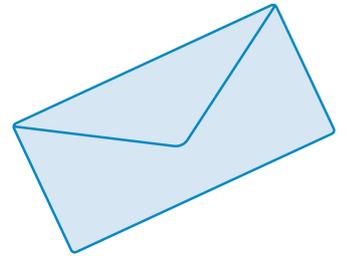


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Why Gazprom may be interested in selling gas as CNG



“An attempt to substitute biofuel for traditional transportation fuel has led to a threat of global food crisis. Whereas natural gas, as a replacement of gasoline and diesel, particularly with regards to conventional fuels prices, is a real alternative. Today cost of driving a gasoline vehicle, for instance in Germany, is 1.7 times higher than that of a gas vehicle. I will take the opportunity to announce a new Gazprom initiative. We propose to our European partners to study the project of building in Europe a large scale network of CNG filling stations together with Gazprom.”

These remarks by Alexey Miller, Gazprom's deputy chairman and CEO on June 27 at the Gazprom AGM have prompted John Baldwin, MD of CNG Services Ltd to explore the thinking behind Gazprom's strategy.

Gazprom is a very large company with huge financial and gas resources. Hence it must make strategic sense for it to hedge its gas sales by growing the transport sector, as medium term demand for gas to make electricity and for heating falls, due to CO₂ concerns from its major EU customers.

In the electricity sector, the UK wants to make 35% of its electricity from renewable sources by 2020, a target that National Grid says is achievable, mostly by using wind power. In addition, the UK Government wants OPEC members to help fund around 10 new nuclear stations by 2025. Gas-fired power stations will remain, not the least for flexibility when the wind is not blowing – and they are also much more efficient. The UK's largest gas-fired power plant on Teesside, built in 1993 and 47% efficient is having new gas turbines installed with closer to 60% efficiency – so the same electricity can be produced using 25% less gas.

UK demand for natural gas for heating, the biggest sector for natural gas, is being hit even harder. New building regulations introduced in 2005 mean that a new house in the UK already uses 40% less gas than 3 years ago.

This is the first step in a process that leads to a regulation that says from 2016 new homes in UK cannot have natural gas, because they have to be carbon zero – so woodchip, solar, ground source heat pumps, wind, but no natural gas. With the UK Government also supporting investment in insulating the UK's existing housing stock, the long term demand for gas for heating is now

on a path that drifts downwards.

If Russia thinks that the UK experience is being duplicated by its European gas customers it may now, with 100 years of gas reserves, be considering the following ways to monetize these resources:

1. Leave gas in the ground, produce less, for longer, at higher prices.
2. Build more pipelines or produce LNG to get higher market share.
3. Convert some of the gas to diesel (as with the Shell GTL plant in Qatar).
4. Invest to stimulate a market for natural gas as a transportation fuel

Given that the EU has natural gas and electricity grids, it would clearly be easy to create a pan-EU CNG filling station infrastructure: this is not the issue. The key to market transformation lies with the vehicles.

This is the interesting bit

We cannot know Gazprom's strategy, but it probably includes elements of all four options.

The NGV option is a direct competitor to the GTL option. Both require investment, both require distribution channels for the fuel, both require vehicles. Shell is reported to be spending around \$18 billion on its Qatar project, which will probably be the largest engineering plant on the planet. The GTL made can be used directly by vehicles, offering lower NOX and particulates. However, since this project was conceived, new diesel

vehicles are much cleaner and it is not clear that there is a market or distribution channel for 'neat GTL' (how do you get it to vehicles in cities?). Most likely this product will be added to the Shell diesel blend, with Shell diesel in effect 85% fossil diesel, 10% fossil natural gas (GTL), 5% biodiesel.

Even if GTL could be marketed neat, it has a poor well-to-

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The VW CNG PASSAT

wheel CO₂ emissions performance that continues to be a difficult PR issue to manage, especially when the GTL well-to-wheel CO₂ emissions are compared to running vehicles directly on natural gas brought to the EU as LNG. For the Qataris, GTL looks a good move as they will have hedged their LNG sales by having a slice of sales into the liquid transportation market. For Shell, it will also be highly profitable due to gas being cheaper than oil and may allow additional booking of reserves. But the CO₂ issue does make it look like a strategic cul de sac

CNG (and LNG for trucks) is the strategic alternative to GTL. A new CNG filling station costs around \$300,000. So, for around 10% of \$18 billion, Gazprom could build 6,000 of them, more than enough to give Europe a CNG network and stimulate others into this market. Or there are home fill appliances: Phill from Canada (www.myphill.com, majority owned by Honda) and Gasfill from UK (www.gasfill.com). At large volumes these would probably cost around \$3,000, so for just 10% of \$18 billion, Gazprom could offer a 20% subsidy to get 3 million of these in EU homes. Gazprom's funding would be the lubricant to bring in national utilities, growing the market for natural gas. Compared to GTL, Gazprom would be in a perfect place strategically. Every new natural gas vehicle from an OEM (Original Equipment Manufacturer) grows the market for Gazprom gas and increases

the use of Gazprom CNG filling stations. A CNG Passat will use as much fuel in a year as a house, prior to tighter building regulations (assuming 20,000km/year @ 20 km/kg and a 3-bedroomed semi-detached house). Definitely not a blind alley and on the side of the angels too as far as CO₂ and air quality is concerned (*see later*).

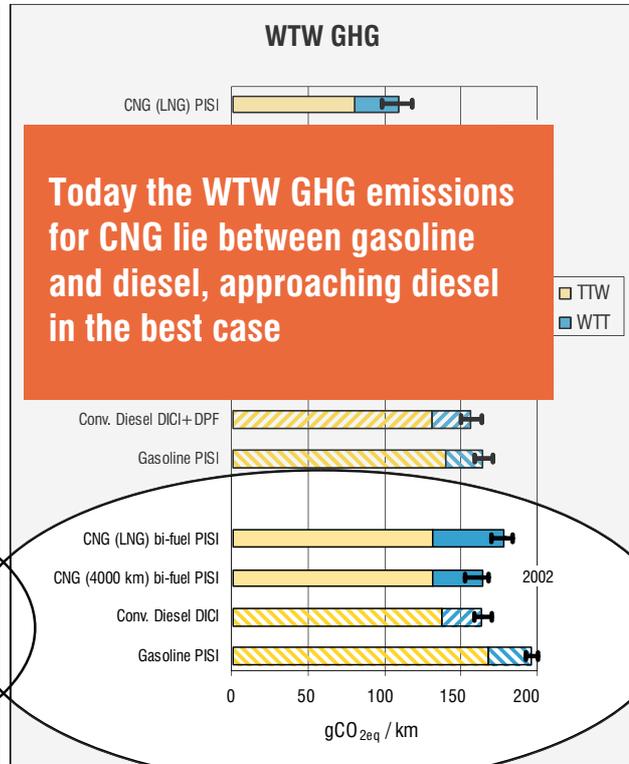
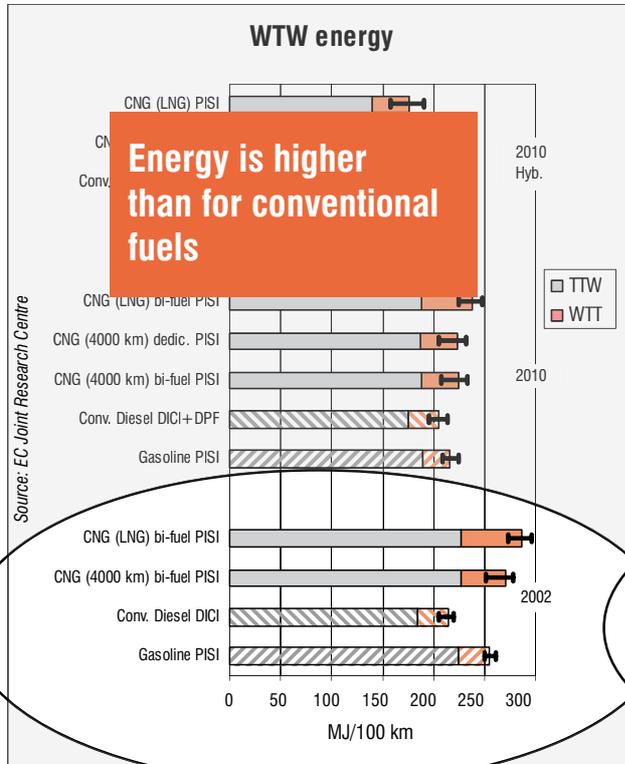
Given that the EU has natural gas and electricity grids, it would clearly be easy to create a pan-EU CNG filling station infrastructure: this is not the issue. The key to market transformation lies with the vehicles. This is the interesting bit.

My view is that we will see in the next 12 months whether CNG cars can make a breakthrough in Europe, and it is the German market that will show this. Whilst efficient diesel and petrol remain king, there is a fascinating battle between electric, petrol-hybrid, flex fuel (ethanol), H₂ and CNG. There are no other contenders. Germany is the key battleground. There is the BMW 7 series on gaseous H₂, there are almost daily announcements in relation to EVs (electric vehicles), new Prius-like petrol hybrids are coming to market and OEMs are talking about fuel cell vehicles by 2020 – 2030. A year ago there were also flex fuel vehicle developments, but these have already been going out of favour because of food concerns. What about CNG?

German CNG growth has been slow since it started to build

CNG – energy and emissions 2002

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a network of 800 CNG stations in 2001 mainly because the vehicles have not been as good to drive as petrol ones. These 'first generation' CNG vehicles have essentially been petrol conversions by the OEM rather than designed specifically to run on natural gas. The Germans are environmentally driven but they do have high standards and so the CNG fleet is 'only' around 70,000 vehicles (which is still a lot higher than the 300 or so in the UK).

My view is that VW's CNG Passat will be the first quality mass produced and mass marketed CNG car ever built. (The Honda Civic sold in the US has not been made in serious volumes and has the fatal flaw of no petrol fallback.)

Volkswagen showed a new concept car at the Geneva Motor Show that uses both natural gas and petrol. That's not new, but it's the first time it has been combined with the VW TSI engine which uses both a supercharger and a turbocharger operating sequentially to provide high power (150 bhp), great economy, exceptional range (420km on CNG, almost the same again on petrol reserve) and meet Euro 5 emission standards from a small capacity (1.4 litre) engine. With a top speed of 130 mph and the capability to accelerate from 0 to 62 mph in 9.7 seconds, the Passat Estate TSI EcoFuel remains viable for everyday use and in most driving conditions the vehicle consumes 5.2 kg of natural gas every 100 km. We are moving into uncharted territory: the CNG Passat has the potential to be a transformational vehicle.

The same high performance applies to the new CNG Sprinter van that Mercedes Benz is bringing out this year and will have a combined CNG-petrol range potential of around 1100 km. And

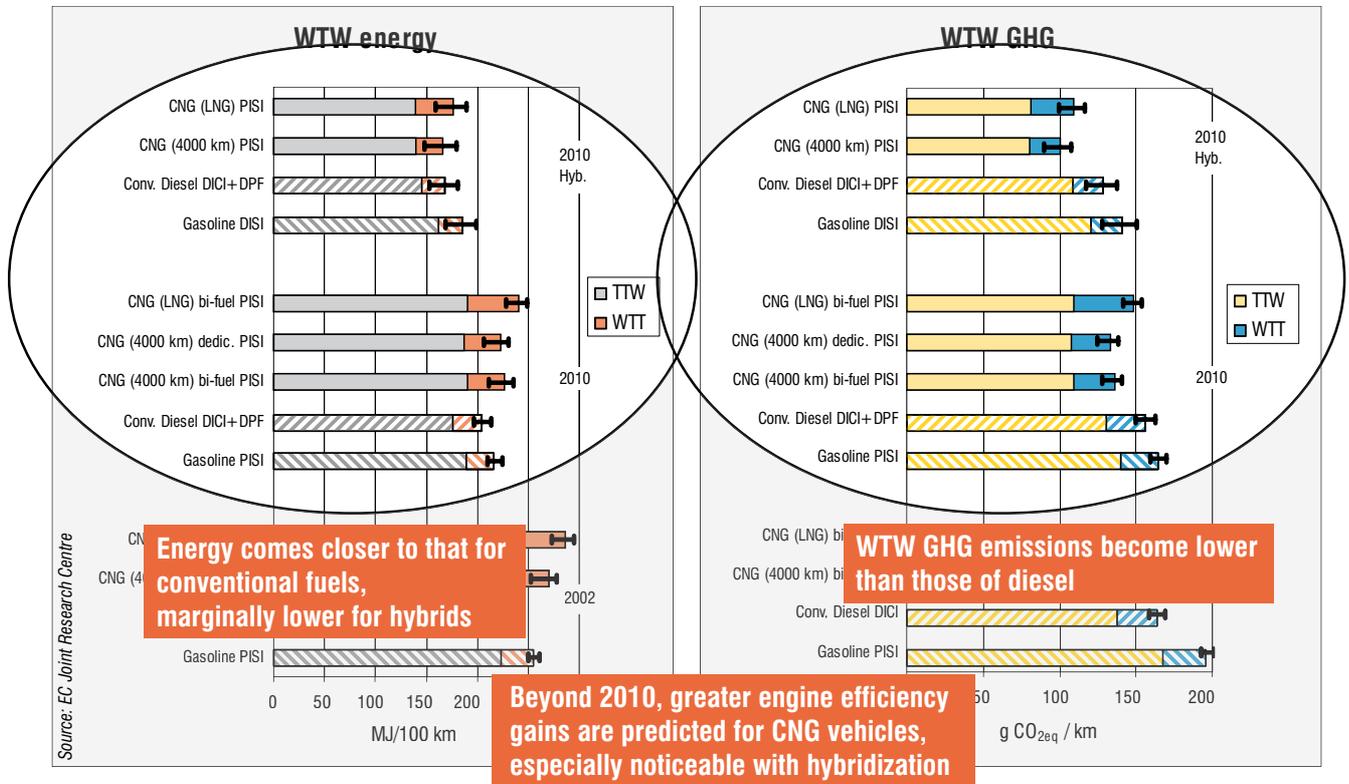
that's just the start. Luckily for the gas industry all the OEMs are working on high pressure direct fuel injection for their petrol cars, investing billions. This just happens to produce an engine that is ideally suited to natural gas. From there, it is a small step to add a hybrid and you then have a strategic underpinning to natural gas as a vehicle fuel – its inherent CO₂ advantage because the methane molecule only has a single carbon atom. By being so frugal on fuel, the range issue becomes even less of an issue.

A study produced for the European Commission's Joint Research Centre in 2007 said: "Beyond 2010, greater engine efficiency gains are predicted for CNG vehicles, especially noticeable with hybridization". (See <http://ies.jrc.ec.europa.eu/wtw.html>, *Well to Wheel Slides, slide 34, and charts on this page and page 27.*) This is not the gas industry speaking. The study was produced by the JRC jointly with EUCAR and CONCAWE, in other words oil and car companies.

The CNG Passat will have a market leading low CO₂ emission level of less than 130 g/km. Further develop the gas technology, add a hybrid, and the proposed new EU target of 95 g/km by 2020 is in reach. This CO₂ advantage is a great barrier to increased taxation by EU Governments...if natural gas had a 5% market share, much easier to tax the other 95% a bit more than target the low CO₂ 5%. That fundamental logic underpins investment in CNG.

In relation to fuel tax, Germany is unusual in that the Government has fixed CNG fuel duty at the minimum possible level allowed by EU law until 2018, so a customer can lock in to half priced fuel for as long as a gas company can lock into fixed

CNG – energy and emissions 2010



gas prices. For Gazprom, that's probably quite a few years.

There is another point that is increasingly being considered by EU electricity companies. With all this wind energy, it will be critical to be able to store night-time electricity. One option is to pump water up hill, another is to compress air. Both are relatively inefficient, involving making large investment in assets to do things that are completely unnecessary. Much better to spend that capex to compress natural gas to be used by vehicles. In addition to lowering capex for CNG, this further increases the CO₂ well-to-wheel advantage offered by the likes of the CNG Passat and Sprinter.

If you want a final strategic factor you can include the growth in the EU of renewable methane made from waste (e.g. Veolia announcement on June 27 of a new business unit to make biomethane fuel for vehicles) and the fact that renewable methane from an anaerobic digester is the most economic so called '2nd generation' biofuel that can be made from the waste of crops and not just the fruit.

Given all this, you can perhaps see where Gazprom may be coming from. Everything that you would want to happen to promote NGVs is happening:

- high oil price (the gap between oil and natural gas has never been as large as this);
- less use of natural gas in the long term for heating and electricity due to renewable and nuclear;
- liquid biofuels out of favour due to impact on food prices and

rainforests;

- reduction in cost of making and moving LNG;
- CNG as most efficient way to store excess wind energy;
- new NGVs being produced by OEMs;
- the range issue falling away as vehicles become more efficient and OEMs hide CNG tanks under the floor;
- EU taxation favouring low CO₂ transportation;
- growth of biomethane as the most economic 2nd generation biofuel (i.e. not made from food crops).

In the last month in India we have seen right hand drive CNG vehicle launches announced by Mercedes, Toyota, GM, Proton, Hyundai and Fiat. All OEMs can produce NGVs – it's not rocket science. However, they have not yet seen customer demand in the EU and North America. Instead they have appeared to be focused on flex fuel ethanol, on mild hybrids and on the potential from electric vehicles including fuel cells. Maybe this will change in the West as it has in Asia and South America. Watch the impact from Q4 2008 of the new CNG Passat and CNG Sprinter in Germany to find out. Not long to wait.

At a strategic level, it could be that Gazprom has recognized these factors before others have. If they have, then it's great news both for NGV folk and for consumers in the EU who are looking for a clean and low-CO₂ alternative to petroleum (and a carbon neutral one on biomethane)

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