

World Energy Congress 2013
Future of transport: Decarbonizing growth

Natural gas and LNG: a part of the solution
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Mr Andreas Schaefer, Professor in Energy and Transport, UCL Energy Institute
Distinguished Delegates,
Ladies and Gentlemen

Slide 1

It is a great honour and privilege to open this Roundtable on the challenges of decarbonizing the global transport sector, which is one of the most rapidly energy demand growing segment, and one of the most complex to address, since it is driven by multiple factors of a political, cultural, technical and economic nature.

I will make a general presentation of the transport sector worldwide and, as the President of IGU, an organization that represents 82 countries and 95 % of the natural gas global market, I will sketch what can be the medium and long-term contribution of natural gas and LNG for the promotion of a sustainable and environmentally friendly growth of transport, by road and sea.

Mr Ayed Al-Qahtani will...*(to be precised)*

Mr Appert will present an overview of the most recent scientific and technological developments in low carbon energy schemes for transport and an outlook of the challenges entailed by their progressive substitution to conventional ones.

Mr Schaefer will then conclude this roundtable by presenting an overall synthesis of the future of the transport sector at the crossroad of a series of constraints and will show how much progress should still be expected on the path of mitigating decarbonizing growth and a global sustainable development.

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The global transport sector consumes more than 2.2 Billion tons of oil equivalent (Gtoe), representing about 20 % of global energy supplies. Liquid petroleum products have been historically dominating the supply pattern, with about 96 % of this amount in 2010, while the rest was from natural gas, biofuel and electricity.

More than 60 % of the oil consumed globally – around 52 million barrels per day – goes to the transportation sector. As this slide shows it, road transport accounts for the bulk of energy consumption, the light duty vehicles (LDVs) meaning cars, minibuses, and trucks representing more than half of the needs. Air and marine each account for about 10 % of energy consumption while the railways for only 3 %.

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Looking at these shares over a long period of time shows that road transport, both for freight and passengers, has always dominated the sector, followed by aviation and shipping.

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The transport sector is a major contributor to the global CO₂ emissions, although its 22 % share is only half of the emissions from the electricity and heat sectors and slightly below that of industry.

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In theory, using natural gas (CNG) and LNG and, in a still unpredictable future hydrogen for fuel cells offer highly promising ways for reducing the carbon print in the transport sector.

However, a series of factors are slowing down the process of conversion, among which:

- The relatively low energy density of these fuels when compared to conventional liquid petroleum products;
- The economic constraints, on a mass market like cars and light buses, for the renewal of the fleets, which has to be aligned with the depreciation and renewal rate of the vehicles, over a timescale that may exceed 20 years;
- The discrepancies in the GHG emission regulations in the transport sector on a global basis;

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The energy density of natural gas under its CNG or LNG forms, although respectively 200 and 600 times higher than for methane at atmospheric pressure, remains much lower than in the case of diesel or gasoline. This is a natural

handicap that has to be offset by providing a higher geographical density of supply points.

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However, developing the necessary infrastructures for CNG, even in countries that already have natural gas transmission and distribution pipelines in place, is a long run process, which has to be fostered by granting the car manufacturers, the fuel distributors and the road users a visible and stable framework, in particular on the fiscal terms and conditions attached to the different options tendered for fuel vehicle supply.

For all the actors involved in the process, from the car manufacturers to the end users, the conundrum is *“Natural gas is great, but where do we get it, where is the infrastructure and can I depend on gas to sell cars or to purchase and run my new car?”*

This explains that a process taking a lot of time when the fuel supply infrastructure is not at stake will take a much longer time if it means switching from one well known type of fuel to another one, although more attractive in terms of pricing and carbon print.

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Another important factor is the regulation on quantitative CO₂ emission target levels, which presently vary considerably from one region to another. The car manufacturing market being globalized, it is essential for the development of CNG that such thresholds should be harmonized. It is a *“chicken and egg”* conundrum, although I would not dare using such terms for governments and regulators...

However, the intrinsic qualities of natural gas and, in particular, the importance of its reserve base (more than 250 years if we include shale gas), its environmental merits and relatively low price in comparison to oil, constitute a strong driver for CNG, as measured by various indicators, like:

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Altogether, it is expected that the worldwide fleet of natural gas vehicles will continue its exponential growth during the present decade, with a total number of about 40 million units expected by 2015, which represents about 4 % of the global light vehicles fleet. **A reasonable assumption, fostered by the abundance of gas resources and environmental awareness, is that NGVs might account for about 5 % of the fleet by 2020, a figure slightly above IEA's estimates issued in 2011.**

In the maritime industry, there is an increased interest towards the use of LNG as a fuel for bunkering, given its long-term availability, price levels and environmental impact. This is a new and highly promising sector for LNG in regions having LNG reception facilities.

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As 2015 nears, the shipping industry is faced with adhering to much stricter regulations on sulphur emissions. Such regulations are now almost universal, they only differ in terms of target levels of SO₂ emissions.

At that time, the Emission Control Areas (ECAs) will enter into force. The ECA already comprises the Baltic and North Seas along with the English Channel, as well as the North American coast together with the US Caribbean. It will see the fuel sulphur limit fall to just 0.1 % in 2015. From 2020, a global requirement of maximum 0.50 % Sulphur outside ECAs shall apply.

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LNG offers one of the most prominent and economic solutions, reducing sulphur dioxide, but also NO_x and CO₂ emissions, while being economically feasible. This slide evidences the potential reduction of GHG and other atmospheric pollutants resulting from the switch from Middle Distillate Oil (gasoil) to LNG.

There are several options for future compliance with the ECA targets, mainly operating on low sulphur fuel oil or MDO, installing an exhaust gas scrubber on the ships or using LNG.

The DNV and large companies like Shell are projecting that, by 2030, up to 45 % of vessels might be fuelled by LNG, the LNG bunkering option now seems a convincing alternative.

As in the case of CNG, the model implies the development of a network of LNG bunkering stations in the large harbours, as well as the need to establish a common regulatory framework for safe and sustainable LNG bunkering operations and related activities.

Altogether, many experts, like HIS CERA, foresee that the share of LNG among bunkering fuels could reach 20 to 25 %, which appears as a game changer in the long-term.

To conclude, I will say that the abundance of natural gas reserves, now evaluated at more than 250 years of consumption, if we include unconventional resources, its more and more competitive pricing conditions as compared to petroleum products and its unquestionable lower carbon print has opened new avenues for its use in the transport sector.

However, although natural gas should not be regarded as a game changer across the board in the medium term, it obviously forms a part of the decarbonisation solution for the transport sector.

I am now pleased to give the floor to Mr Olivier Appert.