

# The influence of interfuel competition on the natural gas market in the countries of the Pacific Rim

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**Abstract – The rapidly growing APR economy requires adequate supply of energy resources. Natural gas has to play an important role in energy supply. However, this region is most exposed to its competition with other fuels, in particular, coal<sup>1</sup>.**

## I. INTRODUCTION

Today, the energy market of Asian Pacific Region is the most dynamic. In 2007, the countries of Asia Pacific demonstrated the highest growth rate of primary energy consumption of 5% [1]. The region's gas consumption increased by 6.4%, coal consumption – by 7%, oil consumption – by 2.3%, and hydroelectric power consumption increased by 5.9% with nuclear energy production reduced by 4%. The use of renewable energy sources, except for water resources, remains low in APR.

Over the long term, coal and natural gas shall account for the region's growth of energy consumption. The main advantages of coal for APR countries include its price-competitiveness and large resources in China, India, Australia and Russia. Among the best advantages of gas are its environmental profile and easy supplies to APR from the large deposits in Russia, Central Asia and Middle East. The transport component has a serious effect on the market. Coal is easy to transport by sea, because it requires no expensive operations of liquation and dilution. It is possible to use pipelines for gas transportation, which is cheaper than shipping fuel by railroad. Therefore, it is advantageous to use coal in coastal areas or close to production sites. Gas

consumption depends in large part on the capacity of gas transmission systems.

## II. GAS CONSUMPTION FORECAST IN APR

APR gas consumption is rapidly growing. Over the last 10 years, the demand for gas in Asia Pacific increased at an average annual rate of 6%, which is more than 2 times higher than the average annual world's growth. In 2007, APR gas consumption increased by 27 billion cubic meters with the production increase of 18 billion cubic meters. China's share in production growth is 60% and its share in consumption increase is 41%.

The share of gas in total energy consumption in several APR countries has remained comparatively low. For example, China's share accounts only for 3.3%. This shows a great potential of gas consumption growth in this region.

There is considerable controversy over the growth estimates for the natural gas consumption by the economy of China. This may be due to the possibility of transition to coal, and a divergence in assessment of the country's economic growth rate. Many experts wonder whether the natural gas could become the main resource in China's energy balance or occupy just a small part of it. Currently, this point is central to investment opportunities in the natural gas industry of China.

According to the International Energy Agency [2], the demand for gas in China by 2030 will reach about 240 billion cubic meters, half of which will be imported (Fig. 1).

Besides China, gas consumption is rapidly growing in India, South Korea, Japan and Thailand. Japan is the current leader in gas

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consumption among Asian countries, consuming 90.2 billion cubic meters per year.

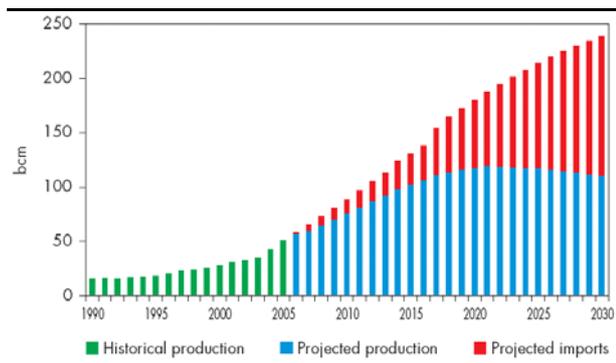


Fig. 1. China's Gas Balance in the Reference Scenario IEA (bcm)

According to forecast from the US Department of Energy, the consumption of natural gas in Asian countries will increase from 354 bn m<sup>3</sup> in 2003, to 1 trillion m<sup>3</sup> in 2030. China and India will account for the major growth share with average rates of 6.8% and 5.9% respectively. Japan with its average annual growth rate of 0.8% will rank the third in Asia by gas consumption volume in 2030.

The basic scenario of the International Energy Agency forecasts lower annual growth rates of gas consumption before 2030 in China (6.4%) and India (4.8%), but more rapid rates in Japan – 1.7%. In this event, Japan will rank second after China by gas consumption in Asia by the end of the forecast period. The alternative IEA's scenario provides for the faster growth of gas consumption in China on the back of decrease in Japan and India.

It is important to note, that APR gas consumption is affected by other energy sectors. For instance, when the breakdowns in nuclear power plant production caused unexpected growth of demand for energy resources in Japan in 2007, imported deliveries of liquefied natural gas (LNG) went up by 8.5% or 7 bn m<sup>3</sup>.

Accordingly, the connection among different energy sources will adjust the demand for each of source, and gas will depend at large on its long-term competitive advantage.

### III. INTERFUEL COMPETITION

Today, coal, gas and nuclear fuel compete in the electricity generation sector. The oil market exists by itself, almost independently of alternative fuels. The decrease in consumption of fuel oil in electricity power generation has minimized its correlation with coal and gas.

The specifics of nuclear power plants which are unavailable for material short-term variation of capacity, as well as the cost of their construction and long-term commissioning, makes it possible for nuclear fuel to compete with gas and coal in the long-term perspective only, and within the strategic electrical power development.

Using natural gas in electric power industry offers a number of obvious advantages – the cheapest pollution-free fuel, very maneuverable load level schedules (gas plants allow daily load reduction up to 50%, compared to 30% for coal and 10% for nuclear power plants) [3]; gas power plants are the most rapid and the cheapest in terms of construction (600-800 \$/kW of installed capacity for the most up-to-date plants) and have the highest efficiency levels.

Higher fuel prices will disadvantage gas power stations to coal plants over the next 20 years.

The ultimate policy in the electrical energy sector will combine gas, coal and nuclear power generation. Separate APR countries will show their own preferences to certain types of fuel. For example, For example, China will be dominated by coal, India will chose coal and gas, and Japan and Korea will preserve a balance of all fuel types with a special focus on nuclear energy.

The share of gas in China will increase mostly due to administrative controls of coal consumption and its substitution with natural gas, which has already started in some regions of China, including Peking, Shanghai and other large cities [4].

Going forward, gas, oil and oil products competition may cover motor fuel and recycle stock. This process is facilitated by increased recovery rate of associated gas. However, no

serious competition is expected in this sector over the next years.

The natural gas prices are linked to petroleum which allows to predict the natural gas market share with some degree of certainty. The natural gas market value could be drastically affected by changes in the current market structure based on the long-term contracts and the correlation with the oil prices lobbied by certain political forces worldwide.

Qatar's Minister of Energy Abdullah al-Attiya and his Algerian counterpart Chakib Khelil said in July 2008 that gas should have at least the same price as oil. According to them, gas costed 40% less than oil in early summer. This conclusion was made on the basis of gas heating value and fuel cleanliness [5].

Gas is more environmentally friendly than oil. Given the measures taken globally to reduce CO<sub>2</sub> exhaust, and provided gas prices are freed from oil prices, gas prices can get upscaled. Oil prices, however, are often defined by factors not affected by actual supply-demand balance and mining and transportation costs. Lately, the market is increasingly affected by speculation and various threats of supplies reductions (terrorism, weather, political and military conditions). These factors push the prices up. But their effect on the gas market, which is considered more stable than oil market, is much less, and the price may be stabilized at the level below the oil price. Over the long term, it would be therefore correct to define the gas price as a correlation with the energy products range which will include oil, oil products, coal, nuclear energy, and, probably, renewable energy sources. Such approach may be used as a long-range landmark, both for long-range contracts and exchange trade.

#### IV. PROSPECTIVE USE OF RENEWABLE ENERGY SOURCES

Today, the renewable energy sector is rapidly growing; however, its share in the total world's energy balance is still very small. The renewables sector is developing slower in APR countries than it does in Europe and the USA. This may be attributed to lesser interest of

these countries in alternative energy sources due to environmental and economical reasons.

The biofuel has been seen as a potential energy resource in many Western and Third World economies for a number of years. Yet, a pragmatic analysis of the biomass production and consumption has recently dampened hopes for its wide implementation. Consequently, the transition to biofuels in the Pacific Rim countries has been called into question.

The EU report published in January 2008 states that biofuel implies ecological risks. They include the growth of CO<sub>2</sub> emissions due to the usage of farming machines for culturing the biofuel raw material, mineral fertilizers and recycle plants. Besides, it is also mentioned in the report that the recovery of the woods cut down for culturing the raw material will take from 50 to 100 years of utilizing the biofuel made of the plants cultured in place of the former woods [6].

Besides, biofuel is claimed to be one of the main reasons of global food products price increase.

So, any drastic growth of biofuel consumption can be hardly expected in APR where environment requirements are lower than in Europe.

At the same time, some APR countries are seeking to develop new technologies of biofuel production which may use non-crops as raw material. For example, in 2008, Japan completed the construction of its first large-scale plant for production of biofuel from bark. The plant will use bark from wood processing as raw materials. The bark is crushed, dried and formed into "biogranules". According to the plant operator, farmers will be able to cut their fuel costs by 30-40%, if they substitute fuel oil with biogranules for heating their greenhouses. In 2008, China created its first plant to produce fuel from straw [7].

Regardless of any scientific research in this sector, Chinese authorities make no plans for large-scale development of biofuel in the near future, because food security has the primary strategic importance for the country [8].

Price run up for biofuel raw materials has killed dozen projects. For example, Malaysia, the second largest producer of clean fuel, licensed almost 90 companies for its production about 3 years ago. Total production capacity was projected to reach 10 mln tons a day. Today, only 7 plants are operative in the country, and the production volume will drop below 100,000 tons a day by the end of 2008. [9]. Manufacturers involved in this sector say that they see no sense to invest money in this production, because they suffer enormous losses in the current situation.

There is no material increase of biomass and waste use expected in APR before 2030. According to forecasts from IEA, China's consumption of biofuel by 2030 will remain at the level of 2005, India's average annual growth rate will be 0.8%, and Japan's rates will amount to 4.3%. By the end of the projected period, the share of biomass and waste of the total primary energy consumption in Japan will be below 3%, in India – 15%, and in China – 6%.

Until 2030, China and India will annually increase their consumption of hydropower by 3.8% and 3.9% respectively. In Japan such growth will amount to only 0.7% per year.

The highest possible growth rate of all primary energy sources will be shown by other renewable energy sources, including geothermal, solar PV, solar thermal, wind, tide and wave energy for electricity and heat generation. They will annually grow by 9.9% in China, by 11.7% in India and by 4.3% in Japan. However, their share in total consumption of primary energy will remain rather small, and will vary in these countries from 0.7% to 1.8% by 2030.

## V. ENVIRONMENTAL ASPECTS

The world nations attempt to focus on environmental aspects of the energy infrastructure. Even though the Pacific Rim countries are not as preoccupied with the carbon dioxide emission as the European Union, they, too, take a closer look at the environmental demands due to the growing

energy consumption in the Pacific region. The environmental factor could further affect their energy profiles in the near future.

According to BP, APR countries have gained the lead in growth rates of carbon dioxide emissions over the last ten years (Fig. 2).

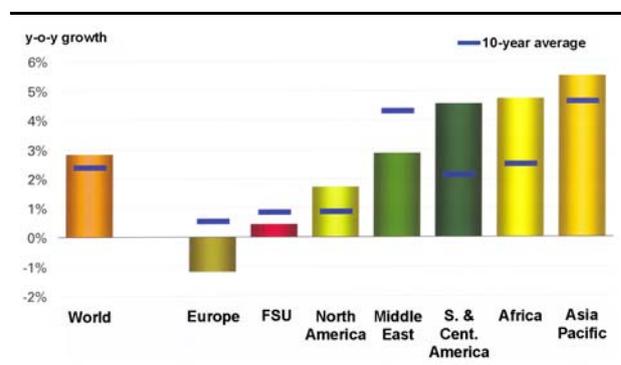


Fig. 2. 2007 and 10-year carbon emissions growth.

For a long time, APR avoided the programs for reduction of CO<sub>2</sub> emissions. An important step forward in this area was made by Japan which began to perform its obligations to reduce greenhouse gases emissions in April 2008 [10]. Japan shall have to reduce its emissions of 1990 level by 6% over the period from April 1, 2008 to March 31, 2013. According to Japan's Prime-Minister Yasuo Fukudo, the country will cut its greenhouse emissions by 60-80% until 2050 [11]. As a result, the emission quotas cost for "dirty" fuel will be included in its consumption price, which increases the appeal of natural gas in Japan.

China also pays increasing attention to environmental challenges. In the current year it will spend 41.8 billion yans (about 6 billion dollars) on projects related to energy saving and reducing greenhouse gases emission, which is 78% more than in 2007.

South Korea which now ranks tenth by greenhouse gas emissions, plans to reduce such emissions mostly by means of using environmentally safe energy of tidal and nuclear power plants. In particular, Korea Water Resources (KOWACO), a South Korean corporation, plans to complete the construction of Sihwa Lake Tidal Power Plant, the largest tidal power plant in the world, by the end of

2009. The total capacity of this plant is projected to reach 254 MW [12].

Other APR countries also develop their own plans to reduce CO<sub>2</sub> emissions; however, the measures they take are inadequate to emissions growth rates in the region. The extended use of natural gas may become one way of preserving environment.

## VI. RUSSIAN GAS AND APR MARKET

The natural gas mining and transportation costs may differ considerably across potential suppliers to the Pacific region. Considering a limited number of opportunities for a further rise in the natural gas supply, the natural gas prices, as contrasted with the alternative fuel prices, would be crucial to the survival of many infrastructural projects. Consequently, the number of natural gas suppliers to the countries of the Pacific Rim could change depending on local market trends. Under these circumstances, the Sakhalin and East Siberia oil and gas deposits would remain in a favorable position in the long run.

Besides Russian gas, supplies to APR will include pipeline gas from Central Asia, LNG from Indonesia, Australia, Malaysia, and Middle East. Transportation distance from all the above sites to consumers usually exceeds the distance from the fields in the Eastern Russia, provided comparable production costs. Russian gas, therefore, has a competitive advantage in this region.

The Russian state policy for developing gas industry in the Eastern Russia is set forth in the Program for Creating the Unified Production, Transportation and Supply Gas System in Eastern Siberia and Far East, Considering Possible Gas Export to China and other APR Countries.

According to the above program, from 2020, the total volume of natural gas export via pipelines to China and Korean Republic may reach 25-50 billion cubic meters, and supplies of LNG to APR countries in 2020 will amount to 21 billion cubic meters, and 28 billion cubic meters in 2030.

The actual export volumes to China will depend on the agreed mutually acceptable supply conditions, in particular relative to prices, and China's policy regarding its fuel balance. LNG market is more flexible and allows for diversification of consumers portfolio. Russia has all chances to reach the projected export volumes in APR.

The consumers' interest in Russian gas is supported by contracts concluded almost for the whole volume of supplies from Sakhalin in liquefied form and reinvigoration of negotiations with China and South Korea on pipeline gas supplies.

Russia, therefore, will play an important role both in supplying energy to APR and stabilizing environmental situation in the region.

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VI. BIOGRAPHIES



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