The global energy landscape has changed radically in the last five years due to the unconventional oil and gas revolution. The technologies for unconventional oil and gas exploration and production has evolved very rapidly making this type of production economic viable in most unconventional plays in North America. This process let to a rapid increase in oil and gas production in North America.

The unconventional revolution had two types of impacts in the global energy landscape. First, the rapid increase in oil production in North America contributed to reduce oil imports in the US. This reduction in oil imports has affected the world market balance in recent months. After an unusual lull in prices between 2011 and 2014, oil prices fell sharply and it seems that high price volatility is here to stay. This makes shale oil and gas business considerably less attractive, hence limiting the growth of less productive and efficient fields.

Second, the shale gas revolution will have impacts beyond United States’ borders both directly, via LNG US exports, and indirectly, through the dissemination of unconventional oil and gas production technology to other countries.

This new panorama has strong implications for Brazil, which needs to invest heavily to develop its large Presalt oil and gas discoveries and in order to play a greater role in the global oil industry. The fall in oil prices brings new important challenges for the development of pre-salt resources. In addition, the corruption scandal involving Petrobras as well as several of its suppliers poses a great risk for Brazilian oil and gas production goals.

This paper analyses how the changes in world energy landscape can affect Brazilian energy sector. The first part of the paper analyses the changes in global oil market. The second will focus on the changes in the international natural gas market. Finally, the last section draws some conclusions about how these changes can affect Brazilian energy market.
Change in the Panorama of Oil Prices

In the history of the oil industry, oil prices experienced different periods, some of stability and others of high volatility. The volatility is associated with market forces in a context of low supply and demand elasticity. On one hand, supply responds poorly to price variation because of high fixed costs. On the other, demand will not find a global-scale substitute for oil products and shows therefore low sensitivity to price change in the short term. Consequently, if the market price is free, its volatility is significantly higher on small variations in supply and demand in comparison with a market with controlled prices.

To understand the current drop in oil price, it is important to be familiar with price volatility and stabilization mechanisms used in the past. The modern history of the oil industry began in Pennsylvania in 1859. At first, when the markets were not yet developed and the technologies had not been established, volatility was high. Rockefeller realized that such large price movements - Busts and Booms - were not favorable to the development of the oil products market. Standard Oil through monopsony and monopoly practices then came to control supply in order to stabilize prices (Yergin, 1991).

With increasing competition from the majors companies and the emergence of antitrust, Standard Oil split up into 34 companies - some of which later became Exxon, Mobil and Chevron - and lost the power to control prices. Thus, price instability struck again in the 1920s raising awareness among dominant countries about the need for someone to control supply. For this reason, the first version of OPEC came to life in the late 1920s. The Texas Railroad Commission played this price-setting role by controlling supply and maintaining idle spare capacity (Bordoff & Losz, 2015).

The control of spare capacity, which can be put into production quickly, was the mechanism chosen by the Texas Railroad Commission - TRC to stabilize prices. Indeed, by reducing this spare capacity, enough oil could be added to global markets in order for prices to fall. On the contrary, the opposite effect can be obtained by holding back production, hence raising spare capacity. During this long period of price stability, despite several supply disruptions in the Middle East like the one of 1967, negative impacts on price levels were successfully countered by spare capacity control (McNally, 2014).

This capacity control came to an end in the 1970s. Indeed, in 1972, TRC decided to push capacity to full production to meet growing American demand thus losing the ability to control prices. The TRC stepping down from this key leadership position encouraged other producing countries to seize the opportunity to take over. As a result, OPEC started to be the one retaining production capacity after the oil shock, with Saudi Arabia having greater relevance in controlling spare capacity and playing the “swing role” (Bordoff & Losz, 2015).

However this switch of power to OPEC, namely Arab producers, gave them unprecedented geopolitical and economic influence which was yielded in the 1970s and...
1980s and resulted on several oil crises. Indeed, this paradigm switch enabled them to defend their political views on America’s aid to Israel in the Yom Kippur by carrying out the 1973’s oil embargo, price rise and production cuts of 5%. Even if these sanctions were significant, many consider that the international market’s panic reaction was disproportional. After this strong diplomatic and economic friction, this new major player’s capacity to disrupt and assert its strong influence on international matters became clear. Their weight on global markets became even more compelling in 1979, when fear spread around international oil markets following the Iran Revolution.

In the 1980s, the amount of spare capacity in the hands of Saudi Arabia was very high. This generated high costs to the point where it stopped being profitable for the Saudis who then decided to reduce their spare capacity (Bordoff & Losz, 2015). With the increased production, the price collapsed in 1985.

The general rule is that 5% of OPEC spare capacity is sufficient to stabilize prices, like what occurred in the 1990s. In the 2000s however, the growth of global oil demand was reducing spare capacity. 2009 was an exception year due to the economic crisis, but after a sharp increase these reserves quickly settled back below 5% (McNally, 2014).

IEA’s supply projections were repeatedly inaccurate in 2003, 2004 and 2005. Subsequently, the shale boom in the US came as a surprise as the growth of US production exceeded expectations. However, North American oil still has a small participation in global supply - not enough to undermine the supply of other players. Contrary to what one may think, US production growth alone cannot explain the recent drop in prices. In addition, Libya is also back producing and exporting again which also came as unexpected news given its current political instability (EIA, 2015).

So why have oil prices been high and stable in the last three years and now suddenly collapse? This trend is a consequence of Saudi Arabia and OPEC’s behavior. For a period, despite oversupply resulting from the disappointing global economic growth, high prices were sustained with the expectation that OPEC, especially Saudi Arabia, would cut production. However, the Saudis, by announcing surprisingly that they are not willing to play that role this time, pushed prices down significantly (EIA, 2015). Moreover, as central banks all over the world have recently been injecting money in the economy, volatility on financial and commodity markets on the whole has been low.

Specialists argue that to keep prices stable OPEC should have cut 2 MMbbl/d in early 2015 (Bordoff & Losz, 2015): BP, for example, predicts that at some point OPEC will have to cut their production. Saudi Arabia however considers that this cut should be done by the American supply of shale oil.

On the American side of things, the supply of shale oil and gas is more flexible and can respond to price fluctuations in the shorter term. This is mainly due to the fact that in shale fields continuous investment in fracking is needed to maintain production: with
lower prices, investment attractiveness in new wells drops and production tends to respond more quickly. By doing so, it is believed that shale oil could put a ceiling and a floor on oil prices (Bordoff & Losz, 2015).

Nevertheless, Saudi Arabia is optimistic about the volume of American production to be consequently taken off the market. They believe that an $ 85/barrel price is enough to halt investments on less efficient fields, leading to a 1.5 MMBB/day cut in production in 2015. However, studies suggest that the US will reduce production by only 0.5 MMBB/day with the price of oil at $ 50/barrel (Bordoff & Losz, 2015).

Regarding demand, the poor performance of the global economy is a determinant of the current situation. However, most forecasts tend to underestimate consumption, which will probably reach higher levels than it is expected. As emerging countries will not experience energy efficiency gains as OECD countries have in the past, economic growth will require more oil than what is considered by analysts (McNally, 2014).

However, short and medium term prices are likely to remain low. In the longer term, despite uncertainty on price levels, volatility will certainly be high. Nonetheless, prices will depend on supply and demand behavior, in opposition to the previous model of price control by regulating supply (McNally, 2014).

**Change in the World Natural Gas Panorama**

In the natural gas panorama, the most relevant expected change in the next few years is the export of the US shale gas production through LNG. This new backdrop can bring innumerous impacts to the market and the global natural gas price (NERA, 2014).

Historically, natural gas has been treated as an unattractive product by companies, which focused in oil. However, this situation has been changing in recent years with the expansion of natural gas consumption, which led to an increase of the share of natural gas in operators’ portfolio. This trend is known as the *Gas Era*. Its main drive was a strong growth – stronger than oil’s – in natural gas supply led by OECD countries, such as the USA and Australia between 2000 and 2013 (WEO, 2009).

With the sharp increase in US supply, its domestic prices have fallen dramatically. In the late 2000s, the Henry Hub price was around US$ 7.63 per MMBtu. Following the shale gas revolution this benchmark price shifted in 2009 when it dropped dramatically, reaching prices as low as US$ 1.8 per MMBtu mark in April 2012. Yet natural gas prices on global markets increased during this period, as it was observed in Europe (NBP prices and Russian natural gas price in Germany) and Asia (LNG price in Japan). Therefore the USA had a competitive advantage in natural gas-fueled industries, which played an important role in the country’s post-economic crisis recovery (NERA, 2014).
Despite the recent downturn in the price of natural gas and oil, North American production is still growing. Nevertheless, the drop in oil prices has a great impact on shale attractiveness, since the production of liquids alongside with shale gas extraction is one of the factors that made these projects viable. As a consequence, the number of wells drilled also fell, but this was also offset by higher well productivity (Colomer, 2015).

The recent rise in natural gas supply boosted the share of LNG exports in international trade given that pipelines trade have not experienced any kind of expansion. This trend is expected to be established in the coming years, with Australia and the USA as its major contributors. Asian markets are the most likely destination for this new supply since its LNG prices are higher than in Europe given that Asian countries pay a premium in order to guarantee energy security.

According to Bordoff & Houser (2014), three reasons explain why Europe will remain dependent on the Russian gas and will not be the main importer of US LNG: (i) the entering of the US LNG in world supply with a low price will sideline other more expensive LNG: there will be no LNG surplus to let Europe change its supply; (ii) Russian gas is relatively cheap and is likely to maintain its competitiveness; (iii) long term European contracts with Gazprom are valid until 2025.

Another feature of the Gas Era is the so-called gas-gas competition. Dynamic natural gas pricing is progressively less pegged to oil prices. This is already a reality in Europe, but has not yet been implemented in Asia. Furthermore, these two continents still depend heavily on gas imports and global gas consumption rises in both optimistic and downbeat environmental-affected scenarios. Nevertheless the future evolution of demand will

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**Graph 1 – Natural Gas International prices – 2000 to 2014 (US$/MMBtu)**

*Source: Own elaboration with data from Index Mundi and MME.*
depend on environmental-oriented policies, which increasingly strive to find a substitute for coal (IGU, 2015).

Moreover Asia is expected to be the key player in world demand growth stimulus. In the US, natural gas has increased its share in the electricity generation mix. The recent rebound in spot natural gas prices slightly reversed this tendency; nonetheless the restrictions on the use of coal by the EPA may foster gas usage back to power generating purposes.

In addition, the shale gas that revolutionized the natural gas market in the US is being watched carefully by other countries; however it is unlikely to witness a similar revolution elsewhere. Many factors of the North American market make it a unique success story. First of all, the American secular oil industry relies on its large geological knowledge, which was enabled it to make the most of its shale gas resources. Another important issue is the institutional flexibility and the less constraining regulatory framework that allowed production to grow rapidly: in the US, unlike most other countries, the surface landowner has rights over his land’s hydrocarbons and regulatory processes are conducted much faster. Besides, North American infrastructure (pipelines and logistics) is one of the most crucial factors of the shale gas revolution since shale resources are spread all over the country. The infrastructure quality and density allows shale gas, which has a higher unit cost in comparison with conventional resources, to have viable exploration. IEA is optimistic about shale gas supply outside the United States but has doubts on whether it will work elsewhere in the world. Indeed environmental concerns and social acceptance are relevant issues: even in the US shale was banned on several areas, like in many other countries (Colomer, 2011).

Lastly, the US’s entry in the global LNG market will lower this commodity’s price worldwide and have impacts across the board. Yet the cost of the last LNG projects have been rising, exceeding the budget previsions. With the US stepping in with lower prices, some of these projects will face difficulties. But this process will take some time: the first LNG export project will come to market this year but most of them are planned for 2018 and 2019 (Bordoff & Houser, 2014).

**Potential impacts to Brazil**

The change in the international oil and gas outlook will have significant impacts on the Brazilian oil and gas industry. Both the reduction in oil prices in the short term and their increased volatility in the medium to long-term pose a major challenge for oil investments in Brazil. While the cost of domestic oil is noticeably high, the country relies largely on Petrobras, Brazil’s largest company and pre-salt’s only operator, to solve these major issues. Considering that pre-salt oil has a higher unit cost than conventional oil, oil price instability can challenge its economic feasibility. In the past five years, Petrobras increased dramatically its investments by relying on credit, naturally building up a high
level of debt. Besides, the oil giant is currently under scrutiny and facing difficulties due to its involvement in a corruption scandal with its suppliers (Almeida, 2015).

Sharper focus on Petrobras' cash flow is therefore crucial to avoid rapid deterioration of the company’s investment capacity. The company’s new management has taken action by firstly putting an end to their old and dodgy practices and secondly by carrying out business strategy adjustments. As expected, the state enterprise chooses to rely less on financial leverage – needing therefore more of its own cash flow – and to focus investments on its main activities, namely E&P. Petrobras’ 2015-2019 Business Plan promotes a 37% cut in investments compared to the previous plan, which seems to match the new oil industry trend. For instance, a divestment plan of US$ 15.1 bi for 2015/2016 and US$ 42 bi for 2017/2018 has been announced.

Given the new oil and gas global overview, a new discussion on the attractiveness of investments in E&P in Brazil is required. Several Latin American countries such as Mexico and Argentina have adopted measures to attract foreign investment in E&P like opening the oil and gas market to direct foreign investment. This more pragmatic approach from neighboring countries puts pressure on competition for private investment in E&P in the region. Therefore, timely discussions must be held on the regulatory issues that may affect the competitiveness of the E&P in Brazil such as the local content policy, derivatives pricing in the country and taxation on both investments and bidding rounds.

Regarding natural gas, the Brazilian situation is highly uncertain. On the natural gas supply side, forecasts for its pre-salt production are less favorable than expected because of high CO₂ levels and the substantial investments needed to offload it to the coast. In addition, Bolivian natural gas import contracts, which account for half of Brazilian market, expire in 2019 and their renewal depends on increasing Bolivian reserves, which do not look promising. Another imported commodity is LNG, which has experienced significant growth lately.

On the demand side, the need to increase thermal generation have clearly become essential to guarantee national energy security. Indeed, the hydropower-based Brazilian energy sector model has been constantly failing to ensure nationwide power supply thus leading to an intensive and expensive use of backup thermal power plants. Besides, cheap LNG imports could make thermal gas more competitive (Losekann & Almeida, 2014). Brazil has acquired LNG in the spot market for prices as high as $20/MMBtu. In April 2015, some cargoes was acquired for prices as low as $6.1 / MMBtu. Therefore, the new landscape of international LNG market can make Brazil increasingly dependent on imported LNG.

References


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