Energy, Oil and Gas Club

April 8, 2011

A summary of remarks

Session 1 – Transportation

Oil remains by far the largest source of energy for transportation. Gasoline, diesel, jet fuel, bunkers represent 97% of all transportation fuels. Road transportation account for 42 % of oil consumption (36 Mb/d) and aviation for 7% (6,5 Mb/d). The annual growth rate of diesel consumption is very impressive: 3,3% pa (Gasoline 1,2, kerosene 1,6).
The growth in the demand for oil transportation fuels is fostered by population, income, taxes and regulation policy, technology and the competition from substitutes. In 2007 the number of cars per one thousand inhabitants was close 900 in the US, 600 in Europe and Japan, and much less than 30 in China. But the total number of LDV (Light Duty Vehicles) which was 700 millions in the world will increase up to more than 2 billions in 2050, most of the increase coming from non-OECD countries. The demand for oil in the transportation sector should increase up to 61 Mb/d, with substitutes representing 8Mbd (of which biofuels : 5)
Technology should allow reducing the unit consumption of gasoline engines by 20 - 30 % and the consumption of diesel engines by 15 – 20 %. There could be a more rapid increase in diesel use than in gasoline use for road transport.

There will certainly be a development of alternative solutions to combustion engine: dedicated engines using NGV (Natural Gas Vehicle) or CNG (Compressed Natural Gas), or Hydrogen, Electric vehicles and of course hybrid vehicles (thermal/electric). Hybrids will develop but gasoline hybrids will develop more than diesel hybrids.

The present “high oil price” (more than 100 $/b) is a promise of bright future for all alternative sources of motor fuels and for hybrid vehicles. High prices make other technologies interesting. A bunch of new technologies become attractive if the price remains at the present level for some years. Regarding “pure” electric vehicles, studies show the positive impact of these electric vehicles is mixed. Decarbonization of electricity is necessary if electric cars are to be “environmentally friendly». According to a participant, the Toyota Prius does not make any profit. It is “sold as advertisement”. The comparison between standard internal combustion engines car and very small electric car must be made carefully. It depends on the marginal electricity used

The development of the car population in China is quite impressive: 16,5 million cars have been sold in China vs. 10 millions in the US in 2010. In order to limit the increase in the traffic, China has taken 3 measures:

- Regulation (Beijing : a car must be off the road one day a week, non-Beijing registered cars can not drive from 7-9 am and 4-6 pm; before you get a car you have to get a permit through the monthly lottery process. Only 20 000 new cars are allowed each month. The lottery is 88 % private car, 12 % Company cars.)
- Car engine efficiency improvement – with stricter conditions than the US CAFÉ standards;
- Fuel substitution – via coal-based alternative fuels such as methanol, and electrification of car fleet.

The development of electric cars is very important for China. China has to control oil demand and oil imports. China has rare earths to develop electric vehicles. In China, if you buy an electric vehicle you are not subject to lottery. China already has 120 millions 2-wheels electric vehicles. 20 millions are produced every year. A four-wheel electric vehicle capable to drive at 50 km per hour costs 4000 dollars.

Other alternative fuels are also developed: there is a large volume of methanol blended into gasoline pool. CNG is progressing very quickly. The cost of CNG is 50 % of the cost of gasoline. However there were gas shortages during winter and protests from taxi drivers. There are also projects of CTL (Coal to liquids). However the Sasol process was not approved. China thinks its processes are better. The potential for biofuels looks limited given its interference with food and arable land in a highly populated country.

Participants debated on the merit of electric cars. It is mentioned that if electricity is produced from CCGT (Combined Cycle Gas Turbine), the overall efficiency is 50 % (loss in CCGT: 40 %, loss in the electric engine 10%) while in an internal combustion engine, the yield in usable energy of the hydrocarbons is only 35%.

The question of biofuels is more and more important. Biofuels could reach (cf supra) more than 10 % of the market. However some participants underline the risk of competition with food. The question is: what is the status of 2nd generation biofuels ?

The EU regulation on CO2 emissions for vehicles creates an avenue for electric cars. This regulation is equivalent to a penalty cost of CO2 abatement 100 Euros per ton. There is no barrier for entry in the electric vehicle (while there is a barrier for internal combustion engines). There is a growth of small gasoline cars for city driving. This is of course a concern for the car manufacturing companies which are making profit on big cars.

The beginning of the debate was about: how to improve the efficiency of engines. But could we transform the way we transport people? (Especially in cities where is most

of the increase in the population). Can we expect bottlenecks in other things than motor fuels? The case of the monopoly for lithium is discussed.

For some participants, it is too late to reorganize transportation in China. However there is a development of metros (Shanghai, Beijing). In the US, electric vehicles are often considered to be a solution. The objective of Obama is to sell 1 million vehicles in US in 2015. This could lead to a new dependency on rare earth. In Tokyo there is more than 20 metro lines. In case of black out, there is less public transportation and the population uses e-assisted bikes.

The GDP growth makes for both an increase in the number of cars and in the size of the cars. There is far more than transport in a car. The income elasticity (a figure of 70 % is quoted) is far more important than the price elasticity (7 %?). And the price elasticity is reduced by the cushion of taxes in Europe and in Japan.

At the end of the session it was noticed that not a single word was said about fuel cells (while we had a lot of discussions 4 years ago).Transportation is more and more fragmented and it is more and more difficult to have a clear view of the costs and benefits of the different solutions.
Last but not least: research on engines capable to burn either fuel (gasoline or diesel) seems to have been abandoned.

An interesting point was made during the session: in Spain, in March 44% of electricity was produced from Wind. However we should remember that there are 16 billion Euros subsidies for wind and solar. Can we afford that when we have very large public deficits? There is no justification except climate change.

Session 2 - Geopolitics

Iraq: there was a national agreement late 2010. Shiha parties have 23 ministries.
A National Council for Securities Policy has been created. In the new government, there is a reinforcement of Shiha. Full withdrawal of US troops should be by end of 2011.
However there is a shortage of electricity, food, petroleum products. Protests erupted against this in February. The concern of the population is mainly corruption, not democracy. There is a demand for improved services food, electricity, water, sewage. Economic growth was around 5 %. Inflation is around 5%. Iraq is entirely dependent on oil. Production is now 2,7 Mb/d of which 1,9 Mb/d are exported

Ten contracts for oil fields have been approved, 3 for gas fields. The announced objective: 12 Mb/d in 2017 is unrealistic (technical reasons, issue of OPEC quotas when the production will reach 4 Mb/d). A realistic target is 4 Mb/d in 2015 and 7 Mb/d in 2020.
The export terminal in the South can handle 2 Mb/d, in the north 0,8 Mb/d

Situation in MENA: before the effective tsunami in Japan, there was a political tsunami in MENA. Mubarrak is reported to have said:" they killed me by Facebook" The situation in the Arab countries can be considered similar to the situation in France in 1789 (French Revolution). The situation has of course an impact on prices. A trader said: "It is no longer safe to be sure anymore". The army played very different roles in Tunisia and Egypt on one side, in Syria, Bahrain on the other side).

In Saudi Arabia a huge "stimulus package" has been set up in order to keep the population quiet. The amount of the stimulus is such that the "break even" price for Saudi Arabia (price of oil which allows oil revenues to balance the budget) is now more than $80/b.

The question of reservoir management in Libya is key. The impact of rapid shutdown of the production is significant (remember what happened in Iran, Iraq (war), Venezuela)

The political evolution in Egypt is closely watched. For the moment the transition is smooth. However the gas export contracts should be scrutinized since the price seems low.

Russia

Oil is very important in Russia: 20% of GDP and 43% of budget revenue. The oil production could increase from 10 to 12 Mb/d in 2030, most of the increase coming from East Siberia. Gas production could increase from 700 to 900 billion cubic meters, with, again, most of the increase coming from East Siberia. However there is a huge need for investments and an investment deficit as large as $ 85 billion can be envisaged. The potential of Artic is very large but of course difficult to develop.

The future development of the petroleum industry will depend on the deployment of a number of measures:

-Rapid transfer to a stimulating taxation system based on profit taxation

- Introduction of economic stimuli for the development of petrochemical industry and export of oil products

- Complex program for efficient use of associated gas and development of gas chemistry

- State program for exploration of the Arctic shelf

- Conditions for attracting international experience and competence and foreign capital

Situation in the US: the republicans want to eliminate EPA, Family Planning. Another objective is to reduce dependency on oil by 3 Mb/d. Will nuclear start again? There will probably be a move ahead modestly, not rapidly. There is a fair potential for biofuels (2^{nd} generation, but also first generation). There will not be any tax

breaks for energy efficiency. Republicans are enthusiastic for renewable. There was a 70 % support to nuclear, but a dramatic fall of the support after Fukushima. There is no mandate for negotiation on climate change. However “Cap and Trade mechanisms” will start next year

The debate starts on “revolutions in MENA”: will they bring economic improvement? If not, it could be a blow to the “Revolutions”. Egypt was doing well from an economic point of view, with many billionaires, but many qualified people unemployed. Any way there are huge disparities in most countries. What will be the role of fundamentalist Muslims? In Tunisia we moved from one to 55 political parties. The political system is disaggregated. Fundamentalists could be a threat. Some participants are not very optimistic about the referendum in Egypt. Islamic brothers and the army have preempted the movement.

In Kuwait, in Saudi Arabia, in Oman, people want change. They want a constitutional monarchy, they want an elected parliament, they want separation of judiciary power, legislative power, and executive power. They want a prime Minister responsible in front of the parliament. People do not only need access to employment they need access to dignified employment. The situation is similar to the 1848 revolution in France.

Each country is in a different situation. However the impact of the events on investment is negative. In Libya investments are of course impossible. Saudi Arabia is not dependent on foreign investments, but has enough financial resources to cover its investments needs. The figures for spare capacity in are revised down (4 Mb/d?).

Last comment: the surprise is why these events did not happen before? Poverty and dictatorship was feeding terrorism

Session 3 Current issues

The first issue can be called: the move to Asia. The oil and gas demand in North America and Europe will not increase very much and the deficits will remain more or less the same while the demand and the deficits in Asia will increase tremendously. The Asia-Pacific deficit could be greater than the Middle East surplus
The oil deficit will remain stable between 2009 and 2030 in North America (around 8Mb/d) and in Europe (around 11 Mb/d) but will increase from 18 to 29 Mb/d in Asia-Pacific. By 2030 the oil net surpluses could be as follows : North Africa 3 Mb/d, South America : 5Mb/d, Russia 8 Mb/d, West Africa 6 Mb/d, Central Asia 1 Mb/d, Middle East 22 Mb/d. There should be more links between South America and Africa, Europe and Middle East, Russia plus Central Asia and Asia. The key uncertainties are about:

- Iraq
- Libya Knock on

- New pivot countries
- CCS, nuclear investment
- Unconventional oil and gas outside North America
- Price spike to plateau

The oil market is less liquid in Asia than in the Atlantic Basin. There is an important change in the physical market. The risk of physical disruption is entirely in Asia because of the size of the demand and of the imports.

The second issue is the accident in Fukushima. The earthquake and the tsunami caused the death of more than 30 000 persons. The economic damage is huge: between$150 and $250 billion probably (more than 2% of GDP - The damage of the earthquake in Kobe in 1995 was around $80 Billion or 0,5 % of GDP). Japan has immediately got a strong help from the US (18 ships, 18000 soldiers).

As a consequence of the accident, a forbidden zone of a radius of 3 then 10 then 30 kilometers has been set up. Farmers of this area are forbidden to sell vegetables, eggs and milk.

There is a gloomy sentiment of economic slowdown. Tepco, which has 70 GW power capacities, has lost 25 GW. So, rolling blackouts are organized. There is of course a reduction of energy consumption. Trains are slowed. There is less electricity consumption: no light in gardens. No more crimes however! Summer will be very tough. There is a big chance of gas regaining a bigger share of energy mix. Many offers of more gas (LNG, Australia)

In many countries, companies deeply interested in nuclear set up “emergency management crisis” teams (40 persons in AREVA for instance). Of course there is a very important debate about security. The key issue is the conclusions which will be drawn by the safety authorities. Technology credibility has been jeopardized. However it is not a problem of technology, it is a problem of economy. Security standards should be revisited. The Atomic Energy International Agency did not play an important role in the management of the crisis. The crisis could lead to recommendations of international standards and to the creation of organizations for the measurement of radiations. G8 or G20 could set up an international control agency

The behavior of Tepco is questioned. Tepco should have prepared the population to the gravity of the situation from the beginning of the accident. They should have explained the risk of “worst case”. They did not do it.

The government policy was to limit communication to the population. Nobody in the government wanted to face the cameras and tell: this is what happened. There was no important interview before 31 March. This is still part of the Japanese management. The question of political instability in Japan (change of prime minister every year) is

questioned. Did it play a role in the management of the crisis? It should however be mentioned that every 6 hours an excellent synthesis of the situation was given by the JI (local central administration for nuclear affairs).

The old chairman of Tepco said: we have no choice but to scrap reactors 1, 2 , 3 , 4.

Abu Dhabi reactors: asked to change the design because of US demand. The design will obviously change after Fukushima.

The new nuclear reactors are much safer than the old ones. Cost of safety is 15 % of total cost.

The question of oil.

There is oil. There are oil surpluses in Africa. Oil price is dominant. There is also a development of products markets

Regarding reference crudes, WTI is disappearing. It is too much linked to Chicago. The price differential of WTI with Brent is abnormal : WTI is sold for 10 dollars less than Brent, when the differential should be positive by several dollars. The future of Brent is also gloomy because the production is decreasing.

Another key issue for the oil production and demand is the huge increase in the demand for liquids in Saudi Arabia. If the present trend is not modified, in 2030 most of the Saudi production will be used locally (for transportation – the pump price for motor fuels is very low, for electricity production, for water desalination). Cheap gasoline, cheap water, cheap everything make for huge consumption. Exports could fall rapidly if appropriate measures are not taken to reduce demand

Saudi Arabia was looking for non associated gas for electricity production, water desalination, petrochemicals, but the companies were not very lucky in finding non associated gas.

The question of shale gas

What about the development of shale gas in China? (CBM was a disappointment). Reserves could be as high as 20 Tcm in China (10 times of proven gas reserves)
Huge amounts of money are to be spent. If prices are competitive, there is a bright future for shale gas in China. The source rock is good. Technology is easy to find. No obstacles to drilling.

The question of cost is key and was already discussed in a previous meeting. It is difficult to know the cost of the shale gas until you produce it. In the US cost is assumed to be in the $8 to 10/ MMBTU (perhaps high if compared to the current Henry Hub price). (Note : in a more recent meeting, production costs of shale gas in the US were said to be very different from one area to another one : from $2-3 to 6-8/

MMBTU).

JP Favennec