

## Prospects for Expansion of International Transport Corridors Russia- Europe with the Use of Natural Gas as Motor Fuel

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Natural, labor, industrial, agricultural, financial and other resources are spread throughout the nations of the world unevenly. Production & exchange of goods and services (the trade) have lead to the formation of integrated production-exchange centers connected by the transportation routes. In modern economy major trade routes, for instance in Europe, have been termed 'International Transportation (or Crete) Corridors'. Conceptually they are similar to the ancient Silk, Hansa or Amber ways (routes).

Based on those Corridors in 2002 the International Expert team has suggested to develop Blue Corridors. These are the routes for on-road passenger transportation and goods freight between nations by coaches and trucks powered by the blue fuel – compressed and/or liquefied natural gas.

As many would recall the Blue Corridor project was supported by the UN ECE in 2002 and G8 Saint-Petersburg summit in 2006.

The international expert group under the auspices of ENGVA (the then existing European NGV association) has recommended three Blue Corridors: Helsinki – Saint-Petersburg – Moscow; Moscow – Minsk – Warsaw – Berlin; Berlin – Rome. A little later a joint Gazprom-E.ON Ruhrgas team has proposed to add one more Blue Corridor: from Kaliningrad to Berlin.

The Blue Corridor Project is actually a concept, a philosophy of shifting from traditional gasoline and diesel to environmentally and economically more friendly transportation fuel – compressed of liquefied natural gas.

The Blue Corridor Project is not a purely European ideology. This approach could be applied to any part of the world. The Blue Corridors is an infrastructural concept which implies the development of the NGV market along the existing and future trade routes and ways where natural gas is available.

The growing world population is a key-factor for the global economic development. According to the United Nations Population Department, in the first half of the XXI century the global population may grow 1.5 times from 6 to 9 billion people.

Demographic predictions may differ from source to source. However most of them unanimously state that Asia will keep the leadership: in 2000 it had 61% of the world population; in 2050 it is projected to have 59%.

Percent wise Africa will top the list: its population till 2050 will grow to almost 2 billion people, which equals a 250% rise over the current 800 million people.

Asia, Oceania and Americas will have relatively similar population growth rate: from 42 to 48%. However absolute numbers can not be compared.

Europe is doomed to loose 13% of its population. One of the reasons for that will be labor migration to growing economies.

In the coming decades Asian leadership in population will be accompanied by a dramatic economic growth. It is projected that by 2050 Asian countries will produce almost half of the world GDP.

European and North American nations will have lower shares, although their economic growth will remain also significant.

The cumulative global GDP will grow 4 times in 2050 compared to 2005.

Global economic development will require new transportation capabilities on the ground, in the sky and high seas. In particular, the world on-road fleet may by 2035 reach from the current 800 million to 3 billion vehicles.

National and regional motorization levels will keep growing, although this growth will not be globally even.

Available forecast state that by 2020 global motorization level will be growing at an average annual rate of 10%, whereas that in industrialized countries will be 6 % and 40% in developing economies.

World population growth, economic progress including higher mobility demand inevitably expand demand for fuel and energy. International Energy Outlook 2008 assumes that from 2005 to 2030 overall global energy consumption may grow 50 percent.

A similar 50% expansion of energy consumption is predicted in the world transportation sector. It is also supposed that the share of liquid petroleum fuels will in the transportation energy basket may fall from 37 to 33 percent by the year 2030.

Gasoline and diesel will be replaced by other energy carriers including natural gas and biomethane.

Demographic and economic data give the ground to suppose that in the near future world energy sector will be developing more aggressively in the Asian subcontinent.

It is obvious that the general scheme of AfroEurAsian gas supply corridors looks more developed in the European part. The density of population, businesses and concentration of finances for decades and decades allowed Europeans to invest enormous resources into the energy infrastructure.

It is only recently that African and Asian countries have started major natural gas projects particularly in the on-land gas transmission sector.

New gas pipelines - planned or under construction - in Africa, Europe and mainly in Asia will allow to link national and regional gas supply corridors into a unified AfroEurAsian blue fuel transmission system: from Tokyo to London and from Murmansk to Abuja.

A continuous, uninterrupted intercontinental gas flow opens the opportunity to extend the European Blue Corridors to the Far East, South Asia and sub-Saharan Africa.

Blue Corridors are not just vain hopes or fruitless efforts. Economic and environmental feasibility of long distance operation of NGVs have been proven in many countries. For instance in Russia in 2008 and 2009 we have organized the Blue Corridor NGV Caravans from Saint-Petersburg to Sochi. NGVs from original manufacturers had no breakdowns or incidents along the 2300 kilometers route.

The NGVs performed perfectly well not only on the planes but in the mountains too.

We are sure that in order to promote the NGV philosophy it is necessary to organize similar convoys in other countries and parts of the world. National and regional NGV associations together with gas and automotive companies shall play the key role in these activities.

A tremendous promotional effort was done by a group of NGV companies that had sponsored the world trip of CNG VW Caddy in 2006.

It must be stressed for the record that the 'The Blue Corridor' concept reaches beyond on-road vehicles and is applicable to rail-road, air and water-borne means of transportation.

Quite a lot has already been said and written about the use of LNG for aircraft. It is useful to remind that in the late 80-s of the last century Soviet Union has successfully fly-tested the TU-155 flying laboratory with a liquid hydrogen and a little later liquefied natural gas engine.

The river and sea ships are using LNG for decades now.

A new option is the use of LNG gas turbine locomotives which Russia began testing in early 2009. This locomotive is easily pulling a 15 thousand ton train. This technology could be used for the Russia-Alaska rail-road connection in the near future.

It is necessary to mention one more aspect. Natural gas is a pathway, a bridge to other even cleaner motor fuels.

We may use the following palette to classify different fuels.

- Today the whole world is crisscrossed with Red corridors where **traditional gasoline, diesel and kerosene** are used.
- National and international Blue corridors with **CNG and LNG** have been initiated in Europe, Asia Pacific and Latin America since 1999.
- Green corridors where **biomethane** should be the principal propellant will grow in the next ten years. Biomethane corridors are emerging in Sweden and Switzerland.
- And finally, White corridors for **hydrogen** powered vehicles may become a commercial reality in 20 – 25 years. The HyNor project, for instance, – a hydrogen road between Stavanger and Oslo – is being implemented in Norway since 2003.

Growth of the population, industries, energy consumption and motorization primarily in Asia will inevitably stimulate the expansion of the existing and future European Blue, Green and White corridors to the South and East.

This expansion will be following the development of the regional energy complex including the natural gas production, transportation, storage, processing, and distribution infrastructure.

And finally: only 86 kilometers of the Bering Strait separate AfroEurAsian on-land transportation corridors from the American ones. 86 kilometers look like nothing compared to 69 million kilometers of paved roads across the world. But this link will open a new dimension in the global economic and social progress. The continuous on-road Blue, Green and white Corridors will close the transportation loop between four parts of the world out of six and 99% of the population.

The final conclusion from the above is: the original Blue Corridors concept, initiated in the Russian Federation in 1999 has all social and economic grounds for further extension. We shall go:

beyond on-road applications and include rail-way locomotives, air- and watercraft;

beyond natural gas and include at least biomethane and hydrogen;

beyond current geographic boundaries.

We must see a broad picture. A global picture!