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I am tasked to outline the future of LTO (Light Tight Oil) in the US and impact of US LTO on the future price of oil, not an easy task!

I will do it in three points. The first point is to look at shale gas (gas, not oil), because it is a fascinating story and it can shed very interesting light on what is happening today with oil.

Then we will switch to US LTO, LTO for light tight oil. For the non-specialists, LTO is produced from very tight formations, thanks to a technology which is called hydraulic fracturing, or fracking.

Finally, I will look into my crystal ball and give you the answer that everybody is expecting: what will be the price of oil!

In gas, the story is quite amazing, because it is a story of US entrepreneurship. In the mid-2000s, the price of gas was pretty high in the US, and then a few crazy people started to say, 'Why do we not produce shale gas'? Everybody knew that there were shale gas, but it was very expensive to produce. These people took the opportunity to drill, frack and test for gas.

At the beginning, it was not very successful. However, after a couple of tries, they realised that they could decrease the cost of the next well. This was really new: typically, since 1973, each new discovery/province was more expensive to develop, in deeper water. In shale, it is different, it is in an extractive industry with economy of scale and experience curves, and each new well will typically be cheaper to drill and complete than the previous one. These entrepreneurs managed to decrease the cost of producing gas in the US by 15-20 % per annum.

As a consequence, the US are now producing enough gas to supply their own market, at a very competitive price. Gas is replacing coal, which is leading to a significant reduction in US carbon emissions. The US are now in a position where they can cover the global LNG market for anything between 20 and 50 years.

This has completely changed the dynamic of the gas market globally. There used to be regional markets, but the ability of the US to export has completely changed the price of gas. There is a very interesting story that we have seen in Lithuania. Just opening an LNG import terminal has decreased the price from Gazprom by 25 %.

In summary, in gas, there is a lot of cheap gas. The price of gas will probably be low globally for a long period of time, because of the shale revolution in the US.

The question is: does this reasoning and story apply to oil? When you look at oil, the beginning of the story is the same. The drillers and the exploration and production (E&P) companies in the US moved to oil after the financial crisis. They started to say, 'Why can we not do with LTO what we have achieved with gas?'

In '09, it was still very expensive to produce LTO. The average price was 93 USD per barrel and there was a lot of variability. The highest was up to 400 USD per barrel and the least expensive was 20-30, but on average, it was still very expensive to produce LTO. However, very rapidly, E&P companies applied the same technology, entrepreneurship and experience curve, to drastically reduce the cost of LTO. After 3 years, in 2012, the US were adding 1 million barrels per day every year to the supply, repeating the success of gas in oil.

What happened in terms of price? At some point in time, because of increasing demand and a decrease in production, mainly from Libya, even though the US kept adding to production, the market was still balanced. However, in Q1 of 2014 the market started to be over supplied. Everybody waited a bit, and they realised after two or three quarters that this situation would stay. There was no other choice for OPEC but to decide to maintain production. If OPEC had



decided to cut production, it would only have maintained momentum in the US and the US would have replaced production almost immediately.

However, as we said, it is an entrepreneurial business, and in the US, the price went down and the operators started to slash CAPEX. They reduced their CAPEX by almost 40 % between '13 and '14, which had a very immediate consequence of stopping the drilling activity. One has to realise that in LTO, most of the CAPEX is well related. It costs something like 7-8 million to drill and frack a well. The well produces quite a lot for 2-3 months and then it starts declining very fast. The well cost is recovered in six to 10 months and then the remaining production is for the profit of the operator.

As expected, the production of LTO went down, not as fast as some people thought as there is some latency. It takes something like six months or one year for actual production to start decreasing. In the latest estimate from IHS, we will have lost 1 million barrels per day in July 2016 compared to the peak.

I will now use my crystal ball. The reasoning is based the cost curve, which is a bit technical. A cost curve looks at the various sources of liquid, and the range of costs to explore, develop and produce these resources. There was a traditional hierarchy of cost: the cheaper oil is from Middle East and North Africa, then other conventional oil, then enhanced oil recovery and heavy oil. LTO was at the end of the cost curve, the most expensive resource. The shale revolution has completely changed the cost curve by moving LTO to the middle of the cost curve.

However, one must notice that LTO is only a very small part of the total resources and comprises only 7 % of the total global resources. This is not the case for gas, where tight gas and shale gas represent 50 % of global resources. So US LTO cannot replace Russia and Saudi Arabia. It is a significant but marginal resource. It might go up to seven, eight or 10 million barrels per day, so it is significant, but it cannot replace the rest of the production. There will still be competition between the various sources of liquids.

In oil markets, there is still a lot of uncertainty: geopolitics, OPEC reaction, technology in supply, technology in demand, regulation... For instance, if the battery technology for cars improves faster than expected, it may reduce demand. On the supply side, better fracking means we might be able to extract more oil from the ground, leading to improving recovery factor and lasting impact of LTO on global markets.

So, in summary, in oil, there are a lot of uncertainties, which mean that today, the scenarios for the cost of oil are wider than at any point in time. I was listening the other day to the Chief of the EIA, Energy Information Administration, in the US. He was saying that, for the first time, they have a range of between 30 and 110 in their scenario range, so that is my prediction!