers too. This may be one of the reasons to explain the forecast of LNG consumption till 2020, according to which Europe will go ahead USA in consumption. If for the period of 2008-2013, in accordance with the forecast, USA consume up to 350 million tons, that is the year average consumption volume amounts to near 58 million tons, in Europe analogous indexes will equal to only 243 and 40.5 million tons, to the end of the 2014-2020 the relationship will differ: near 460 and 66 million tons in USA and

580 and 83 million tons in Europe (CSR). To supply the growing demand the existing exporters will have to increase the capacities (Table 3).

Table 3. Dynamics of LNG exporters' capacities

Exporter	Existing capacities (August 2005), million tons	Planned increase to 2007, million tons
Nigeria	8,85	8,2
Trinidad and Tobago	9,9	5,2
Egypt	4,8	7,5
Qatar	19,5	4,7
Oman	15	3,3

Source – calculations of the author on the basis of the data of CSR, EIA, World LNG Map 2003 Edition

Except the forecasts of capacities increase there are forecasts oriented at the general conjuncture of the world LNG market. Despite the fact that they are made be the largest world companies they are to be challenged.

The doubts concern rates of increase of the world LNG market forecasted by North West Shelf Australia LNG and Shell. North West Shelf Australia LNG predicts that the volume of LNG world trade is likely to reach 240 million tons to 2010, that is twice higher than the level of 2003 (forecast for 2004), in 2020 the volume can be equal to 380 million tons. We can define growth rates accordingly, which will be 10% a year till 2010, for the period of 2010-2020 the rates will slow down considerably and amount to 4.7% (IA "Interfax", 14.09.2004). Then the reasons for the high rates till 2010 and their sharp decrease after 2010 are not clear. According to Shell forecasts, the volume of world demand can equal to more than 460 million tons to 2020, so that for the period of 2004-2020 annual demand growth rates will exceed 8% (RIA "TEK", 11.10.2005, AK&M, 11.10.2005).

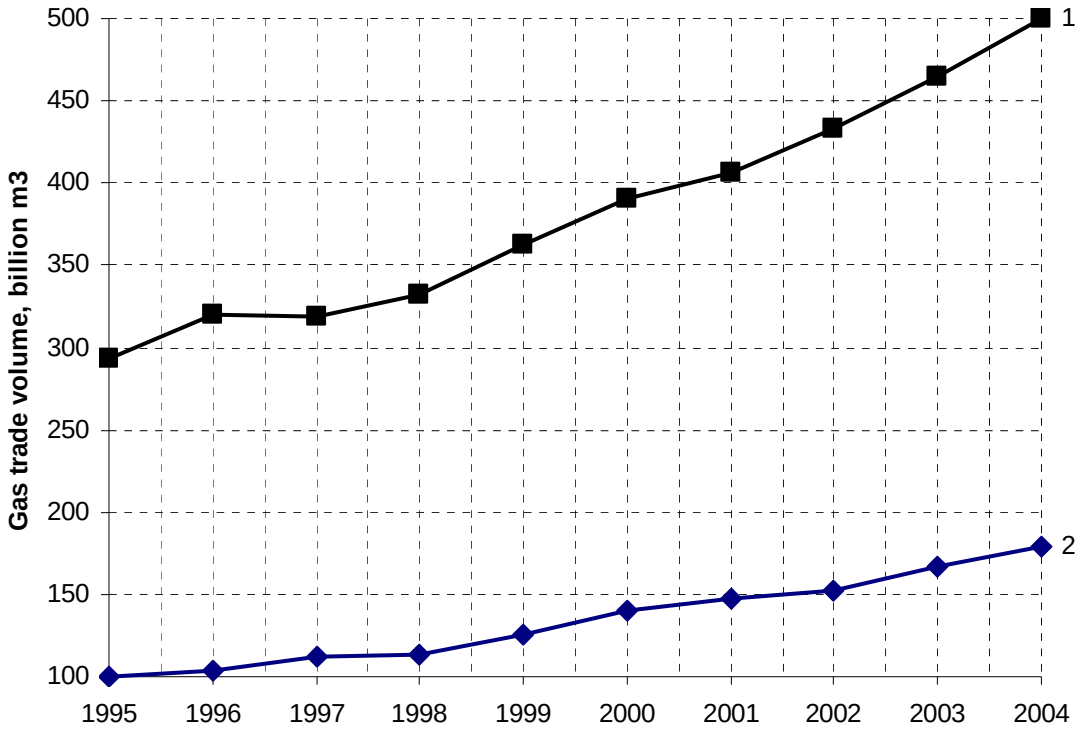
To realize the forecast of the Australian company to 2010 it's necessary to build additional liquefaction aggregates of total capacity up to 80 million tons as a minimum, then the volume of the world market will correspond to the volume of the capacities, and also the condition of full capacity utilization will be realized, which has never happened yet. Nevertheless, according to EIA, aggregates with the capacity of near 53 million tons are at the building stage and are to be integrated in 2005-2007. This allows considering the situation that building timescales can be broken for many reasons. There is no sense in considering construction periods of facilities just planned to be built because of many admissions.

Realization of Shell forecast depends on the dynamics of capacities construction. Still, according to IEA, near 260 million tons of capacities are under construction and planned, that amounts to no more than 417 million tons together with the existing capacities.

As far as growth rates are concerned, we can observe retrospective data that doesn't reflect the forecasted indexes. Growth rates near 7% a year look more realistic (based on the average annual index for the period of 1994-2004 equal to 7%). In accordance with them the calculated volume of the world trade can amount to near 195 million tons to 2010. According to this volume we can reasonably expect the correspondence of the volume of capacities and the demand. If today we already have near 158 million tons of capacities and 53 million tons capacities are under construction, then to 2010 their total volume will be at the level of 198 million tons. More long-term forecasts may turn to be not exact, both in the sphere of consumption and in the sphere of liquefaction capacities. In this respect we can mention the most realistic forecast of Gas de France, which predicts the world LNG production volume of 186 million tons to 2010, and 340 million tons to 2020 (IA "Interfax", 14.09.2004), that suggests even lower world trade volume because of the possibility of internal LNG consumption by the exporters themselves.

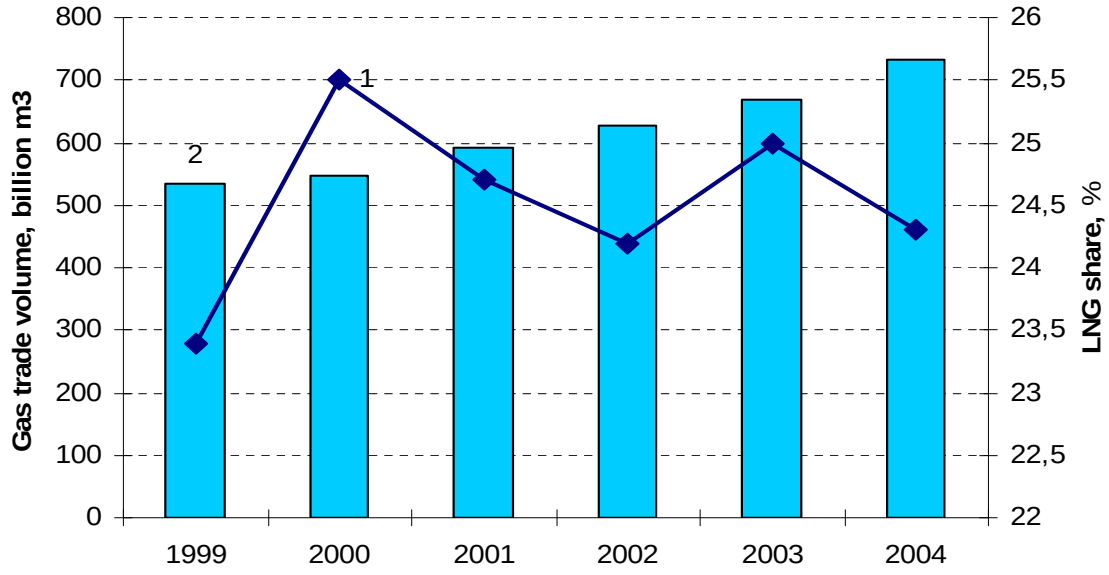
However, the companies are likely to underestimate the prospects of conventional gas, which world trade grows even faster (Fig. 3). Despite the fact that LNG has evident advantages, we shouldn't forget that gas transmission networks and pipelines are already developed and contracts between the supplier and the consumer are often long-term. The ambitious forecasts regarding world LNG market growth are challenged by the fact that despite the explosive growth of the new market the share of LNG in the world trade structure doesn't exceed a quarter and at the end of 2004 has decreased 2.8% relative to 2003 (Fig. 4).

Fig. 3 Dynamics of the world trade of pipeline gas (1) and LNG (2) for the period of 1995-2004



Source - calculations of the author on the basis of the data of EIA, OPEK

Fig. 4 LNG share (1) in the structure of natural gas (2) world trade



Source – the author's calculations on the basis of the data of EIA, BP, OPEC