

Investment
in
exploration-production
and
refining
2014

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Table 1: Summary table of investments and markets

\$ billion	2013	2014
Global investments in E&P	697	733
North America	194	210
Latin America	100	101
Europe	70	72
CIS	60	65
Africa	63	65
Middle East	48	53
Asia-Pacific	162	167
Upstream markets analysed	397	422
Geophysical Market	16	13
Drilling market (*)	236	253
of which:		
<i>Onshore drilling</i>	29	30
<i>Offshore drilling</i>	56	61
Offshore construction market	60	65
Refinery investments	70	82
Investment spending	26	29
Maintenance spending	28	34
Spending on catalysts and chemical products	17	19

(*) Including equipment and services for wells

Sources:

- Upstream oil sector, IFPEN from
 - o global investments: Barclays, DTI, NPD, DEA, figures published by various companies and countries, IFPEN forecasts
 - o geophysical market: IHS Energy, First Break, Spear & Associates, IFPEN
 - o drilling market: Baker Hughes, IHS Energy, Offshore Rig Locator, Spears & Associates, IFPEN
 - o offshore construction market: IHS Energy, Spears & Associates, IFPEN
- Downstream oil sector: IFPEN from HPI Market data, IFPEN forecasts

1 Changes in oil and gas prices

1.1 General background: weak economy and global disorder

The international outlook is not very optimistic: geopolitical threats are on the increase and the world economy is running out of steam.

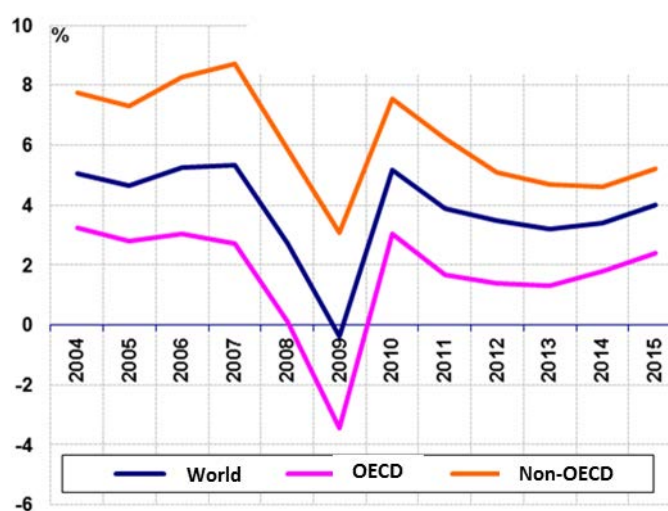
As far as geopolitics are concerned, the situation continues to worsen in a number of oil-producing countries. Although Libya, Syria and Iraq in particular have been in the spotlight this year, a number of other oil-producing countries have also experienced domestic troubles, such as Nigeria, South Sudan, Yemen and Venezuela.

Europe has also been experiencing tensions due to the situation in the Ukraine – a country that is torn between Europe to the west and Russia to the east. The conflict has definitely helped relations between Russia and China: in May, Russia signed a major gas supply deal with China that will see it delivering some 38 billion Gm3 of natural gas per year over a 30-year period. Elsewhere in Asia, China installed an oil rig in early May in the South China Sea, reigniting tensions with Vietnam over the Paracel and Spratly Islands.

And negotiations with Iran over its nuclear programme failed to reach any kind of a conclusion in July and so were extended until 24 November. Although a number of commentators believe that the US is interested in a strategic rapprochement with Iran so as to better manage the situation in Iraq, it still imposed additional sanctions on the country at the end of August.

Statements issued by the World Bank in June, the International Monetary Fund (IMF) in July and the OECD in September all agree, with economic forecasts revised downwards. In July, for example, in light of the less favourable outlook regarding a number of emerging countries (China and Brazil in particular) and a disappointing first quarter for the US, the IMF reduced its growth forecast for 2014 by 0.3 points, setting it at 3.4%.

Figure 1: IMF Economic Outlook – July 2014



Source: IMF

The economic slowdown affecting China is regularly highlighted. According to the World Bank, growth is set to fall from 7.7% in 2013 to 7.6% in 2014, and then to 7.5% in 2015. The IMF is also forecasting lower-than-expected growth in 2014 for Brazil, Mexico and – of course – Russia, due to

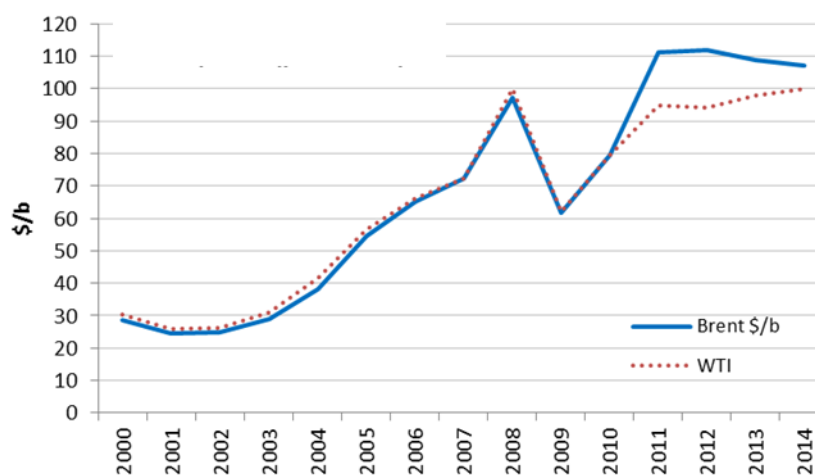
EU and US economic sanctions. A boomerang effect means that these sanctions also have a negative effect on Europe, which is facing the risk of deflation.

In July, the IMF forecast a slightly more sustained growth rate of 4% in 2015 for the world economy – 2.4% for the western countries and 5.2% for the world's emerging countries. It should be pointed out that, as far as the latter are concerned – countries which greatly influence the raw materials market – their growth levels since 2011 have been below average levels for 2004 to 2007 (8% on average). This partly explains the drop in prices on the agricultural and metals markets since 2011. The energy market – the oil market in particular – is an exception to this general trend.

1.2 Oil prices: fundamentals that could help to relax oil prices?

Apart from daily fluctuations, the price of oil has been falling steadily since 2011, but much less so than that of agricultural or metal products. But these price decreases are still considerably less significant than those experienced by the farm products and metal markets. Brent, for example, has fallen from an annual average of US\$115/b in March 2012 to US\$108/b in September 2014 – a fall of only 6%.

Figure 2: Changes in the prices of Brent and WTI between 2000 and 2014 (provisional)



Source: IFPEN-Reuters

Nevertheless, there is an underlying downward trend which became more pronounced between June and October 2014, with the per-barrel price of Brent falling from US\$115 to US\$87. Is this a long-term trend? How low can oil prices fall?

Simply looking at day-to-day fluctuations since January 2011 gives grounds to be cautious. Sudden and dramatic falls in prices, often associated with economic risks, occur on a regular basis, such as those between March and June 2012, or between February and April 2013, similar to those seen between June and September 2014. Each time, they are followed by a period during which prices rise, ultimately resulting in their settling at around US\$107 to US\$110/b.

This means that the fall that prices underwent in September-October cannot be used as a basis for establishing any kind of underlying trend. Indeed, price changes are affected by a number of parameters, including:

1/ expectations about the future global economy. Economic growth forecasts for 2015 remain modest, suggesting a moderate increase in world oil demand (around 1.2 Mb/d according to the IEA, close to the 10-year average).

2/ changes in non-OPEC supply. With the development of shale oil in the US, supply should increase at the same rate as demand. Oil production in OPEC countries should therefore at best remain stable at around 30 Mb/d in this hypothesis. This level can be reached despite the dramatic fall in production in Libya and current embargo on Iran.

3/ OPEC reactions to a too sharp fall in prices;

4/ changes in the value of the dollar (rising since May);

5/ the effect that the geopolitical situation is having on oil production at a time when many oil-producing countries are experiencing increasing instability.

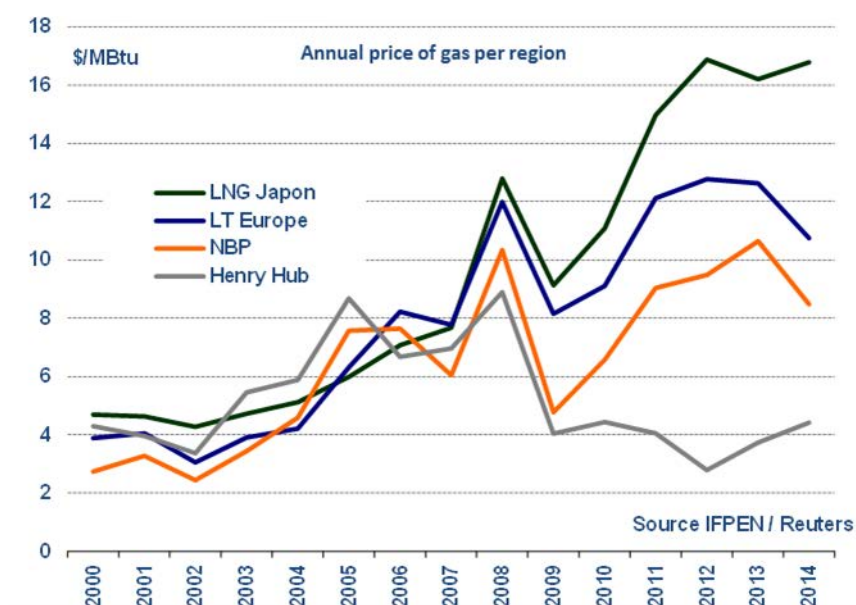
6/ whether or not any agreement is reached regarding Iran and its nuclear programme.

So although the market fundamentals are increasing the likelihood of a fall in oil prices, caution should obviously be exercised, given the unstable geopolitical situation. This instability is also likely to result in a fall in upstream investments in a number of countries. Insufficient investment eventually results in pressure on prices.

1.3 Gas prices: fall in Europe, stability in Japan, increase in the US

Gas prices continue to vary considerably from region to region – the US, Europe and Japan in particular. 2014 also highlighted a number of differences in underlying trends: prices have remained high in Japan, they have fallen in Europe and increased in the US, although only slightly.

Figure 3: Annual price of gas per region



Average import prices in Japan are still greatly influenced by oil prices. This explains their significant increase since 2009 (US\$9.1/MBtu) and their relative stability since 2012 at more than US\$16/MBtu. One of the distinctive features of Japan is the high volume of LNG imported in the wake of the Fukushima disaster (70 Mt in 2010 and then approximately 87 Mt from 2012). The nuclear power stations, which were shut down just after the disaster, have to be security inspected before they can resume operations. It is likely that some of these stations will get the authorisations they need in 2015. In a baseline scenario, LNG imports could fall from 87 to 80 Mt in 2015. This would reduce the gas bill which is currently US\$74 billion (US\$30 billion in 2009).

In Europe, the role played by spot markets in setting import prices is becoming more important. In France, the pricing formula used to convert increases in supply costs now includes a share of nearly

60% of spot market prices, up from 46% previously. This explains the 16% fall in the average indexed price which is expected this year. This is estimated at US\$10.7/MBtu (€27.4/MWh). The UK NBP spot price is around US\$8.5/MBtu (€21.4/MWh), significantly down on 2013 (-20%). This drop is the result of two factors: on the one hand the lack of competitiveness of gas compared with coal in the electricity sector since 2012 and on the other, the mild 2013/2014 winter, which in turn explains the dramatic fall in consumption since November 2013.

On the US market, the Henry Hub price was strongly affected by the extreme cold early in the year, with daily peaks of around \$8/MBtu in February and March (monthly averages of US\$6 and US\$4.90/MBtu). Vigorous mobilisation of stocks maintained relative pressure on the price until June (US\$4.60/MBtu). In the face of moderate demand in July in the electricity sector, and given the strong increase expected in production (760 Gm³, an increase of 38 Gm³ compared with 2013), the price fell in August to less than US\$4. Taking current forecasts into account (prices holding steady at US\$4), a price of US\$4.40/MBtu is conceivable for 2014 (a 19% increase compared with 2013).

Initial indications for 2015 appear to point to:

- A slight fall in gas prices in Japan to around US\$15/MBtu, provided there is a fall in oil prices.
- Modest pressure on European spot prices with prices climbing back up to around US\$9 or US\$10/MBtu, their range in 2011/2013.
- A return to US\$4/MBtu for US prices – i.e., their level in 2009/2011.

Needless to say, these predictions do not take any exceptional events (such as the unusually cold weather experienced in the US in early 2014) into account. Nor do they factor in any unusual geopolitical events. The Russia-Ukraine crisis in particular may have a bearing on the volumes supplied to Europe and on market prices... The predicted trends for 2015 are therefore likely to change significantly.

It should be pointed out that the first LNG exports from the US will probably begin in 2015 through a number of new shale gas development projects. This is a significant issue for the US (gradual impact on US prices), for countries in Asia (option to negotiate prices independently of the oil market) and eventually for the world market (less pressure). Watch this space.

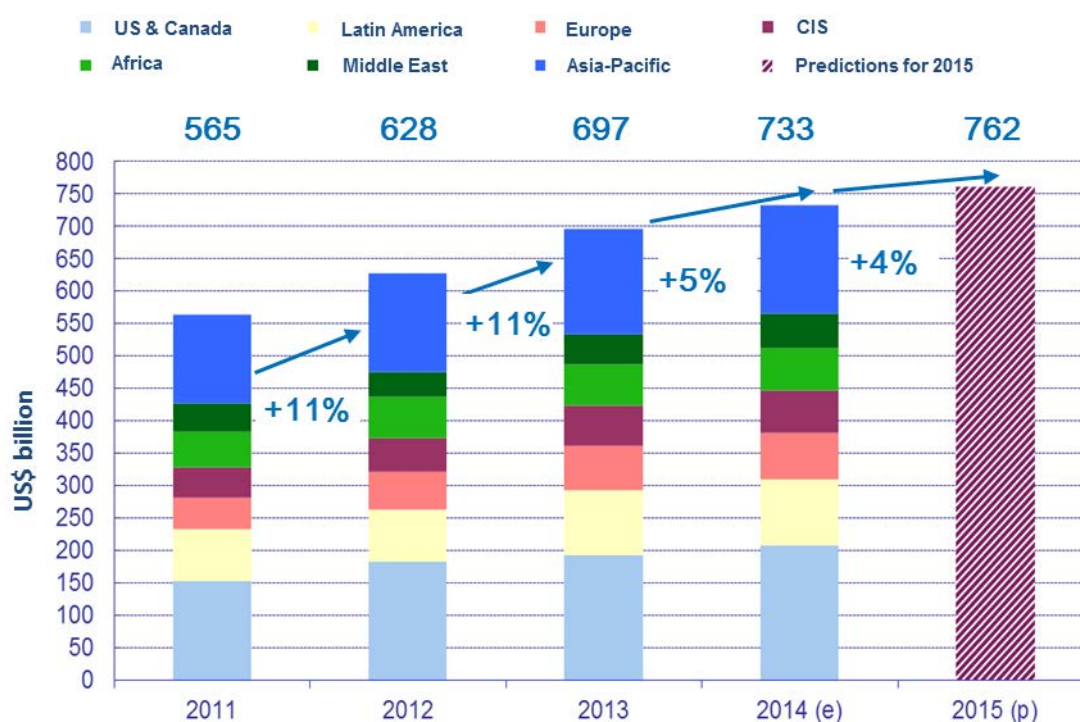
2 Exploration and Production: slowdown in growth

2.1 Moderate rise in investment in 2014

After 4 years of double-digit growth, growth in investment/exploration and production looks set to be more moderate this year – 5.1%, the lowest since 2010. This slowdown in growth can be attributed to the majors investing less at a time when independent companies and NOCs are continuing to enjoy strong growth. Investment should still, however, reach a new record level and exceed US\$730 billion – US\$36 billion more than in 2013. The Middle East is the most dynamic region with growth of around 10%, followed by North America (8.5%) and then the CIS countries (7.5%). The Asia-Pacific region should see a 3.3% rise in investment, with Europe and Africa both seeing a 2.8% rise. Growth in investment looks set to be the weakest in Latin America (1%).

In 2015, growth should remain moderate with a predicted increase of 4%. Most of the majors have announced that they are going to maintain investment at their current levels or even reduce them. In Australia, investment levels should peak in 2014-2015 after several years of strong growth boosted by the development of LNG projects. In the North Sea, investment is expected to fall considerably from 2015 onwards. However, the NOCs and independent companies, which drove growth in 2014, should continue to invest and North America looks set to remain buoyant. This should apply to the US in particular as it continues to develop its shale gas and oil operations.

Figure 4: Increase in global investment in E&P



Regions throughout the world saw an increase in their exploration and production investments in 2014, with growth rates varying from region to region.

In 2014, the Middle East should see growth of around 10%. Saudi Arabia needs to invest significantly in order to maintain its oil production levels and develop its gas resources. The same applies to Kuwait which is seeking to increase its production from 3.3 Mb/day in 2013 to 3.5 Mb/day in 2015 and then 4 Mb/day by 2020.

Driven by the rapid development of tight oil and shale gas, North America, which is where 29% of the world's exploration and production investments went in 2014, is still a very dynamic region. In the US, investment increased by nearly 10% in 2014. North America has also benefited from the geopolitical instability and security issues in the Middle East (Iraq) and in North America (Libya, Algeria): this has resulted in a number of US companies repatriating their investments.

In Russia, Rosneft has announced a 26% increase in its investments, while Lukoil has announced a 21% increase. However, these announcements came before the US and the EU imposed sanctions on Russia, the impact of which is yet to be determined. Gazprom (which includes its subsidiary Gazprom Neft), on the other hand, announced a 4% reduction in investment. It should be pointed out, however, that the Russian gas company's *actual* investments usually end up being higher than the forecasts it announces at the start of the year (16% higher in 2013, 33% higher in 2012 and 20% higher in 2011). It is therefore highly likely that it will once again have underestimated them this year.

Growth in the Asia-Pacific region is suffering from the majors having reduced their investments by more than 5% in this region and from Sinopec and Petrochina having frozen theirs. Growth in this region is being driven by NOCs from outside China (25% for Pertamina and 20% for Reliance) and independent Asian companies (21% for Inpex).

After having nearly doubled between 2010 and 2013, investment in exploration and production in Europe should see more modest growth this year – an estimated 2.8%. In the UK, investment should fall by 4%, having reached record levels in 2013. The high investment levels of previous years can partly be attributed to a small number of major projects starting up. These projects should continue to drive investment for a few more years as they develop, but in the absence of any new major projects, investment levels are expected to fall between 2014 and 2017. In Norway, investment levels have grown by 4% – moderate performance after three years of double-digit growth. The Norwegian national office of statistics is forecasting a fall of 18% for 2015. The country's official body stresses, however, that this fall may be offset by the Johan Sverdrup project. This should get under way once its development plan has been submitted to the authorities (scheduled for the first quarter of 2015).

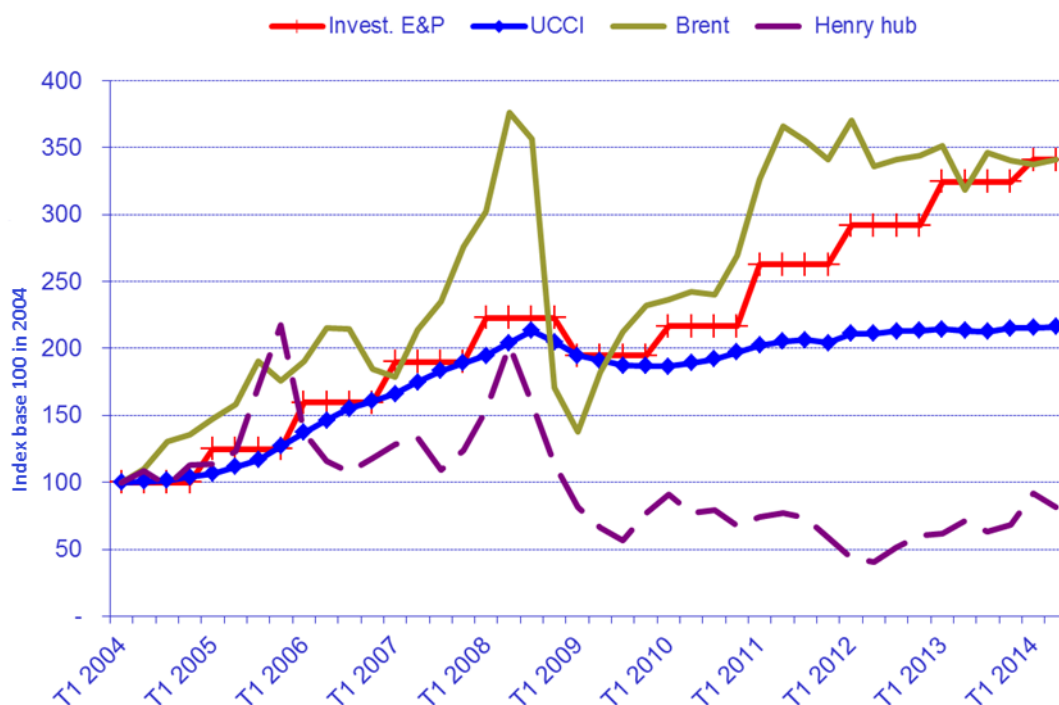
In Africa, investments are continuing to be negatively affected by the situation in North Africa: instability in Libya, events in Egypt which are not propitious for investment in exploration and production because of gas prices being too low, and uncertainty regarding the regulatory framework in Nigeria. But the success of exploration projects in East Africa (Kenya, Tanzania and Mozambique), together with the development of a number of projects (in Angola in particular) are compensating for this trend. Once all of these factors are taken into account, the whole region should see growth of around 2.8% in 2014.

In Latin America, Petrobras (which is increasingly in debt – US\$96.5 in 2013, up 31% on the previous year) should slightly reduce its investments in 2014, before increasing them again in 2015. In Mexico, investment was affected by the reforms to the oil sector – reforms to which Pemex is now going to have to adapt.

One of the distinguishing features of 2014 is the decline in investment from the world's majors, while independent companies and the NOCs have significantly increased their budgets:

- The underlying trend for the majors has been to exercise more budgetary discipline, the aim being to increase cash flow and dividends. In 2014, the majors reduced their levels of investment by an average of 8%. This reduction has been particularly significant for Shell: it reduced its levels of investment by 20% according to its last annual report. Chevron, Exxonmobil and Total have all reduced their levels of investment by between 5 and 8%. BP is the only major to have increased its levels of investment (by 5%).
- The investment budgets of the independent companies have all increased by an average of 7.5%. This increase has been more pronounced in the US (12%) – North American independents are refocussing on the US (and, to a lesser extent, Canada). North American independent companies that are active at international level have reduced their levels of investment outside North America by 4.4%, while they have increased them by 10% in the US and 2% in Canada.
- The NOCs' investment levels have increased by an average of 10%. This increase has been particularly strong in the Middle East (15%).

Figure 5: Change in E&P investment, prices and costs



Following a modest 1% increase in 2011 and 2012, and then a slight drop in the second and third quarters of 2013 (0.5% in both cases), the IHS-CERA upstream capital costs index (UCCI) started to increase again in the fourth quarter of last year. October 2013 to July 2014 saw growth of around 2%, and the index exceeded its 2008 peak. According to the IHS-CERA, the main factors driving growth were:

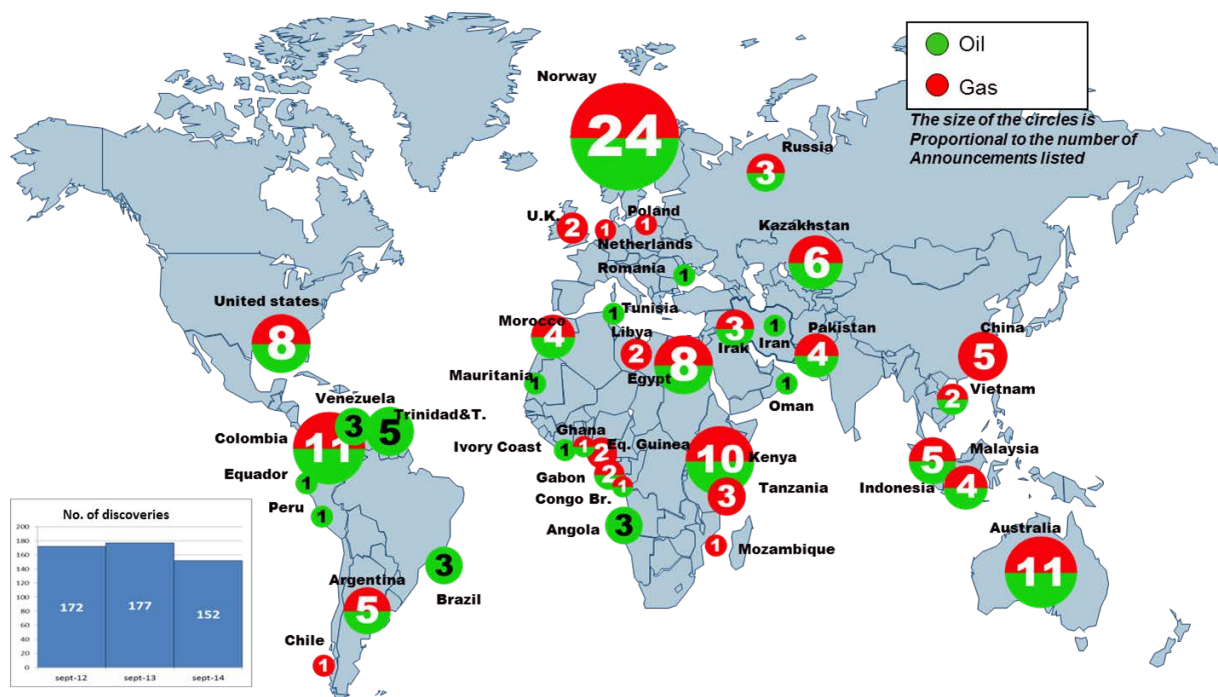
- the increase in the price of steel in the fourth quarter of 2013,
- the increase in the daily rates for leasing offshore construction vessels and in the cost of subsea equipment and construction in the first quarter of 2014,
- the increase in the cost of subsea facilities, labour, engineering and project management in the second quarter of 2014.

2.2 Exploration – Discoveries in 2014

In 2014, as of the end of September, 152 discoveries had been made compared to 177 over the same period in 2013. This decrease can mainly be attributed to a decline in activity in basins which have been extremely prolific in previous years (East African and Brazilian offshore) – operators having been more focused on assessing and developing existing discoveries. Knowledge of the volumes that have been discovered is still very incomplete, but some discoveries already appear to be quite significant. There have been significant discoveries in sub-Saharan Africa this year. In particular the potential of the Angolan pre-salt layer has been confirmed: since 2012, Cobalt Energy has discovered between 1.1 and 2 billion barrels of oil in 5 areas (100% success rate). And there have been a number of successful developments in Kenya, including the first offshore oil discovery in East Africa. ENI has also made 4 major discoveries – in the Congo, Angola, Gabon and Ecuador, representing a total of 2.3 billion barrels.

- In the Republic of Congo, an estimated 1.2 billion barrels of oil has been discovered in ENI's Nene Marine 3 exploration well.
- In Angola, Cobalt Energy has made two major discoveries in the pre-salt layer – Orca 1 (400-700 million barrels of oil) and Bicuar #1 (150-300 million barrels of oil), while ENI has discovered 300 million barrels of oil in the offshore block 15/06.
- In Kenya, Tullow Oil has made 6 discoveries in block 10BB in the north of the country, bringing the total oil reserves discovered up to 600 million barrels. And Tullow is hoping to increase this to more than 1 billion barrels by continuing with its exploration of this zone.
- In Tanzania, Statoil has discovered between 57 and 85 Gm³ of gas (340-510 Mboe) on block 2, while BG Group has discovered around 28 Gm³ of gas (340-510 Mboe) on block 1.
- ENI has discovered 500 Mboe of condensate gas in the Gabon pre-salt layer.
- Off the coast of Australia, the Phoenix South-1 well (Apache Corp.) potentially represents Western Australia's greatest offshore oil discovery of these last few years (300 Mboe).
- In Ecuador, ENI has discovered approximately 300 million barrels of onshore oil

Figure 6: discoveries in 2014 (as of 25 September)



2.3 Russia: sanctions will have limited short term impact

On 16 July, the US imposed financial sanctions on Rosneft (Russia's largest oil producer and its third largest producer of gas) and NOVATEK (the country's largest independent natural gas producer). Additional EU and US sanctions followed on 29 July, targeting the supply of services and technologies for use in deep water and Arctic exploration and production operations, and shale oil. These measures all apply to oil, but not to gas, since Europe is highly dependent on gas from Russia. They also include measures that restrict Russia's access to the financial markets, as well as sanctions specifically targeting certain prominent Russian figures. The sanctions were further tightened on 12 September on both sides of the Atlantic. The US widened them to include Gazprom, Gazprom Neft, Surneftegas and Lukoil, while the EU extended them to other companies and additional prominent figures.

Although production in Russia will probably not suffer considerably in the short to mid-term, future projects – together with those that are currently in development – run the risk of being affected if the sanctions last. And that could affect the country's growth strategy beyond 2020. The European sanctions are not retroactive, so contracts that were signed before they came into force are not affected. Furthermore, the embargo on the sale of technologies and services only affects deep offshore, the Arctic and shale oils, and current production in these areas is very low or non-existent. Russia's oil equipment and services sector is well developed and could – to an extent – replace European and American equipment with Russian or Chinese equipment for hydraulic fracking, horizontal drilling and 3D seismic operations. However, if these sanctions continue, or if they are extended to include conventional exploration and production, oil production may well suffer.

Oil development projects in the Arctic and deep-water exploration operations which involve both the majors and Russian companies – Rosneft in particular – may encounter difficulties should these sanctions be extended. Furthermore, financial sanctions could hinder the development of conventional projects that require significant investments, making it harder to fund them. Shale oil projects would also have to be slowed down, but not completely stopped: Russian or Chinese oil equipment and service companies could be used instead of western companies, and the fact that the sanctions are not targeting the gas sector (only shale oil) means that Russian companies have the means of getting around the embargo. Although the gas sector has been explicitly excluded from the sanctions, a number of major infrastructure projects – such as the Yamal LNG plant project – run the risk of being affected by funding difficulties because of increased political risk. If this happens, all of Russia's plans as far as LNG is concerned could be disrupted.

The sanctions will also affect western companies operating in Russia. The most exposed are BP and Total because of the stakes they own in Rosneft and Novatek. Total also holds interests in the Yamal LNG project, as well as the Kharyaga project in the Arctic. Exxonmobil also has exposure through its joint ventures with Rosneft in the Arctic and in its development of shale oils in the West Siberian Bazhenov formation. Exxonmobil also has a stake in the Far East LNG project. Statoil and ENI are both involved with Rosneft in exploration operations in the Arctic. Furthermore, Statoil has stakes in Rosneft's shale oil and heavy oil developments and ENI has shares in Gazprom's South Stream gas pipeline. And Wintershall has entered into a number of strategic partnerships with Gazprom.

Sanctions imposed by the West run the risk of strengthening any desire that Russia might have to move closer to China – something it is already trying to do in order to look for new outlets in the face of stagnating European demand. Russia started working more closely with China regarding hydrocarbons in 2013. CNPC acquired a 20% stake in the Yamal-LNG project and entered into a contract with Rosneft to supply 22 million tonnes of oil per year – a contract worth a total of US\$270 billion (including US\$60 billion in prepayments). And in May, after 20 years of negotiations, Russia and China finally signed a contract to supply 38 Gm³ of gas per year. More recently, Russia is

reported to have offered an unidentified state-owned Chinese company a stake in Rosneft's giant Vankorskoye field.

2.4 Implications of the reforms to the Mexican energy sector.

On 11 August, Mexico promulgated a number of reforms to its energy sector, opening up hydrocarbon exploration and production to private investment and ending PEMEX's 75-year monopoly in this area. The new legislation should improve Mexico's outlook for oil and gas production considerably.

Mexican oil production continues to fall. A production rate of 2.35 Mb/day is predicted for 2014, having peaked at around 3.5 Mb/day in 2004. The reforms to the energy sector should enable Mexico to increase its production levels to 3 Mb/day in 2018 thanks to US\$50 billion of private investment expected between now and then. For 2040, the DOE has revised its estimates for Mexican production upwards: it should reach 3.7 Mb/day by then.

However, the success of the reforms will depend on how they are implemented. The first licensing round will be used to specify the assets offered to investors, as well as the contractual and fiscal framework available.

The first thing that Mexico's National Hydrocarbon Commission did at the end of August was define the reserves that will remain under PEMEX's control and those that it will have to sell. It has already been decided that PEMEX will retain 83% of Mexico's proven and probable reserves – approximately 20.6 Bboe. This is enough for it to continue operating at current rates for at least 15 years. It is likely that PEMEX will retain ownership of its main production assets and will look for partners in order to develop the more complex fields, such as the deep water fields off the Gulf of Mexico and reserves of extra heavy oil. Ten priority projects that will require alliances with private partners have been identified by the state-owned company. Approximately US\$32 billion will need to be invested in order to develop the 1.6 billion barrels of reserves.

The first licensing round was announced on 13 August and will be used to auction off two types of asset: assets that will be developed as joint ventures with PEMEX, and assets that do not necessarily require PEMEX's involvement. The first assets are fields for which PEMEX does not have the requisite financial or technical means, while the second include 109 exploration blocks and 60 fields that are currently being developed. The first licensing round should be launched next February, with assets being allocated between May and December 2015.

3 Drilling activity and market throughout the world

In 2013, the number of drilling operations being carried out across the world (onshore plus offshore) was similar to the number for 2012. The recovery which followed the period immediately after the crisis of 2009 is coming to an end. The offshore drilling market has grown by 10%, while the onshore drilling market is stagnating. 97% of all drilling operations are onshore, meaning that it is these operations that define the overall trend.

In 2013, Central and Latin America, North America and Europe also saw falls in their onshore activity. The number of offshore drilling operations increased in all regions throughout the world.

In 2014, there was a slight recovery in onshore activity – it will most likely have grown by 4% over the year. The increase in offshore drilling activities looks set to be lower than in 2013 – around 6% over the year.

In terms of turnover, in 2013, the drilling and associated services market was worth an estimated US\$236 billion – 6% more than in 2012. Turnover for onshore drilling operations alone increased by 6% in 2013 to US\$30 billion; it should increase by the same rate in 2014.

As far as the offshore drilling market is concerned, it grew by 14% in 2013 to nearly US\$56 billion; continued growth of around 10% is forecast for 2014.

For 2015, the global drilling market should grow by around 5%, mainly driven by unconventional and deep offshore activities.

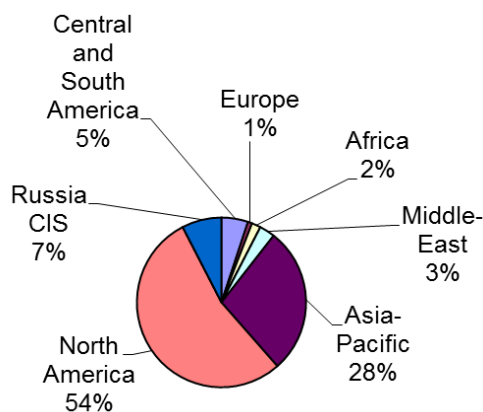
3.1 Onshore and offshore drilling

3.1.1 Number of wells drilled throughout the world

Most oil and gas drilling activity occurs onshore. A total of 101,000 new onshore wells and 3600 offshore wells were drilled in 2013 – meaning that activity was relatively stable compared with the previous year.

North America (US and Canada) still accounts for more than half of total drilling, followed by the Asia-Pacific region (28%), most of which is in China. In 2014, onshore and offshore drilling should involve nearly 105,000 wells – the same level of activity as in 2006 before the world financial and economic crisis.

Figure 7: Distribution by region of onshore and offshore wells drilled in 2013.



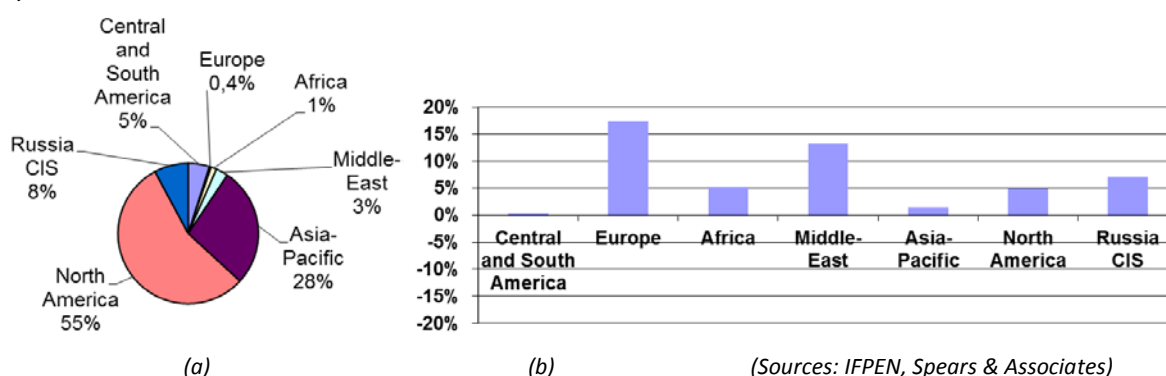
(Sources: IFPEN, Spears & Associates)

3.1.1.1 Number of onshore wells

In 2013, world onshore drilling was relatively stable compared with 2012. Europe saw a 6% decline, North America a 2% decline and South and Central America a 4% decline. Regions which saw growth were Africa (10%), the Middle East (7%) and the CIS countries (7%). Asia-Pacific stagnated compared with 2012.

For 2014, onshore drilling activity should increase by an average of 4% over the whole year. With the exception of South America (which has remained stable because of the fall in drilling operations in Brazil and Mexico), all regions across the world saw growth. Growth has mainly been driven by the Middle East (13%) – Saudi Arabia, Oman, Turkey and Iraq in particular. A low number of wells (380) drove growth in European drilling activities (17%).

Figure 8: Distribution of onshore wells in 2013 by region (a), and growth in mid-2014 over one year (b).

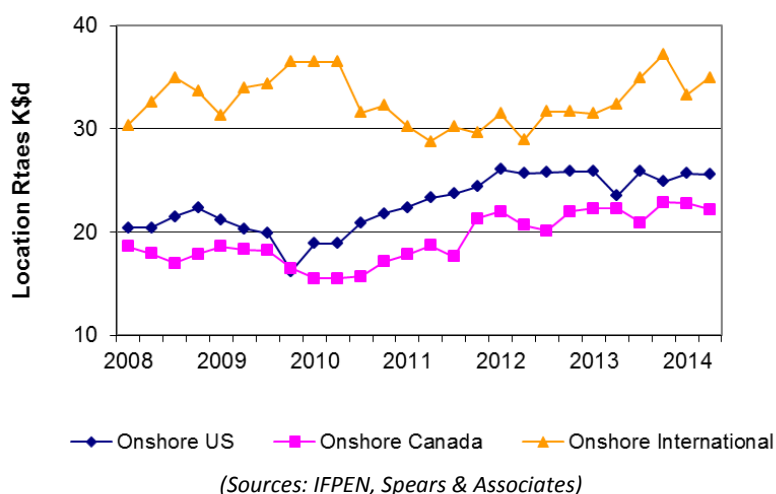


Onshore rig rates

In 2013, annual onshore rig rates across the world (except North America) saw strong increase (17%). In the US, however, they fell by 4%, while increasing by 4% in Canada.

For 2014, Spears & Associates forecast in June that the strong increase in rig rates at international level would plateau out to no more than 5% across the year. In the US, rates should remain practically unchanged over the year, while increasing slightly in Canada (2%).

Figure 9: Onshore rig rates in North America and across the whole world.



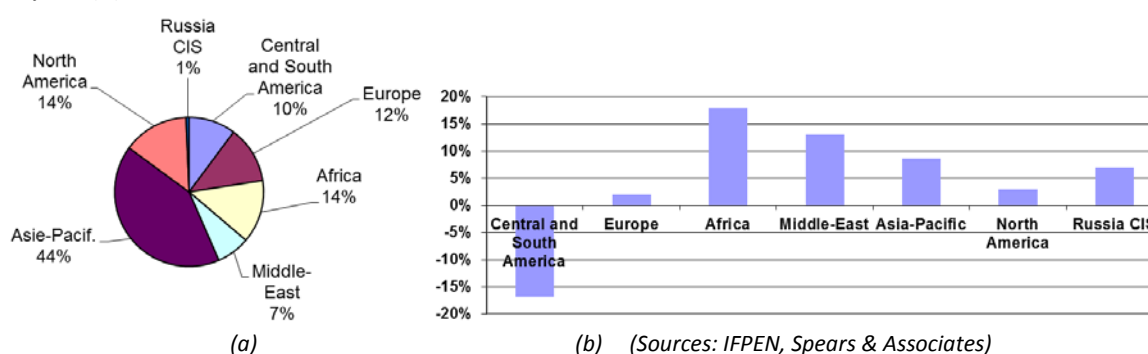
3.1.1.2 Number of offshore wells

In 2013, the offshore drilling market grew by 10% over the year. All regions saw growth, particularly the Gulf of Mexico (21%) following on from 2012 when it saw growth of 45%. Asia-Pacific and Africa saw growth of 11% and 8%, respectively.

As far as 2014 is concerned, forecasts suggest that the offshore drilling market will grow more modestly (6%). The increase in operations in the Gulf of Mexico should slow down to 3%, but the African drilling market will continue to grow (17%) with the development of many discoveries, particularly in Angola, Mozambique and Tanzania. Asia-Pacific should see growth of 8%.

Only South America should see a decline in growth in 2014, mainly because of Brazil investing less in offshore drilling.

Figure 10: Distribution of offshore wells drilled in 2012 by region (a), and growth in mid-2013 over one year (b).

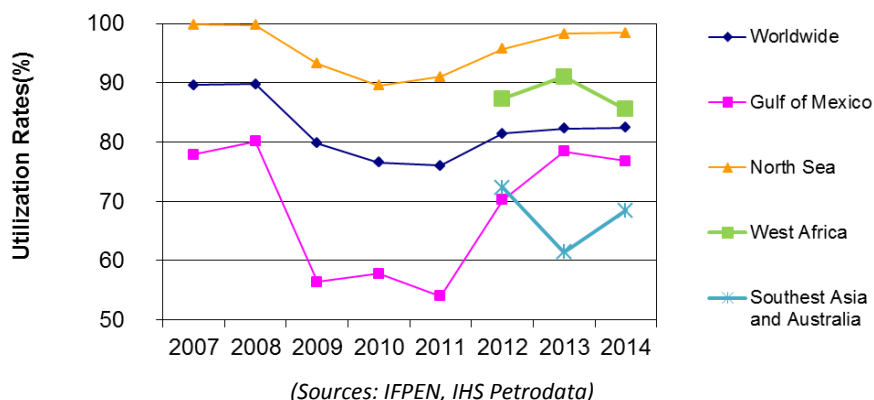


Offshore rig utilisation rates

This includes the utilisation rates for semi-sub and jack-up rigs, as well as drilling ships at international level and by region. In 2013, average rig utilisation rates were stable (1%) at international level. Utilisation rates in the Gulf of Mexico continued to increase (11%), as well as in the North Sea and West Africa (3% and 4%, respectively). Utilisation rates fell by 15% in South-east Asia.

Average utilisation rates trod water in 2014, remaining stable in Europe and at international level. They fell by 2% in the Gulf of Mexico and by 6% in West Africa. However, utilisation rates in South-east Asia rose by 10%. We can expect a recovery in utilisation rates in the US on the Atlantic coast with the opening of oil exploration operations.

Figure 11: Mean annual offshore rig utilisation rates for the whole world, the Gulf of Mexico and the North Sea

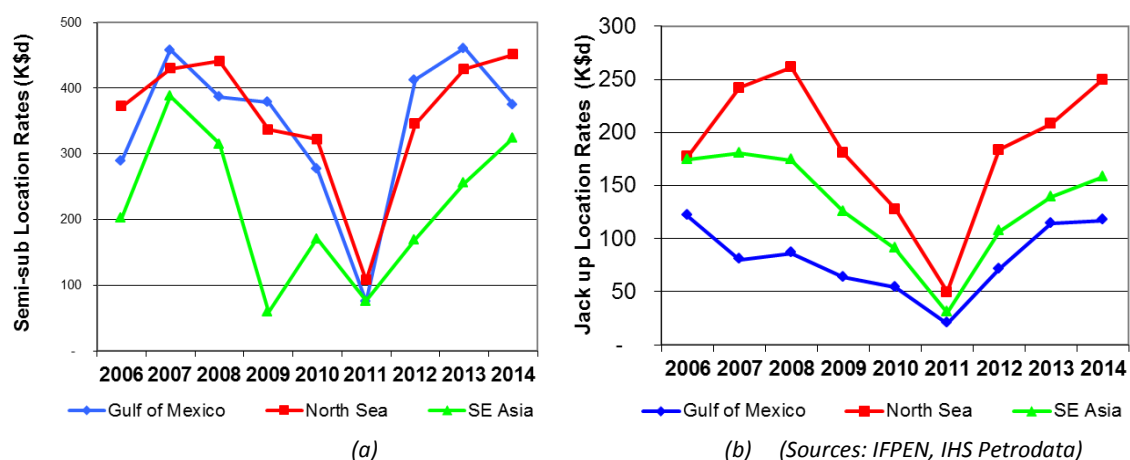


Offshore rig rates

In 2013, with the exception of rates for semi-sub rigs in the Gulf of Mexico, the recovery that began in 2012 continued. The overall decline observed in 2011 ended, and rig rates returned to the levels they were at before the world economic crisis.

In 2014, semi-sub rates should increase by an average of 10% in the North Sea and by 50% in South-east Asia, while rates are predicted to fall by 20% in the Gulf of Mexico. For jack-up rigs, rates are expected to increase by 6%, 40% and 10% for the Gulf of Mexico, North Sea and South-east Asia, respectively.

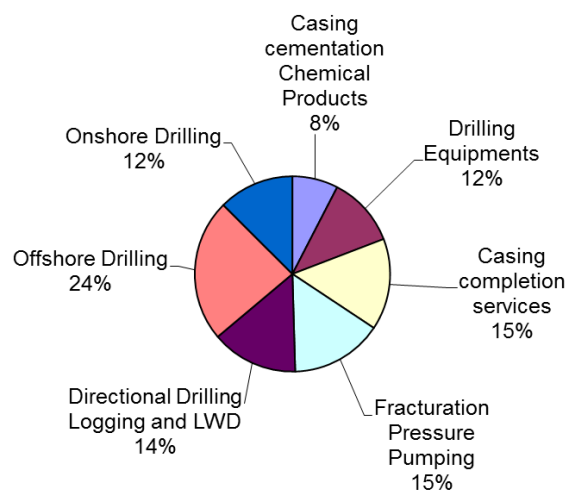
Figure 12: Mean annual rates for (a) semi-sub and (b) jack-up rigs in the Gulf of Mexico, the North Sea and South-East Asia.



3.1.2 Drilling, equipment and well services markets

In 2013, the global drilling and associated services market was worth an estimated US\$236 billion – 6% more than in 2012. Offshore and onshore drilling operations accounted for 24% and 12% of the global market, respectively – US\$56 billion and US\$29 billion in turnover. Although there are considerably fewer of them, offshore drilling operations are much more expensive.

Figure 13: Distribution of the various segments of the drilling market in 2013.



(Sources: IFPEN, Spears & Associates)

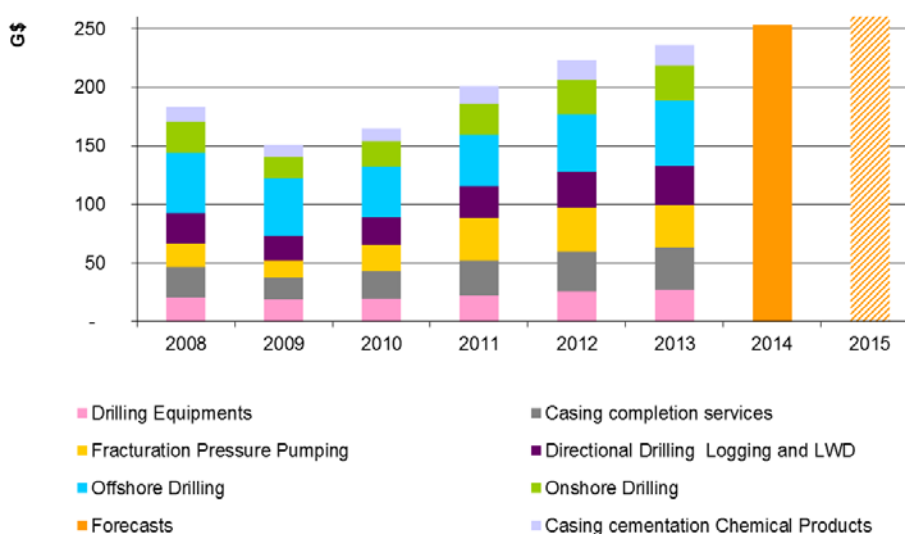
The other segments on this major market involve equipment and services for wells:

- casing cementing, drilling tools, well completions and directional drilling account for half (US\$115 billion) of the global market.
- fracking and pumping operations (15% of the global market) which have kept pace with the development of shale gas operations in North America have generated turnover of the same order as offshore drilling operations (US\$36 billion).

For 2014, the whole global drilling market is predicted to continue to grow, with average growth of approximately 6% over the year (as was the case in 2013), exceeding US\$250 billion.

Since 2009, the development of shale oils and gases in North America has helped boost the onshore drilling market considerably, as companies turn to directional drilling and hydraulic fracking.

Figure 14: Increase/decrease in size of the various drilling market segments since 2008 and forecasts for the global market in 2014 and 2015.



(Sources: IFPEN, Spears & Associates)

For 2015, the global drilling market should grow by around 5%, mainly driven by projects to develop unconventional fields in North America and deep offshore activities.

3.1.2.1 Onshore drilling market

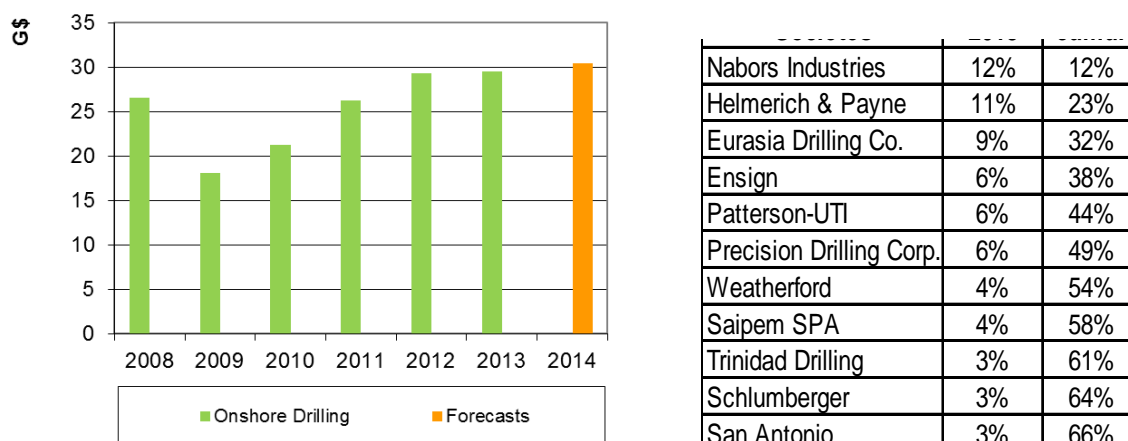
Turnover from onshore drilling operations alone increased by 6% in 2013 to US\$29 billion; it should increase by the same rate in 2014 and exceed US\$30 billion. Eleven major groups account for two-thirds of the world onshore drilling market.

The sector leader is Nabors Industries, with a 12% share of the market, followed by Helmerich & Payne (11%). Eurasia Drilling is in third place, continuing to win market share (a 1% increase in 2013), having already increased its share by 2% in 2012.

The three companies in 4th, 5th and 6 place are: Ensign, Patterson-UTI and Precision Drilling with 6% of the market.

Weatherford, Saipem and Schlumberger, for which onshore drilling is not their core business, are in 7th, 8th and 10th place, respectively.

Figure 15: Increase/decrease in size of the onshore drilling market and market share of the major onshore drilling companies in 2013.



(Sources: IFPEN, Spears & Associates)

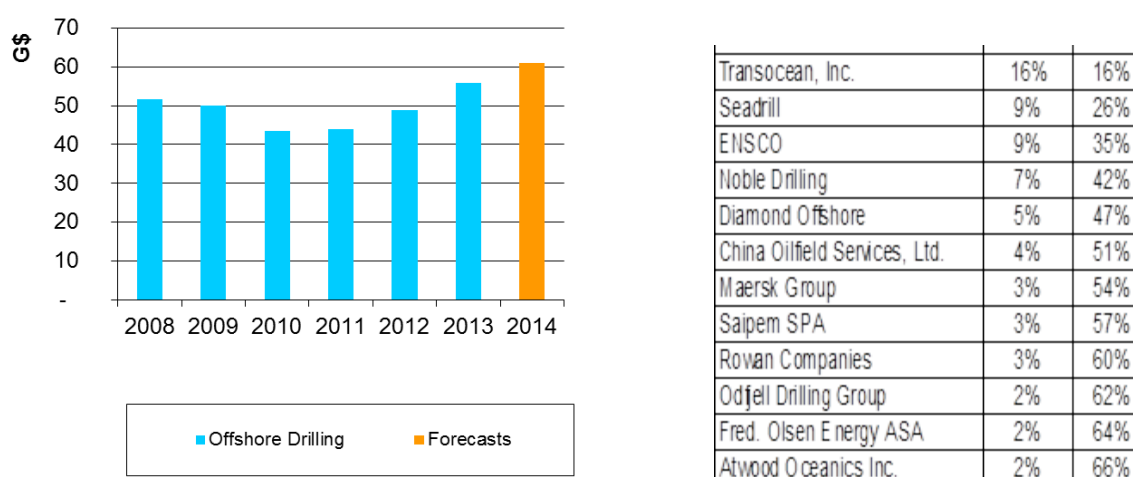
3.1.2.2 Offshore drilling market

The value of the onshore drilling market alone grew by 14% in 2013 to nearly US\$56 billion; In 2014, it should continue to grow by around 10% and reach US\$61 billion. This market is also extremely concentrated – 12 major groups account for two thirds of it.

Transocean is still the world's largest offshore drilling contractor, but its market share fell by 16% in 2013 following a fall of 20% in 2012. Transocean had already suffered a 3% fall in market share after the Macondo oil spill in the Gulf of Mexico in 2010.

Seadrill and ENSCO are still in 2nd and 3rd places respectively, each with a 9% share of the market (as opposed to 10% in 2012). The fall in market share compared with 2012 that the market's three leading players suffered has helped the smaller companies with less than 2% of market share. Diamond Offshore lost 2% of its market share in 2013 (as it had done in 2012).

Figure 16: Increase/decrease in the offshore drilling market and market share of the major onshore drilling companies in 2013.



(Sources: IFPEN, Spears & Associates)

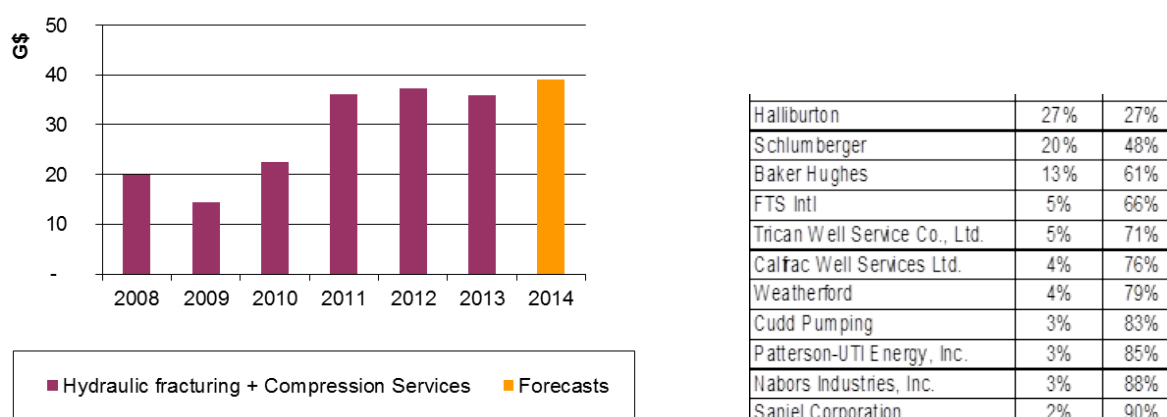
3.1.2.3 Fracking market

The value of the fracking market reached US\$36 billion in 2013. After two years of strong growth (60%) in 2010 and 2011, the market stabilised in 2012 and 2013, growing by 3% and then shrinking by 4%, respectively. The fracking market hit a low point in 2009, falling to US\$14 billion. But it has doubled since 2008 and the world economic crisis.

Eleven companies account for 90% of the market. Halliburton, Schlumberger and Baker Hughes – the three leading companies – account for 61% of world turnover.

The fracking market is seeing increased competition. In November, discussions were under way about Halliburton, the largest company in the sector, merging with Baker-Hughes.

Figure 17: Increase/decrease in the size of the fracking market and market share of its main companies in 2013



(Sources: IFPEN, Spears & Associates)

3.2 Geophysical activity and the geophysical market

Marine seismic activity has remained stable over a 12-month period, but contracting companies involved in geophysical activities are carrying out more and more studies with little in the way of pre-financing. These companies are having to deal with oil companies suspending or cancelling campaigns.

As far as turnover is concerned, after a stable 2013, the geophysical market is expected to shrink considerably in 2014 (by 20%) – for both the acquisition and processing and the equipment segments.

The streamlining of the marine fleet should prevent acquisition prices from falling in 2015. If the Russia-Ukraine crisis is resolved, then US and EU sanctions will be lifted, meaning that the next marine acquisition season in the Arctic can be conducted properly.

3.2.1 Geophysical activity

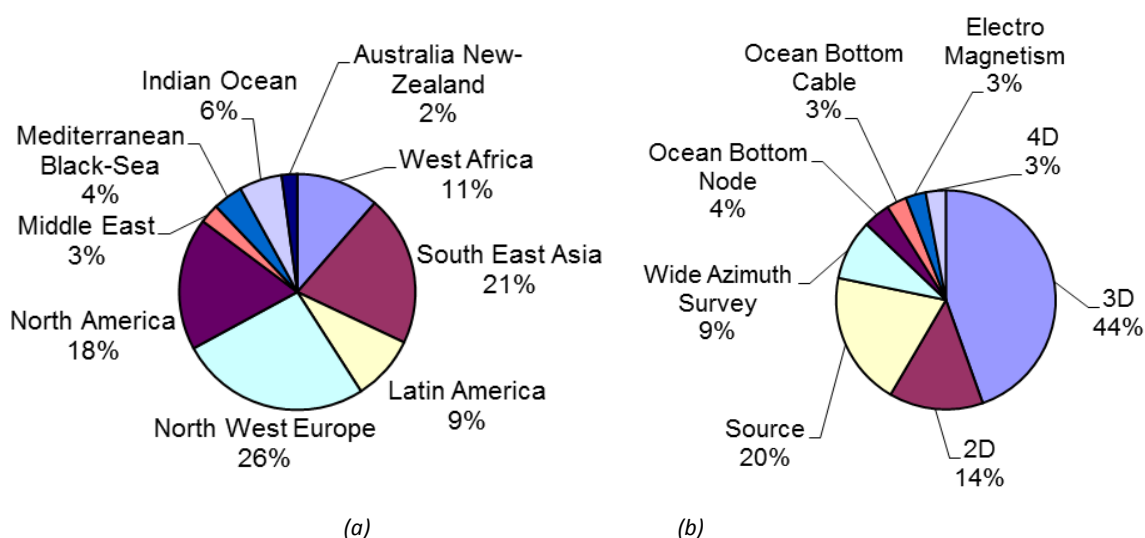
Marine seismic activity throughout the world has remained stable over a 12-month period with a total of 140 seismic campaigns. However, this number is not an accurate reflection of the situation, as contractors are carrying out more and more multi-client studies, some of which with little pre-financing.

Activity has been focused on five regions: North America (26%), South-east Asia (21%), North America (18%), Latin America (9%) and the Gulf of Guinea in West Africa (11%).

Only three of these regions have seen growth: the Gulf of Mexico (21%), the North Sea (17%) and the Middle East, which has seen its modest marine activity triple.

Activity in all the other regions, however, has declined, particularly in Latin America (-31%), Australia and New Caledonia (-41%) and the entire Mediterranean / Black Sea region (-21%). Activity in the Mediterranean / Black Sea region had, however, doubled in 2013.

Figure 18: As of mid-2014, distribution of marine seismic testing campaigns over the last 12 months, by (a) region and by (b) acquisition type.



(Sources: IFPEN, IHS)

3D (44%) and 2D (14%) account for most marine seismic activity. The share of Wide Azimuth campaigns (9%) requiring source boats (20%) has doubled compared with 2013, resulting in a reduction in numbers of conventional 2D and 3D campaigns.

Acquisition using ocean bottom cables (OBC) or nodes (OBN) has fallen slightly compared with 2013 and accounts for 7% of all operations; this activity doubled in volume between 2011 and 2013. 4D seismic monitoring only accounts for 3% of total activity and is stagnating; electromagnetic seismic acquisition campaigns now account for the same level of activity.

Rig rates and ship utilisation rates

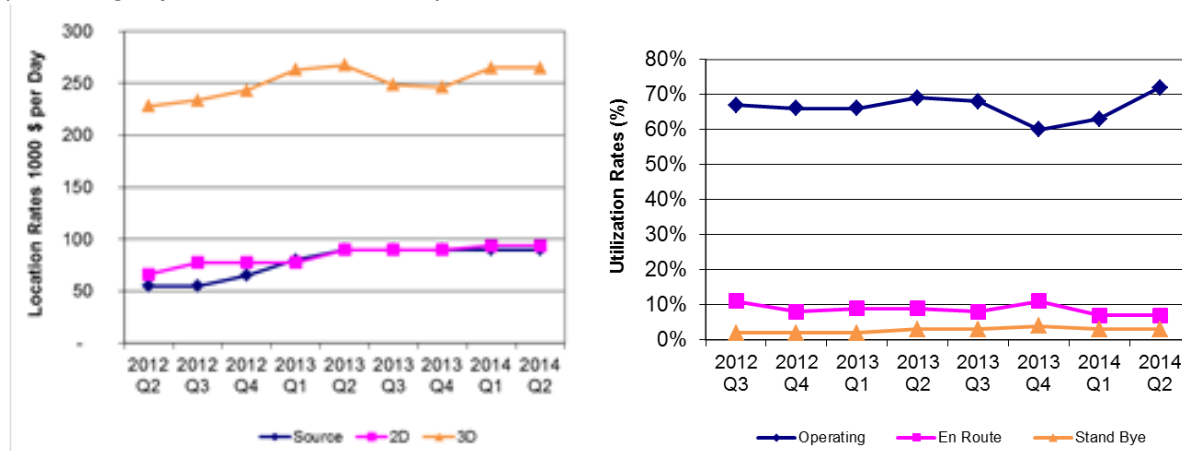
Ship utilisation rates fell by 10% in 2013, before recovering at the start of 2014, mainly due to contractors initiating a number of multi-client studies (equity financed) aimed at getting the ships occupied and anticipating developments on the market.

Geophysical contractors are having to deal with oil companies which have become more selective in their investments (exploration in particular) suspending or cancelling their campaigns.

And the fleet of acquisition vessels is suffering from chronic surplus capacity: new, increasingly modern boats are added on a regular basis, meaning that the older ones have to be dismantled or reconverted.

In these difficult circumstances, advertised leasing rates officially remained stable over the first half of 2014, but in practice, they ended up being more than 10% lower when contracts were negotiated. Depending on specifications and vessel type, leasing rates for a 3D marine acquisition vessel can range from US\$100,000/d to US\$400,000/d; the average price was US\$265,000/d over the second quarter of 2014. The cost of a source boat is very similar to that of a 2D seismic acquisition boat (US\$90,000/d), and adding a steamer has very little effect on rigging rates.

Figure 19: As of mid-2014, rigging rates in thousands of US dollars/day and utilisation rates as a percentage of marine seismic activity.



(Sources: IFPEN, IHS Petrodata)

3.2.2 Geophysical market

In 2013, turnover generated by the geophysical, equipment and data acquisition and processing market reached US\$16 billion. It was more or less stable compared with 2012, and exceeded its highest 2008 value (US\$15 billion).

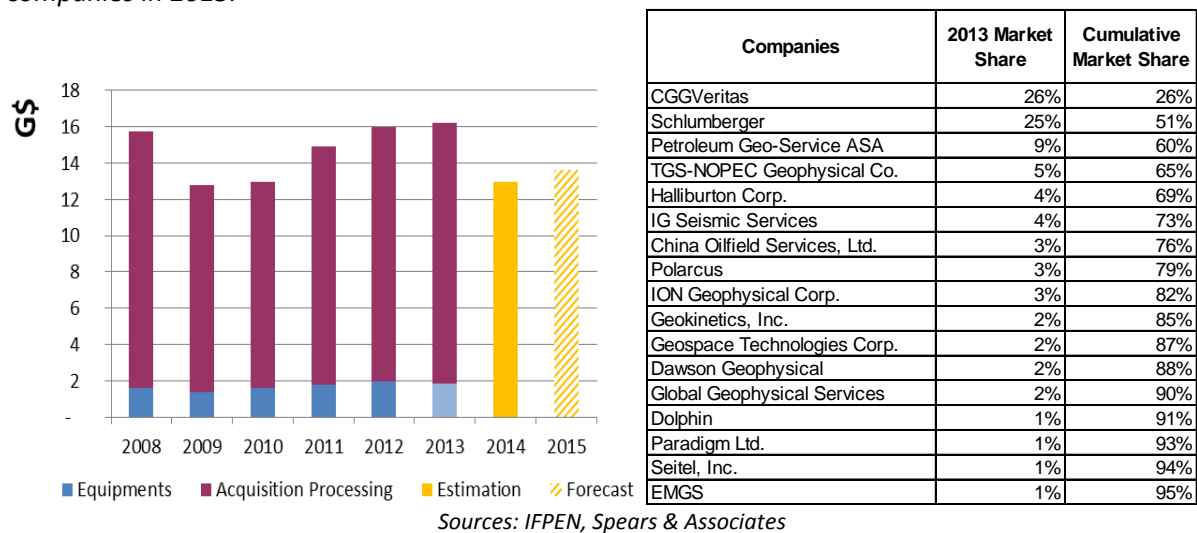
At global level, the equipment segment generated total turnover of US\$2 billion – 12% of the total geophysical market. In 2013, it fell by 5% across the whole 12-month period.

The geophysical market is expected to shrink considerably in 2014 – for both the acquisition and processing and the equipment segments. Given the fall in turnover that CGG and PGS suffered in the first half of 2014, the total market could shrink by as much as 20%. The geophysical market is having to cope with a number of major companies reducing their exploration expenditure. 2014 looks set to be a very bad year – comparable to 2009.

Given that the Arctic marine acquisition season ends in October, the impact of US and EU sanctions on Russia in response to the Ukrainian crisis should be limited in 2014.

As far as 2015 is concerned, industry professionals are not predicting any increases in acquisition prices unless there is a clear recovery in activity and a concerted effort to scrap surplus vessels in the fleet – yet more ships that are in the process of being built are expected to arrive on the market.

Figure 20: Geophysical market (equipment and data/acquisition) and market share of the major companies in 2013.



❖ Companies involved

In 2013, CGG and Schlumberger (together with its subsidiary Western-Geco) accounted for more than half of the world geophysical market. Altogether, 80% of the market is controlled by 7 companies. PGS, TGS-NOPEC and Halliburton are in 3rd, 4th and 5th places, respectively. The Russian company IG Services (in which Schlumberger holds a 30% stake) is in 6th position, followed by China Oilfield Services.

As far as equipment is concerned, CGG's subsidiary Sercel is still the market leader with a 60% share in the world market, followed by ION and Geospace Technologies.

3.3 Offshore construction activity and the offshore construction market

Rig construction, having grown considerably in 2013 (by 20%), should only grow by 5% in 2014. In 2013, the numbers of new drilling vessel construction projects stagnated. In 2014, there was a fall in the numbers of new drilling vessel construction projects. Also noted in 2014 was an 8 to 10% fall in the numbers of construction projects getting under way without a contract. This is a sign that shipbuilders are less willing to take risks.

In 2013, the numbers of FPS (Floating Platform Systems) under construction fell by 10% in 2014. There were more than 300 subsea infrastructure construction projects in progress as of mid-2014, but this is only a small increase compared with previous years – despite the potential of deep and ultra deep offshore projects.

In 2013, the offshore construction market grew by 7% across all segments. In 2014, it should be worth more than US\$65 billion – an increase of around 5%.

As far as 2015 is concerned, the strong growth that the subsea market has enjoyed (annual growth of 20% in 2012 and 2013) should start to plateau as a result of a number of projects being postponed.

3.3.1 Offshore construction activities

3.3.1.1 Rig construction activity

2013 saw a 20% increase in offshore rig construction activity over the whole year, mainly involving the construction of jack-up and semi-sub rigs (up 30% and 25%, respectively). Drilling ship construction activity remained more or less stable (up 3%). Construction projects without future contracts signed accounted for 38% of all projects. More than 60% of these were for drilling ships and semi-sub rigs, as opposed to 18% for jack-up rigs.

In September 2014, of a total of 233 offshore rig construction orders, 139 were for jack-up rigs, 28 for semi-sub rigs and 66 for drilling ships. Over a 12-month period, this represents an average increase in activity of 5%, mainly in semi-sub rig (17%) and jack-up rig (15%) construction projects, while drilling boat construction projects have fallen by 14%.

30% of all rigs are built without a contract: most of these are for drilling ships and semi-sub rigs, as opposed to only 13% for jack-up rigs.

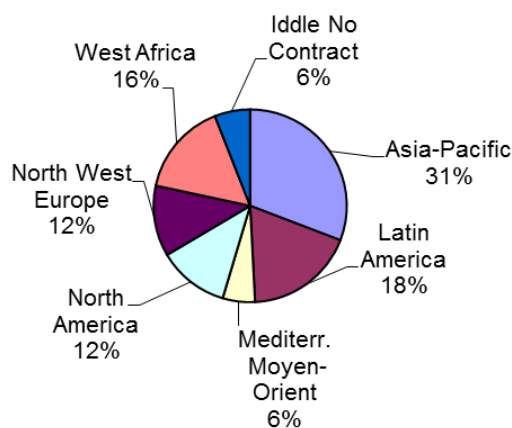
2014 saw an 8% average fall in construction projects getting under way without a contract. This works out at 10% for drilling ships and semi-sub rigs and 5% for jack-up rigs – a sign of just how nervous construction companies are.

3.3.1.2 Floating Platform Systems (FPS)

In June 2014, there were around 390 FPSs throughout the world. This represents an 8% increase over 12 months. All regions throughout the world have seen an increase in numbers – apart from north-west Europe, which saw a 3% fall.

Unused FPSs accounted for 6% – an increase of 12% over a 12-month period. FPSOs (Floating Platform Storage and Offloading) account for most FPSs (63%). The oldest floating platform systems and the single-hull designs are the ones that are most often without contract and which are scheduled to be dismantled soon.

Figure 21: Geographical distribution of existing floating platforms in mid-2014.

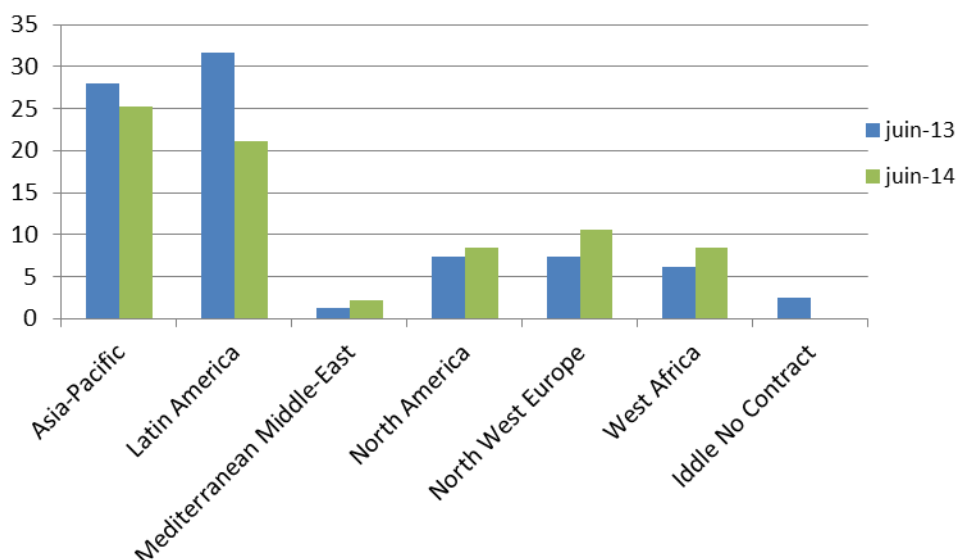


(Sources: IFPEN, IHS)

In June 2014, there were 76 FPSs under construction throughout the world. The total number of construction projects has fallen by 10% over a 12-month period. South America and the Asia-Pacific – which is where 60% of the world's construction projects are based – have seen falls of 34% and 10%, respectively. There has been an increase in the numbers of FPS construction projects in other regions of the world.

In 2014, not a single FPS construction project was undertaken without a future contract, whereas there had been two the previous year. In 2013, the number of construction projects had remained stable, and the number of FPSs being built without a contract had fallen significantly.

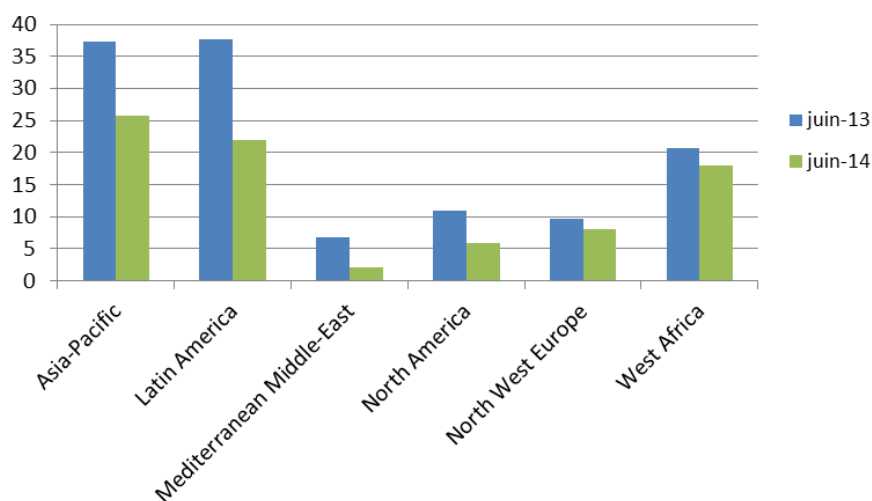
Figure 22: Change in the number of floating platforms under construction between June 2013 and June 2014 per geographical region.



(Sources: IFPEN, IHS)

A total of 98 FPSs have been ordered for all regions together up until 2018. This is 34% fewer than the total number counted last year. Demand is falling for all regions throughout the world, particularly in the Mediterranean and the Middle East (69% down), North America (46% down) and Latin America (42% down). However, if all of the demand inventoried in 2014 is actually built, this will mean a 25% increase in the total number of FPSs over 4 years.

Figure 23: Change in demand for floating platforms up until 2018 between June 2013 and June 2014 per geographical region.



(Sources: IFPEN, IHS)

3.3.1.3 Subsea constructions

The first subsea installation dates back to 1963, but the subsea and laying vessel industry only really started to take off at the start of the 1990s with deep offshore developments. Between 1980 and 2012, nearly 5000 subsea installations were laid. The record year was 2008, which saw 330 installations laid. The North Sea has played an important role in the development of the subsea industry – 35% of all installations since 1980 have been in the North Sea.

Regional developments, as well as developments in difficult conditions and in deep sea locations have contributed to the increase in popularity of subsea installations. In 2006, only 25% of all discoveries were at depths of more than 1000 m. By 2012, however, half of all discoveries were at depths of more than 1000 m.

The North Sea, the Gulf of Mexico and the Gulf of Guinea are the regions with the highest concentration of subsea installations. They are followed by South America and West Africa, regions that are both seeing strong growth.

After peaking at 330 installations in 2008, subsea activity fell in 2009 and 2010, with only 250 units being built per year. 2011 then saw a significant recovery in activity (up 25%), followed by numbers stabilising in 2012 (down 4%).

In mid-2014, more than 300 potential subsea projects were identified. 20% of these are at depths of between 300 and 1500 m, and 16% are at depths of more than 1500 m. The number of deep-water developments continues to increase as resources at depths of less than 300 m have already mostly entered production.

The subsea industry is having to tackle increasingly complex projects, an absence of standardisation and a shortage of qualified personnel. The result is a sharp increase in costs which are difficult to sustain at a time when investments are limited. One such example is Total's Kaombo project in Angola: the final decision about investment has been delayed by one year.

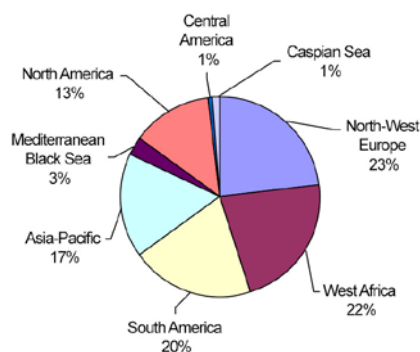
There are a number of other constraints that indirectly influence costs, including:

- the "local content" obligation, particularly in West Africa and Brazil,
- the tightening of legislation governing offshore activity throughout the world in the wake of the Macondo oil spill in the Gulf of Mexico.

Demand for subsea constructions between 2013 and 2017 will mainly be focused in five geographical regions: North-west Europe (23%), West Africa (22%), South America (20%), the Asia-Pacific region (17%) and North America (13%).

North-west Europe and West Africa are in pole position because of the number of regional fields being developed and the already-existing offshore production installations that they have.

Figure 24: Demand for subsea constructions between 2013 and 2017

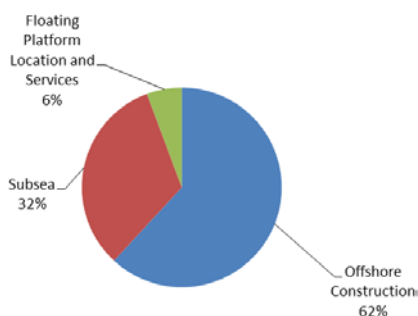


(Sources: IFPEN, IHS)

3.3.2 Offshore construction market

The offshore construction market was worth US\$60 billion in 2013. This should grow to US\$65 billion in 2014 – 5% growth over a 12-month period (slightly lower than the 7% growth that 2013 saw). The market is made up of three segments: the actual offshore construction market which accounts for 62% of the global market, subsea equipment (32%) and services associated with the leasing of platforms (6%).

Figure 25: Share of the three segments that make up the offshore construction market in 2013.



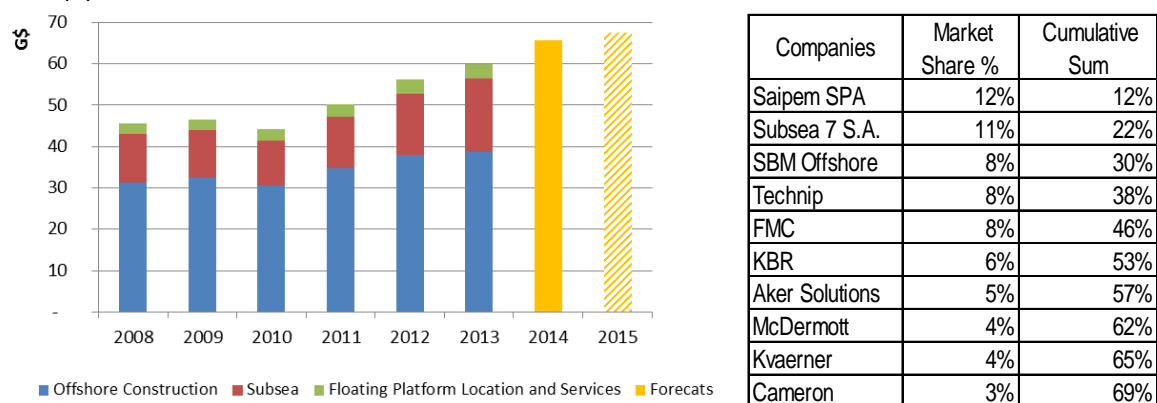
(Sources: IFPEN, IHS)

All of the segments that make up the market grew in 2013, but the subsea equipment segment enjoyed the strongest growth (20%, the same as in 2012). The offshore construction market stagnated with 2% growth, while the floating platform services market grew by 5%.

For 2014, the offshore construction market should see growth of around 5% – similar to the floating platform services market.

As far as 2015 is concerned, the strong growth that the subsea market has enjoyed (annual growth of 20% in 2012 and 2013) should start to plateau as a result of a number of projects being postponed. 70% of total world turnover is generated by 10 companies, which are mainly involved in offshore construction. Saipem is the leading company in this field, followed by Subsea 7. Three other companies are just behind them with market shares of 8% each: SBM Offshore, Technip and FMC.

Figure 26: Offshore construction market (a) and market share of the companies operating on it in 2013 (b).



(Sources: IFPEN, Spears & Associates)

In the subsea equipment sector, FMC is the leading company, followed by Aker Solutions, Technip and Cameron.

In the floating platform services sector, SBM Offshore is the leading company.

Conclusion

In 2014, the international environment has been characterised by geopolitical threats and economic growth forecasts being revised downwards. This means that service companies in 2014 have seen more moderate increases in turnover than in previous years; operators – the world's major companies in particular – have had to make choices about where to invest.

The geophysical sector, which is just upstream of the E&P chain, has been the most affected. The geophysical market is expected to shrink by 20% – similar to the decline experienced in 2009 as a result of the world economic crisis. The equipment and data/acquisition sectors will be affected to the same degree.

The onshore and offshore drilling markets will once again see growth of 3% and 6%, respectively. The onshore market will be helped by the continued development of nonconventional crude oil fields in North America. Apart from in the Gulf of Mexico, rig rates are continuing to recover throughout the rest of the offshore market.

The offshore construction market, which has traditionally been driven by the subsea sector, will continue to grow (5%). But this growth will be more modest, given the complexity and the costs of the projects in question and a number of them being postponed.

Provided there is no major change in the economic forecast, 2015 should see a moderate increase in investments and turnover for companies in the oil equipment and services sector. This increase will, however, be closely linked to changes in the prices of crude oil and natural gas. If the price of Brent crude remains at its current low levels (US\$80 to US\$90/b), investments could end up plateauing.

Table 2: Summary of increases/decreases in investments and markets analysed

	2013	2014	2015
E&P investment	11%	+5%	4%
Geophysical Market	+1%	-20%	5%
Drilling Market			
onshore	+1%	+3%	+5%
offshore	+14%	+10%	+5%
Offshore construction market	+7%	+5%	+3%

4 Refining – significant increase in spending

Spending has increased considerably in 2014, and in all areas (capital, maintenance, catalysts and chemicals). The main reasons for this trend include commissioning projects and continuation on a number of major projects in the world's emerging countries, the modernisation of Russian refineries and the development of shale hydrocarbons in the US. Moreover, high demand in emerging countries in the Asia-Pacific region, the Middle East and South America & the Caribbean continues to exert high pressure on refinery projects at global level – despite considerable increases in production costs.

Industrialised countries, with the exception of North America, are experiencing a long-term slowdown in demand. This, combined with a number of other factors (input costs, regulations, etc.), is resulting in a number of refinery projects in these regions being frozen.

In the short term, the first signs of an economic slowdown in China will lead to a reversal in the trend for oil and gas demand. This will be accentuated by events in Russia / Ukraine. And in the mid-term, global spending may also fall.

4.1 Increase in industrial costs

Globally, design and construction costs have increased significantly since the beginning of the century. There are a number of reasons for this, including increases in the costs of equipment and materials, labour and raw materials.

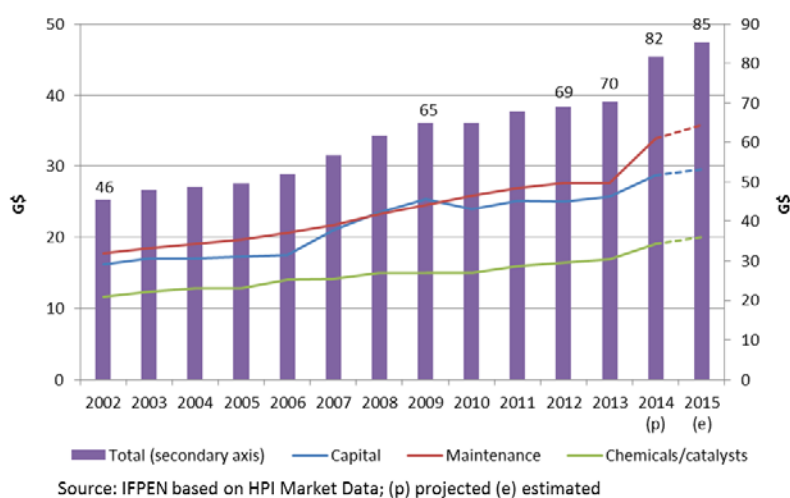
Figure 27: Global spending in the refining industry (in billions of US\$)

The significant increases in steel prices have contributed to this trend, leading in turn to increases in the costs of equipment (reactors, heat exchangers, distillation columns, etc.) and, more generally, increases in the capital costs of new equipment and replacement facilities. The increasing complexity of refinery projects (due in particular to new specifications and environmental regulations) has also contributed to this increase in costs.

Labour is another factor that has led to an overall increase

in costs. Global increase in demand in tandem with the scarcity of qualified labour is accelerating the increase in overall costs, particularly in relation to new projects in developing countries. It should be pointed out that the industry is having to deal with a shortage of engineers and – more generally – a shortage of qualified labour, and this may continue into the mid-term. The refining industry – and the oil industry overall – are beset by a great deal of uncertainty. And this does little to encourage qualified personnel to commit to working on such programmes. There is also a shortage of construction workers and maintenance personnel.

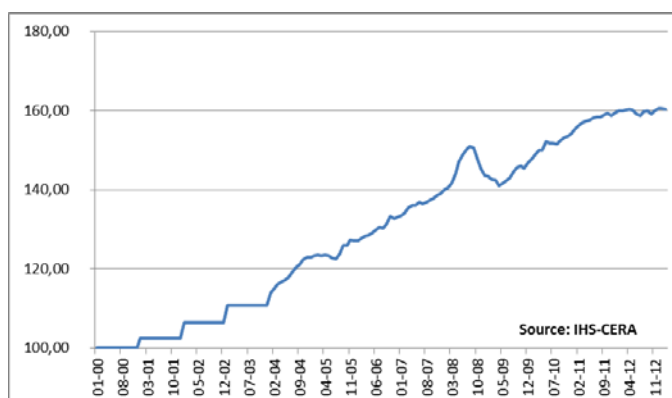
At the outset, refineries are designed to have a service life of around 30 years. But if they are maintained on a continuing basis and if they have money invested in them in order to modernise them, this period can be extended considerably. It is not just the costs of new facilities that are increasing: maintenance and spending on increasing capacity during the service lives of industrial facilities is also rising.



In view of these continuing increases in input factors in the long term (capital, labour, raw materials, etc.), manufacturing and financing companies are exercising caution as far as investment is concerned, keeping their risk exposure to a minimum and being more selective in relation to the projects they choose.

Figure 28: Nelson Farrar refinery construction indexes. Basic 100 (2000)

Not all countries, however, are being quite so cost-conscious. Emerging countries in Asia (China and India in particular), the Middle East and Russia have massively invested, either in new facilities or in modernising existing equipment. Most of these countries (except China) have preferred to target the export markets. Most investments have been concentrated in the world's developing regions (non-OECD countries) or in oil-producing countries that want to start exporting. Up until now, increasing costs have not hindered the development of refining activities in these regions.



❖ Current spending

2014 has seen an **increase in spending** in the refining sector. This looks set to exceed US\$80 billion – a significant increase on the previous year (16%). This increase has mainly been driven by maintenance spending. Some US\$34 billion is spent on maintenance – more than on anything else – and this figure grew considerably between 2013 and 2014 (22%). Capital spending is still high – it should reach US\$29 billion, while spending on catalysts and chemical products should be US\$19 billion.

There are three major reasons for this increase in **capital spending**. The need for emerging countries to meet increasingly high demand which stimulates investment through work beginning or continuing on a number of major projects in these regions, massive programmes to modernise Russian refining facilities and the recent development of shale hydrocarbons in the US.

The vast majority of these projects – and the most significant ones in terms of capacity and investment – are in China, India and the Middle East, all regions in which demand is rising considerably. The Asia-Pacific region is where 43% of the world's atmospheric distillation projects are located, while 28% are based in the Middle East. Together, these two regions therefore account for more than 70% of the total projects identified in 2013.

Moscow has introduced a tax scheme designed to stimulate investment in refining, the aim being to export more finished products (to Europe in particular) and less crude. This refinery modernisation programme – which dates back to the Soviet era – is slowly starting to be put in place. It is worth an estimated total of US\$25 billion and should continue until 2016-2017. Through this programme, the share of light refined products should increase from 56% to 78% of total production.

Shale hydrocarbons have considerably improved the profitability potential of the US refining sector and play an important role in encouraging investment. In 2013, per-barrel revenue for US refining companies was more than US\$7 greater than for European competitors (EIA). In this context, it is important to highlight the major investments in a number of projects to relieve refinery bottlenecks so that these light crudes can be processed (condensate splitter, preflash tower, etc.). Thanks to shale oils being developed, US refineries can now take advantage of raw materials being available at more affordable comparative costs.

Furthermore, the availability of heavy oils from Canada and the lack of sufficient transport infrastructure (no outlets because there are no pipelines) for carrying oil to the refining zones of Texas (PADD III), which is where 50% of the US refining sector is located, have also stimulated investment in adapting production facilities for Canadian heavy oils, the acquisition prices of which are proving competitive. One example of this is Husky Energy's spending on its Lima refinery (Ohio) so that it can start processing Canadian crudes from 2017 onwards; the project involves making modifications to its coking unit (as well as other process units), but without reducing its capacity to process light crudes. The aim is to process 40,000 barrels of heavy crude per day.

Another example is the major investment that ExxonMobil is planning in order to be able to process heavy crude (coking). This will involve its Beaumont refinery in particular (in Texas), the aim being to double its production capacity (currently 345 kb/d). The American multinational oil and gas corporation wants to increase the capacity of its facility to 500 kb/d, eventually bringing it up to between 700 and 800 kb/d. This would make it the largest refinery in the US. This investment is indirectly linked to the American shale oil revolution. Overall, total refining capacity in the US increased by 101,000 barrels per day between 1 January 2013 and 2014 (EIA).

Capital spending in the US is admittedly high, but the risk is very low, given crude oil and natural gas prices, which give them a significant competitive advantage. This is not the case in other regions throughout the world where the risk for investors is considerably higher.

Given the increase in input costs, the **maintenance budget** appears greater in 2014 relative to capital spending. Refiners have focused their efforts on optimising maintenance activities: the aim is to keep equipment and processing units in a good state of repair, while maintaining a relatively high level of capital spending. Project order books are still relatively full. Furthermore, refineries are increasingly tending to outsource their maintenance services, the labour costs for which are increasing. Labour accounts for 60% of the maintenance budget, with the remaining 40% going on equipment and materials spending.

Spending on catalysts and chemical products - proportional to refinery processing - is what enables refining companies to meet environmental requirements and comply with new specifications in place. Consequently, this type of spending is consistent with the growing complexity of refineries.

❖ Trends for 2015

It is not easy to predict how investment patterns will change in the short and mid-term, given that the main players – China and the US – seem to have adopted different attitudes. China seems to have adopted a more cautious approach recently, refocusing its efforts on its domestic market, while the US appears to be continuing with its drives to reinvest in refining, and possibly opening up the market to exports.

– State-owned PetroChina's decision to postpone the construction of two new refineries and to postpone the expansion of another one is the latest sign – the most telling so far – that refining capacity in China has increased too quickly. Although China will doubtless continue to build new refineries, the rate at which they are being built is likely to slow down over the next few years¹.

PetroChina and Sinopecs are currently reviewing their expansion plans and reassessing their priorities. PetroChina's decision to put back the commissioning of its Kunming refinery by two years (200,000 barrels per day) to 2016 and to delay the commissioning of its Jieyang refinery (400,000

¹ New facilities are now competing against other projects for the funding they need. This means that the profitability of refineries will have to improve in order to justify spending money on building and operating new facilities.

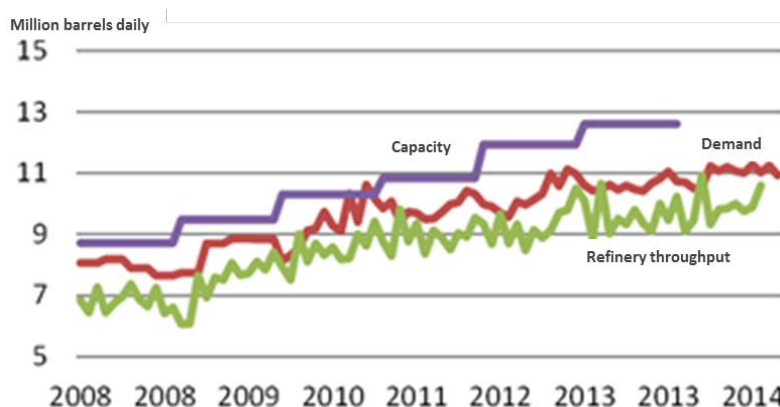
barrels per day) until 2017 (joint venture with PDVSA) could be part of this process. This year, the company is also putting back the extension of its Huabei refinery until 2015.

A joint venture project with Royal Dutch Shell and Qatar Petroleum involving the construction of a 400,000 b/d refinery in Taizhou also seems to have come up against a hitch. BP has decided not to invest in PetroChina's Qinzhou refinery because of its concerns over fuel demand declining at a time when there is a surplus of capacity².

Figure 29: China: refining capacities, demand and utilisation rates

China, which is currently suffering from excess refining capacity, is running the risk – given the projects it has in the pipeline – of making this situation considerably worse.

If refinery utilisation rates are taken into account, demand is still higher than the volumes being refined, and the quantities of crude being processed are capped by demand. But if capacity continues to increase (at



Source: IFPEN based on BP Statistical, Reuters, AIE

the predicted rate), while demand declines and utilisation rates hold steady at around 80%, the volumes being processed will eventually exceed demand. Unless China wants to become a petroleum product exporting country, it will have to slow down the rate at which it is building new capacity, and so reduce spending in this sector.

– In the US, the process of adapting the refineries for use with heavy oils – in PADDs II, III and IV in particular – should continue. Furthermore, the (long-term) fall in petrol consumption and – conversely – the increase in the consumption of distillates, diesel (in particular) will encourage refineries that were designed to focus on petrol production to invest in their production facilities so that they can adapt to changes in requirements. Demand for distillates should increase by around 1% per year until 2025, driving growth in the US refining sector. According to Nexant, demand for American distillates will increase by more than 600 Mb/d in 2015.

– There is considerable uncertainty regarding the future of certain refineries in the OECD countries, where declining demand for oil is a structural development (as a result of energy efficiency initiatives, competition from alternative energy sources, oil industry standards, etc.). Greater numbers of refineries are therefore likely to be closed, modified or converted.

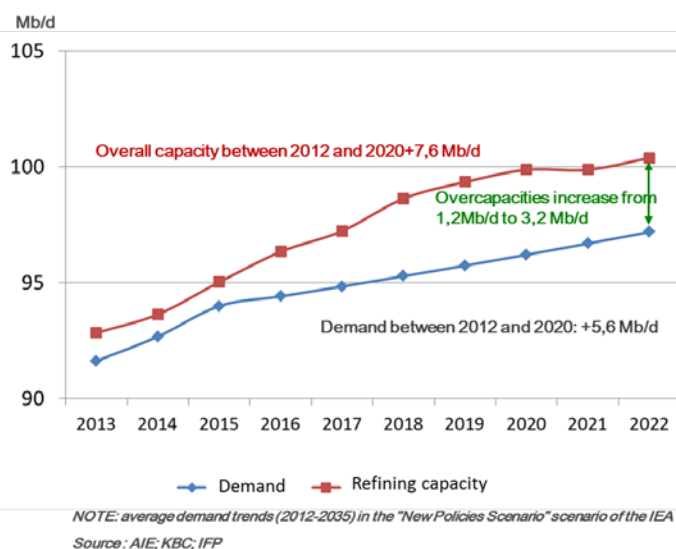
– Despite the recovery in the US refining sector, the decline in demand in China will have an effect on future spending in this country. This in turn will impact global spending. The overall decline in demand in OECD countries is seen as confirmation of this trend. Given the situation, for 2015 we are predicting a slight slowdown in growth in spending on maintenance, capital expenditure and catalysts / chemical products. Following strong growth in 2014, maintenance spending should slow down considerably, but will still be the greatest in terms of total and growth rate (6%); as far as capital expenditure is concerned, growth of 3% is forecast... corresponding to the average increase in capacity over the last 5 years; and there will be a 5% growth in spending on catalysts / chemical products. This would mean total spending of US\$85 billion - an overall increase of 5%.

² The refinery in question, which can process 200,000 barrels per day and which came into operation in 2010, is having improvements made to it so that it is able to process various oil qualities

4.2 A slowdown in the increase in excess capacity in the future?

Figure 31 shows the increase in refining capacity throughout the world based on projects that are currently at an advanced stage of development and which are likely to be completed. It also shows predictions for increase in demand as provided by the IEA in its central scenario.

Figure 30: Medium-term change in refining capacity and demand



What is seen is that by 2020-2022, there will still be considerable excess capacity – increasing from 1.2 Mb/day to 3.2 Mb/day... a 2 Mb/day increase in around 10 years, if the current situation is taken as the starting point. This increase will mainly be driven by emerging countries (in Asia and the Middle East), Russia and – more recently – the US.

However, for the last few months, doubts about a number of major projects and a reassessment of the need for refining capacity in China have led to a slowdown in the increase in refining capacity throughout the world, particularly as the modernisation

programme for refineries in Russia will soon be ending (in around 2017). And along similar lines, Japan's new plan to improve the efficiency of its refining facilities will result in a number of new closures. The plan is to reduce refining capacity by around 10% – the equivalent of 400,000 b/d of the country's total 3.95 million b/d.

Western sanctions affecting Russian refineries?

Western sanctions targeting the equipment needed to modernise refineries in Russia – a country that is particularly dependent on the West for catalysts and other refinery equipment – may result in fuel shortages in a number of regions in Russia. The most recent measures that the West has imposed involve prohibiting the supply of services needed for oil exploration in the Arctic and for other projects involving shale oils. As of mid-November, no sanctions have directly affected refining. But there are indirect consequences: public companies – including Rosneft – find themselves unable to access European capital markets because of the sanctions. The Energy Ministry is expecting fuel shortages over the next few months as a result of production in the refining sector having difficulty in meeting consumption requirements. The refinery modernisation programme which was launched in 2012 in order to increase the share of light products among those produced by the refinery sector has not yet succeeded in offsetting this shortage. Given this precariously balanced situation, the impact that any sanctions might have on the sector could quickly be extremely damaging.

4.3 A bleak future for the European refining sector

The European refining sector is facing an increasingly tough situation. Despite a fall in demand and a number of facilities having closed over the last few years, excess refining capacity is still increasing: it rose from 1.1 million b/d in 2008 to 2 million b/d in 2013.

Demand fell considerably between 2008 and 2013 – by 14%. The reason for this was obviously the difficult economic situation right across Europe (except for Germany), as well as the considerable

progress that has been made in saving energy and in increasing energy efficiency... together with the introduction of biofuels. The fall in demand looks set to continue in the mid-term.

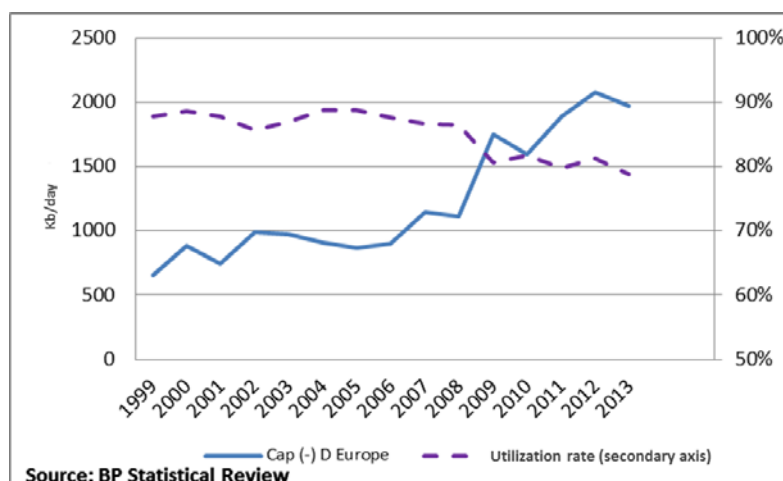
Over this same period, refining capacity fell by only 7%. In Europe, nearly 20 facilities were shut down or modified between 2008 and 2013, representing a 1.9 million b/d reduction in capacity. More will be shut down between now and 2015, representing a total reduction in capacity of 330,000 b/d. In total, capacity will have been reduced by more than 2.2 million b/d between 2008 and 2015.

Europe's refining sector is having to tackle low margins. Margins collapsed in the second half of 2013, with the price of Brent cracking NWE falling below US\$2/b for a complex refinery. Unconverted facilities generated even lower margins. The more complex refineries the per-tonne-of-crude processing costs of which³ are higher than those for simple refineries are finding it harder than before to get value from their production. Consequently, they are finding it harder to generate sufficiently high margins – they have been affected by a considerable increase in costs as a result of low utilisation rates that have been at around 80% for the last five years.

Sites are being closed in order to create a better balance between supply and demand, thereby increasing refinery utilisation rates. But this is not currently the case. Utilisation rates in European OECD countries were 81% on average in June 2013 – which is already low. They fell to 74% in June 2014. Further capacity reductions are expected in Europe in the mid-term.

Figure 31: Refining capacities, demand and utilisation rates

While facilities are being closed or modified, the difficulties that the European refining sector is encountering are resulting in significant changes to the players involved. More and more of the majors are tending to withdraw from Europe's upstream oil sector, making way for new Russian, Chinese and Indian companies, as well as pure traders, such as Gunvor and Vitol. Finance expert Gary Klesh who specialises in taking over



European companies that are operating below their full potential is planning to acquire five or even six refineries over the next two years in France, the UK, Germany, Italy and central Europe. It is worth remembering that Klesh has just taken over Murphy Oil's Milford Haven refinery which had been up for sale for 3 years.

ExxonMobil's approach is sufficiently unusual for it to warrant being highlighted. The American major is going against the general trend and is investing in refining in Europe. It is going to invest US\$1 billion in its Antwerp site – evidence that it has faith in the European market, despite its apparent stagnation. This will bring the company's total investment in its Antwerp refinery to more than US\$2 billion over less than 10 years. Esso Belgium (ExxonMobil's Belgian subsidiary) currently has production capacity of some 320,000 barrels per day. ExxonMobil would like to emphasise its long-term commitment: investing in Antwerp will enable it to step up diesel production, which is imported into Europe in massive quantities.

It should be pointed out that ExxonMobil is not the only major wanting to expand in Antwerp. In 2013, French company Total approved a project worth some €1 billion to modernise its site. Once the

³ This is particularly due to the increase in capital costs, maintenance and fuel consumption.

project is complete, it will be able to produce many more sulphur-free products – as required by new environmental standards.

As far as France is concerned, in 2010 Total pledged not to close any more refineries over the next 5 years. Once this period comes to an end, there will be no more guarantees about Total keeping refineries open (or not reducing capacity) in France. The moratorium ends next year.

The refining sector is losing money, laments J.L. Schilansky, president of the UFIP (French oil industry association). These losses are structural, adds Total, emphasising that sites are going to have to be adapted by bringing in a forward-thinking policy and then re-purposing them. Total's aim is not to close sites, but instead to create new dynamics, as has been done at the Carling petrochemical plant, which has been reconverted into a European hydrocarbon resin production centre.

But despite 30% of France's production capacity having closed since 2008 – much more than in other European countries – the possibility of closures in France and elsewhere has not been excluded. A number of unfavourable factors affecting the sector suggest that this trend will continue: demand is still being refocused on high-growth emerging countries which are investing massively in large modern facilities and which often have access to cheap crude oil. And there is the recent phenomenon of shale hydrocarbons which enable US refining companies to take advantage of low gas and shale oil supply costs, so that they compete against European refining companies on both the US and international markets.

Finally, there is another well-known phenomenon which has had a major impact on the competitiveness of Europe's refining sector: the fact that European production is not suited to demand. Refineries produce too much petrol and not enough diesel, meaning that they have to export surplus petrol and import the diesel that they are unable to produce in Europe. These facilities will therefore need to be converted, and this will require significant investment in order to increase the share of diesel in refineries' output. And capacity will need to be reduced by either closing or converting simple, small facilities.

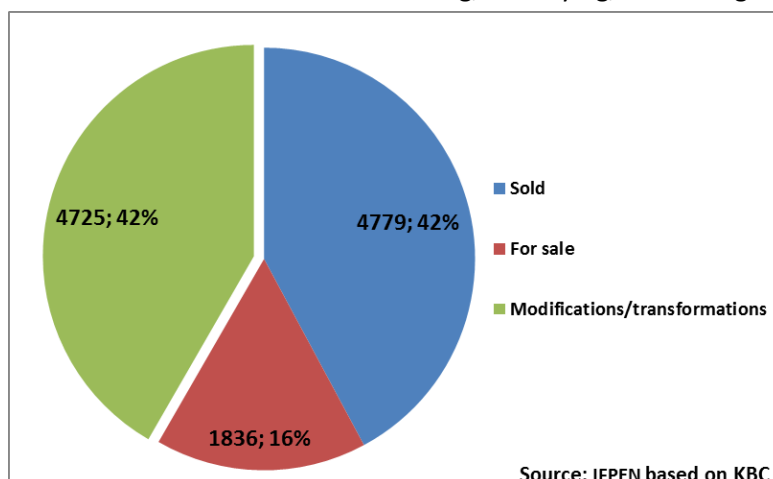
– Fall in the numbers of refineries being sold or for sale, increase in the numbers of refineries having to close or undergo major transformations

The process whereby oil companies (integrated and straightforward refiners) are turning away from refining activities in Europe and the United States - a process that started in the wake of the 2008/2009 world economic crisis – is continuing.

Figure 32: Refinery sales, transformations and closures (2008-2015), in kb/d and %

Since the world economic crisis of 2008/2009, this trend has become more pronounced throughout the world. This "disinvestment" has taken various forms - such as selling, modifying/converting or partly/completely closing industrial facilities.

Transformations and closures are counted together, since both result in the destruction of refining capacity. Refineries that are for sale or have already been sold currently account for 6.6 Mb/day - 1.7 Mb/day more than last year; those that have closed or been converted account for 4.7 Mb/day - relatively little change compared with the situation in 2013. This makes for a grand total



of 11.3 Mb/day, 1.6 Mb/day more than last year. Globally, more progress has been made with the process this year.

Figure 33: Refinery sales, transformations and closures (2008-2015), by geographical region

These restructuring operations affect practically all the world's industrialised countries – particularly North America and Europe: 87% of the assets being sold, restructured or closed in this way are in North America and Europe. These two regions are where 78% of all transactions resulting in capacity destruction are located.

In France, a total of 580 kb/d worth of capacity has so far been removed, involving five refineries:

Petroplus –Reichstett, Petit Couronne-, Total –Dunkerque and Gonfreville (atmospheric distillation units)-, LyodellBasell – Berre. Other refineries in France are at a high risk of closing. Total's refineries in Feyzin and La Mede, Exxon Mobil's refinery in Fos and Ineos' refinery in Lavera are all vulnerable because they are in competition on the same market – a market which is seeing a fall in petrol demand.

