Investment

in

exploration-production

and

refining

2013

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with the involvement of G. MAISONNIER

Economics and Information Watch and Management Division

October 2013

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CONTENTS

FIGURES AND TABLES:

SUMMARY TABLE OF INVESTMENTS AND MARKETS:

$ billion	2012	2013
Global investments in E&P	**623**	**694**
North America	184	188
Latin America	69	78
Europe	56	66
CIS	53	59
Africa	66	71
Middle East	40	48
Asia-Pacific	156	183
Upstream markets analysed	**298**	**326**
Geophysical Market	17	19
Drilling market (*)	225	245
of which:		
Onshore drilling	*29*	*30*
Offshore drilling	*45*	*51*
Offshore construction market	56	62
Refinery investments	**69**	**70**
Investment spending	25	26
Maintenance spending	28	28
Catalyst and chemical spending	16	17

(*) Including equipment and services for wells

Sources:
- Upstream oil sector, IFPEN from
  - global investments: Barclay's, DTI, NPD, DEA, figures published by various companies and countries, IFPEN forecasts
  - geophysical market: IHS Energy, First Break, Spear & Associates, IFPEN
  - drilling market: Baker Hughes, IHS energy, Offshore Rig Locator, Spears & Associates, IFPEN
  - 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

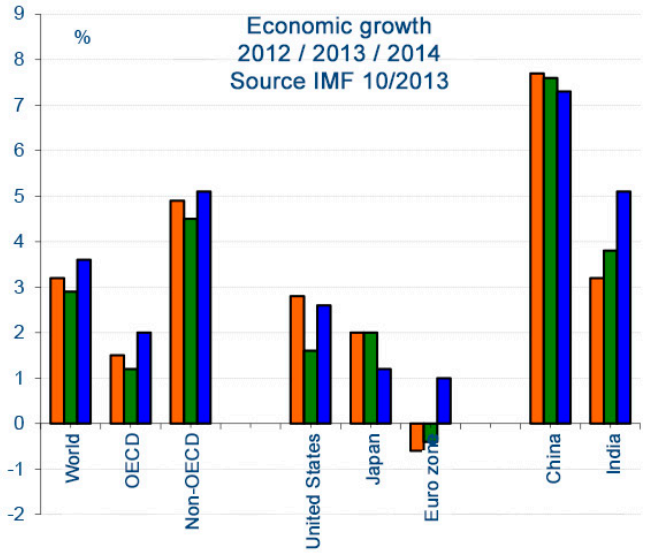
❖ General situation: an unstable environment

The international context is still marked by a number of major upheavals which are having or which will have an effect on the oil and gas sector. Some of these upheavals are more or less manageable and can be predicted, while others bring with them more uncertainty against a background of transition and change. They include:

- geopolitical events, obviously, with the chronic instability that has been affecting Africa and the Middle East for at least the last few years,
- the financial world being under the influence of Central Banks policy,
- the international monetary system which has been prey to what has been referred to as the currency war since 2010,
- the uncertain economic future facing western countries that are having to develop new areas of growth,
- climate change from greenhouse gas emissions which was confirmed in the IPCC's last report,
- and the energy sector, which – as a result – is having to take another look at consumer habits and rethink its production methods – something which was looked at this year in France as part of the energy transition debate. And to this long list should be added the energy revolution that is currently under way as a result of the development of shale oil and gas resources.

❖ Economic growth: good news for western countries

For the very short term, the IMF's most recent forecasts reveal three main trends for 2014:



- first and foremost, world economic growth should be stronger than it was in 2013… around 3.6% – that's 0.7% more than this year.
- secondly, a growth recovery is under way in western countries which should be slightly more sustained in 2014... around 2% – 0.8% higher than in 2013. This trend is evidence of the US economy's buoyancy (2.6%), as well as a welcome return of growth in the euro zone (1%) after two years of recession.
- and growth which is still strong but considered fragile in the world's emerging countries – 5.1%, which is considerably lower than the average of 8% that the years between 2004 and 2007 saw.

This view of the situation is, of course, subject to change – in particular because of the size of the debt with which western countries are burdened. On average, it is 107% of GDP – an increase of 35% since 2007. The levels of long rates will therefore be an indicator that should be monitored closely. They are still considerably below the pre-world economic crisis levels of 2008, but they are starting to rise – in the US in particular. The challenge for 2014 will be to break away from the support policies that the Central Banks have been implementing and then deal with the impact that this will have on long rates and so on growth.

❖ The oil situation: differing signals

2013 will be remembered for two phenomena in particular that impacted the oil sector: disruptions to production in Africa and the Middle East on the one hand, and exceptional growth in production in the US on the other.

As far as the first point is concerned, these disruptions can be attributed to two factors: the embargo imposed on Iran first of all, which has had the effect of reducing supply by approximately 1 Mb/day since July 2012. According to the IMF, that means US$60 billion less for the Iranian budget in 2013 – half the 2011 budget. This may go some way towards explaining the more open position that Iran has adopted regarding negotiations on its nuclear program. Other disruptions can mainly be attributed to instability in certain countries – Iraq, Nigeria and Libya in particular. In fact, production in Libya practically ceased altogether in September as a result of social upheaval.

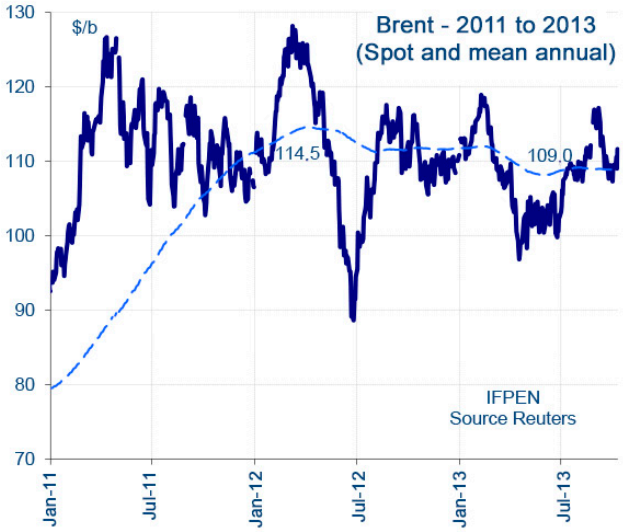
In the US, the shale oil revolution is under way, following in the footsteps of the shale gas revolution. Since 2010, the vast majority of drilling operations have been focused on this resource. Results are impressive: production has increased by 3 Mb/day since 2007 – the same as what Iraq or Iran produces. And this should increase by a further 1 Mb/day in 2014, which would place the US neck and neck with Russia with a production volume of 10.7 Mb/day. If ethanol production is included, net production total is similar to that of Saudi Arabia. If the more optimistic scenarios are to be believed – which appear relatively credible – this increase looks likely to continue in the long term. If this happens, oil prices could well be pushed downwards. It will all depend on the oil production situation in Iran and in countries that are currently experiencing instability, such as Iraq and Libya.

❖ Oil prices: a sharper drop in 2014?

2013 served as a means of gauging the impact that geopolitical, economic, financial, monetary and – of course – oil-related uncertainties have on oil prices. Influenced as it is by all of these factors, it can be seen as a relatively accurate barometer of the "transition/change" that is under way at world level.

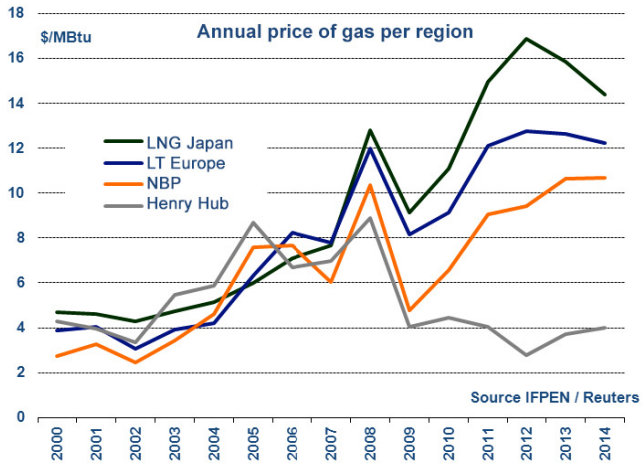
The tensions involving Iran at the start of the year, for example, and the instabilities in North Africa over the summer, resulted in prices peaking at nearly US$120/barrel. But conversely, during the calmer period of the second quarter, the economy and the oil situation settled down, pushing the price of Brent crude down to around US$100/barrel. There were two reasons for this: the scheduled end of the FED's support policy and the market being seen as less tense, owing in particular to the rise of American tight oils. But this situation did not last for more than a quarter because of the events that transpired in Egypt, Syria and Libya over the summer. But it does give an idea of what prices could be like in the absence of any geopolitical tension.

The average price of Brent should settle at around US$108/110 per barrel – slightly below the 2012 average of US$111. It is, however, interesting to note the downward trend in the running annual average since the peak of US$114 that was reached in April 2012. For 2014, a more significant drop in price to around US$100/b is not out of the question. But this will of course depend on the geopolitical situation which is a constant factor on the oil market. Whether or not potential reserves in US are confirmed will also be a determining factor.



❖ **Gas prices: regional differences continue**

The situation on the gas market – as is well-known – has been characterised by significant regional differences since 2009.



- In Asia, for example, prices remain very high – at around US$16/MBtu in 2013. This has been as a result of indexing formulas based on oil prices. There could well be a fall in prices in 2014, if the predicted fall in oil prices becomes a reality. One of the targets for this region would be to eventually have access to contracts based on US spot prices via liquefied gas imports. Such a trend would put pressure on all gas suppliers in Asia to revise their prices downwards.
- In Europe, indexed prices are more than US$12/MBtu, as opposed to nearly US$11/MBtu for UK spot prices. UK prices remain bullish – which is not very favourable at a time when the spot market accounts for ever-growing share of supply contracts. They are also 2 times too high to be competitive with coal. This explains the tension that electricity generating companies are feeling, who are also under pressure because of the increase of renewable energies.
- The US market is still at a historic low, with prices at around US$3.5 to US$4/MBtu. This is around three times lower than prices in Europe: a competitive advantage which goes some way to explaining the levels of growth that the US economy is currently enjoying.

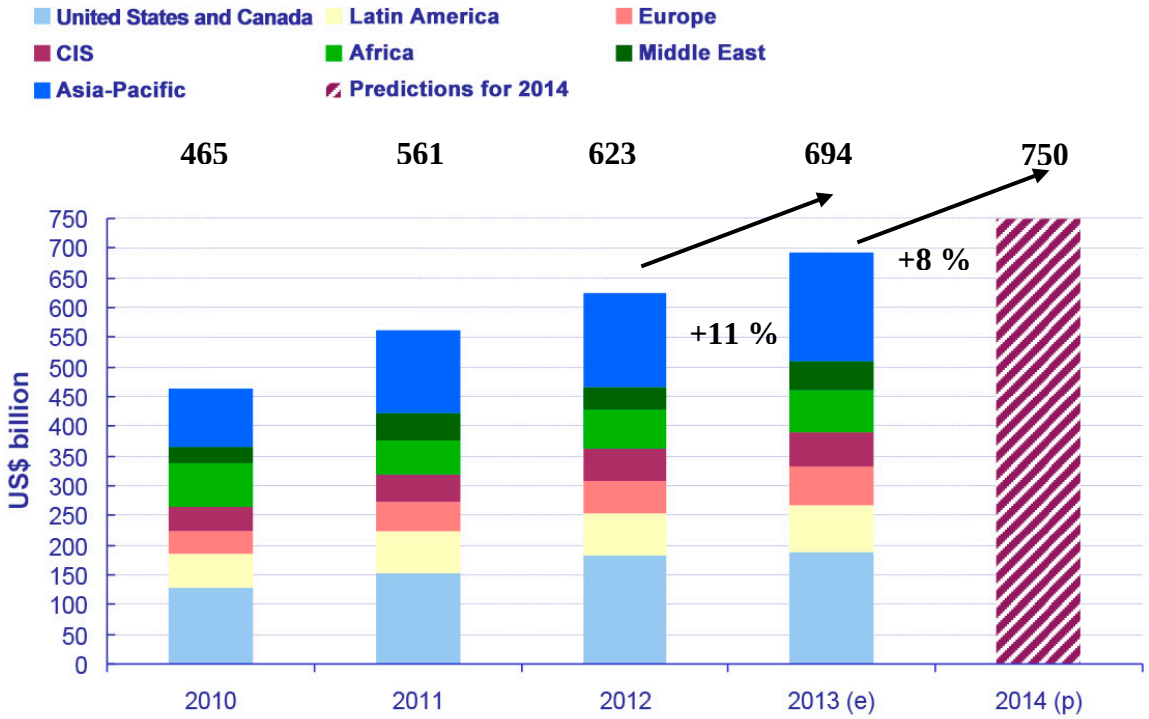
2 Exploration Production: a new year of growth

2.1 The increase in investments continues into 2013

Investments in exploration-production (E&P) should see two-figure growth for the fourth year in a row since the recovery began in 2010. They should increase by approximately 11% in 2013 and exceed **US$690 billion** – an increase of 65% since 2009. Additional investments compared with the previous year stand at around US$70 billion. The Middle East looks set to enjoy the most dynamic growth with investments up by 21%. This region will be followed by Europe (20% growth expected), and the Asia-Pacific region (17%). Latin America should see an increase in investment of around 14%, while CIS countries and Africa should see more moderate growth of around 11% and 8%, respectively. After three years of strong growth, North America will see its growth plateauing at 2%.

We are expecting the increase to continue into 2014, with a growth rate of around 8%. The factors that have been positively affecting growth since 2011 still apply: players in the sector are forecasting oil prices that will remain high in the long-term and the development of both unconventional resources (deep offshore, heavy oils, shale oil and gas and tight oil and gas resources) and of LNG provides oil and gas companies with numerous investment possibilities. New regions and resources to be explored have also emerged in the last few years (pre-salt formations, West Africa, the Mediterranean, Arctic, etc.). These are partly responsible for exploration spending having quadrupled over the last 10 years. And sustained growth in exploration and production pushes costs up which, in turn, speeds up growth in investments.

Figure 1: Increase in global investment in E&P



Regions throughout the world saw an increase in their E&P investments in 2013, with particularly strong growth in the Middle East, Asia and Europe. But growth in North America (the US and Canada) should be more moderate (around 2%). This follows a period of 3 years during which investments practically doubled – increasing from US$93 billion in 2009 to US$184 billion in 2012.

In the Middle East, national companies are all forecasting higher budgets than for the previous year. This is particularly the case in Saudi Arabia where major investments are needed to maintain production capacity of 12 Mb/day and develop gas production, the share of which that is used for electricity generation and in industry will have to increase if the use of oil is to be limited. Work is continuing on developing Iraqi fields – which is another reason behind the growth that this region has been seeing.

In Europe, E&P investment has grown strongly for the third year running thanks to activity in the North Sea. The UK has seen growth of 15% this year, following a 33% surge in 2012. A small number of major projects that were confirmed at the beginning of the decade, together with the introduction of tax incentives to get companies to invest in marginal and end-of-life fields are behind this strong performance. In Norway, growth in investment should stand at around 23% according to the country's office for statistics. Although spending on exploration appears to be levelling off, strong growth in spending on development is expected – both for fields that are already in production and on new products.

In the Asia-Pacific region, investments from national companies should see considerable growth in India, China and in South-east Asia, while in Australia – where development costs have increased dramatically (by 20% between 2011 and 2012, according to consultancy group Wood Mackenzie) – LNG projects have continued to stimulate activity.

Brazil is still driving growth in regional investments in Latin America. Petrobras is intending to invest US$147.5 billion in E&P between 2013 and 2017. 73% of this will be on developing production, 16% will go on exploration, and the remaining 11% will be for infrastructure. In Venezuela, PDVSA’s investments should recover after a 33% fall in 2012.

In Russia, Gazprom has announced a 12% fall in its investments, while most other Russian companies are seeing their budgets increase. Lukoil, for instance, should increase its capital spending by 45%. It's worth pointing out that Gazprom’s forecasts are usually somewhat conservative. It may well be, therefore, that investment growth in CIS countries ends up being more than the 11% that is currently forecast.

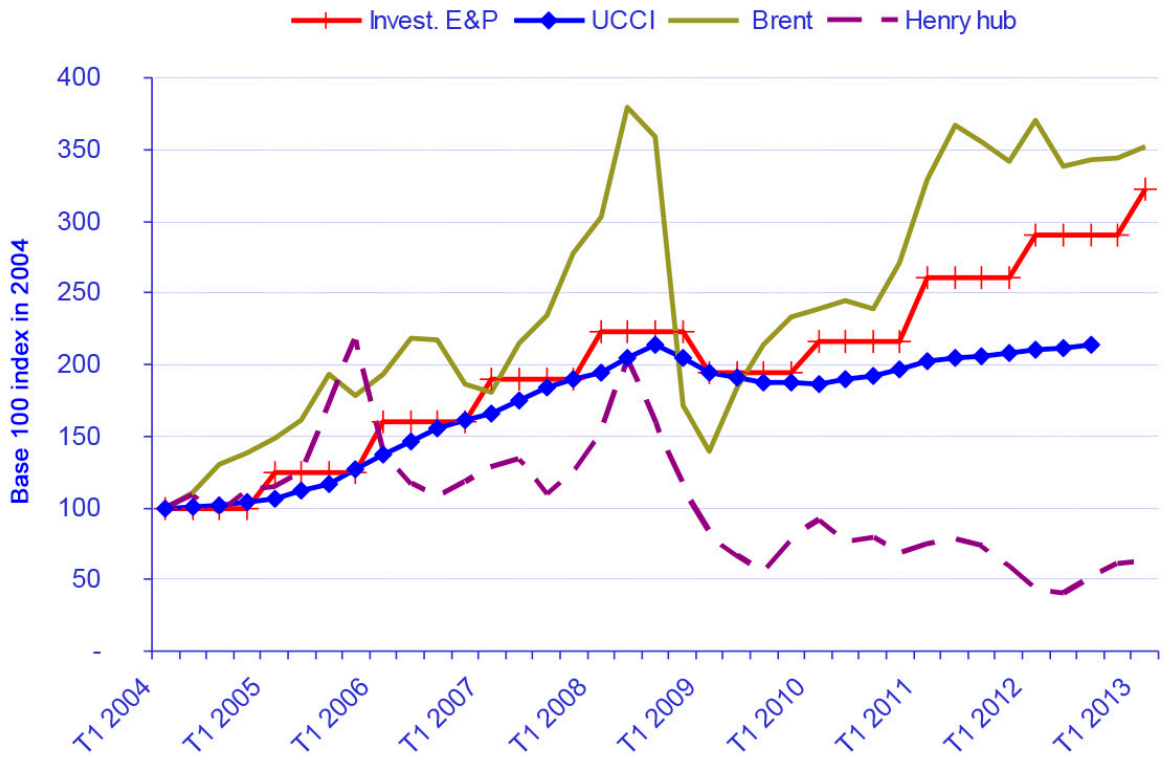
In Africa, following a 13% increase in 2012 as investments recovered following the year of instability caused by the Arab Spring, growth should settle at around 8 to 9%. The continent as a whole continues to be affected by electoral uncertainties in Nigeria, as well as safety issues in a number of countries (Algeria and Nigeria in particular).

Companies of all types (national, international, major or independent) have increased their investments - but this growth has been more marked in national companies:

- The 5 majors all increased their investments in E&P by 9% in 2012. Chevron stands out from the other four companies with its 23% increase in E&P. Shell, BP and Total all have more modest growth rates of between 6 and 8%. ExxonMobil has seen the lowest rate of growth (2.6%).
- The budgets of independent companies have increased by an average of 12%, but there are significant differences between North American independent companies, whose investments have decreased by 2% (with an 8% fall at international level), and the others, whose spending has increased by an average of 19%.

- National companies have increased their investments by an average of 14%. But the situation varies considerably from region to region and from company to company. In Asia, China's CNOOC (43%), India's ONGC (37%), and Malaysia's Petronas (30%) stand out in particular. In the Middle East, Saudi Aramco has increased its budget by 36% and ADNOC (Abu-Dhabi) by 38%. In Latin America, YPF announced an increase of 60% in investment for 2012.

Figure 2: Change in E&P investment, prices and costs



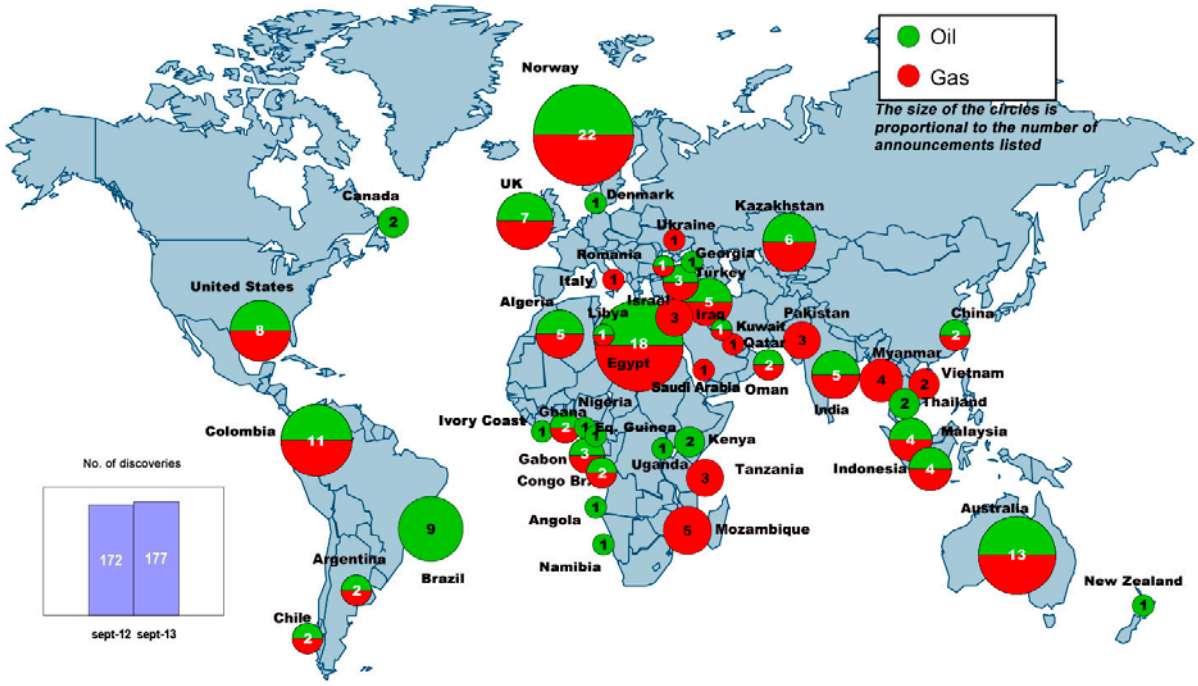
Since 2011, the price of crude oil has remained high, encouraging investments in E&P – all the more so since a significant number of exploration and development opportunities are currently opening up to oil companies. Rising costs may, however, affect the profitability of projects that are currently under way, and may result in future projects being postponed or even cancelled altogether. The Browse LNG project in Australia, for example, which was to have involved the construction of an offshore terminal, has been suspended. The owners of the joint-venture are now looking into a floating facility which would reduce costs. IHS CERA's UCCI (Upstream Capital Cost Index - see Figure 2), which measures unit construction costs in E&P, has been rising since 2010, and has even returned to its record 2008 levels, despite a sharp drop in the price of steel since 2012. Equipment manufacturers and subsea construction companies are seeing their order books fill up, while labour costs are rising – two of the main factors behind the global rise in the cost index in 2012 and at the start of 2013.

2.2 Exploration – Discoveries in 2013

As of the end of September, 177 discoveries had been made in 2013 – five more than at the end of the same month in 2012. This is evidence of activity in exploration holding steady. Knowledge of the volumes that have been discovered is still very incomplete, but some discoveries already appear to be quite significant.

- In the Rovuma basin, the 3 discoveries that ENI made in Mozambique have increased estimates of the volumes contained in zone 4 by approximately 300 billion m³, and a new deeper target has been identified. In Tanzania, the volumes in zone 2 are now estimated at between 420 and 450 billion m³.
- In Iraq, the government has announced that around 1 billion barrels of oil have been discovered.
- In Kazakhstan, the Zhambyl discovery holds an estimated 880 million barrels of technically recoverable oil resources.
- In West Africa, several pre-salt discoveries have been made in Gabon and the Republic of Congo where ENI has discovered up to 600 million barrels of oil with considerable upside potential.
- In the Barents Sea, OMV, Statoil and Tullow – partners on the exploration permit – have announced the discovery of a new oil province. Initial drilling in this region has uncovered volumes of between 200 and 500 Mboe (mainly oil).
- In Canada, off the coasts of Newfoundland and Labrador, Statoil has carried out 2 drilling operations following an initial discovery in 2010, and in so doing has confirmed the existence of a new oil province. Between 400 and 800 million barrels of recoverable oil have so far been revealed following discoveries made in Mizzen (2010) and the Bay du Nord (2013). Discoveries in the Harpoon prospect (2013) are still under evaluation.
- In Brazil, the Santos Basin is still yielding a significant number of discoveries (8 new discoveries had been announced as of September 30).

Figure 3: discoveries in 2013 (as of 27 September)

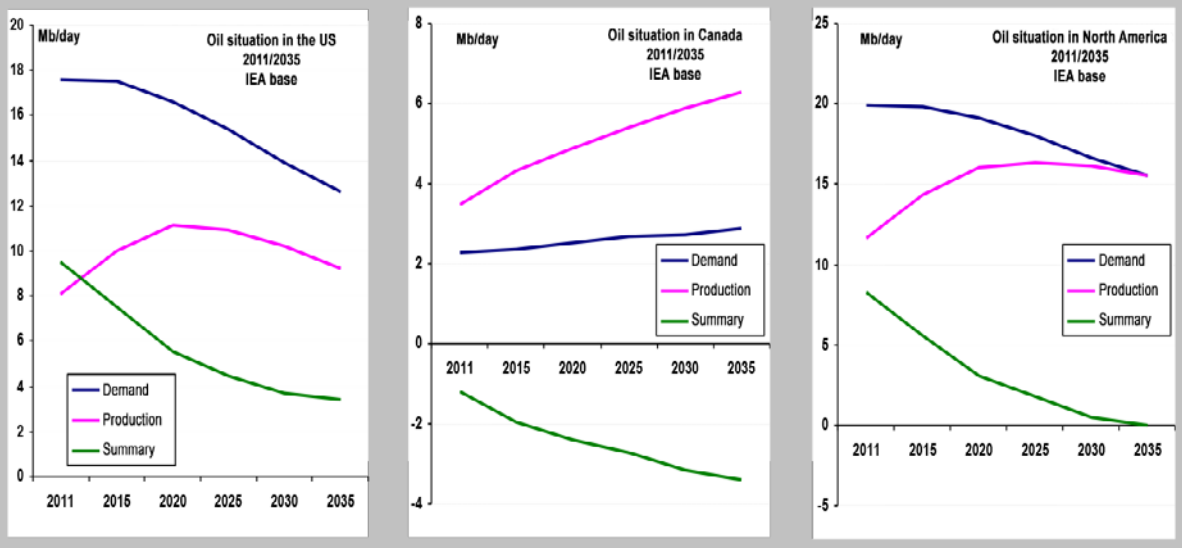


North American oil assessment: moving towards energy independence?

According to the IEA's estimates (WEO 2012), an assessment of the oil situation in North America suggests that the whole region will be oil-independent by 2035 as a result of:

- a significant fall in demand in the US;
- a strong increase in oil production in US which, according to the IEA, should start to fall after 2025;
- a strong increase in production in Canada, thanks to tar sand reserves;

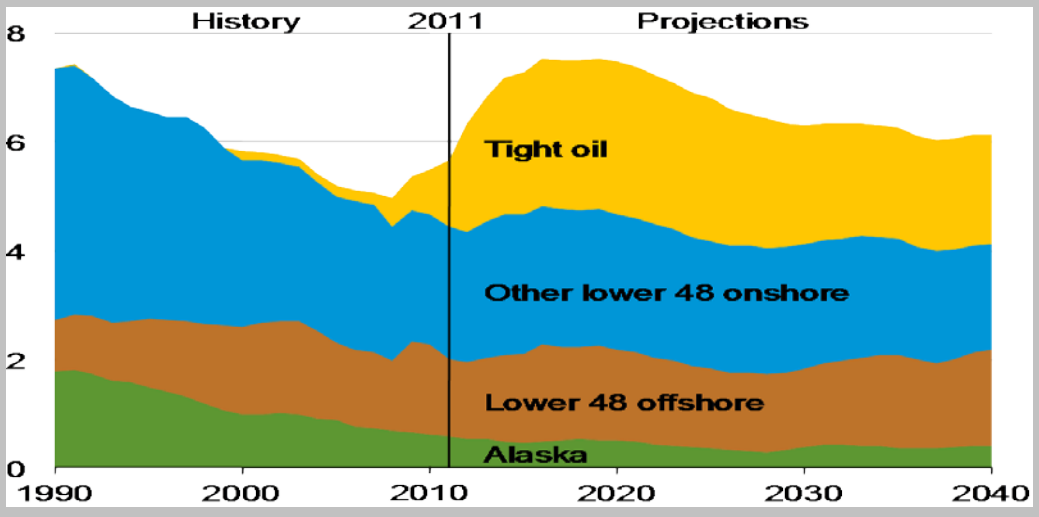
North American oil assessment for 2035



Too cautious an outlook?

There are some major uncertainties regarding these forecasts that should be pointed out. As far as production in the **US** is concerned, the state of affairs that the IEA has forecast in its long-term report (WEO 2012) is similar to the one that the US department of energy (see figure below) is predicting, with a fall in production after 2035.

Outlook for crude oil production in the US (source: DOE)

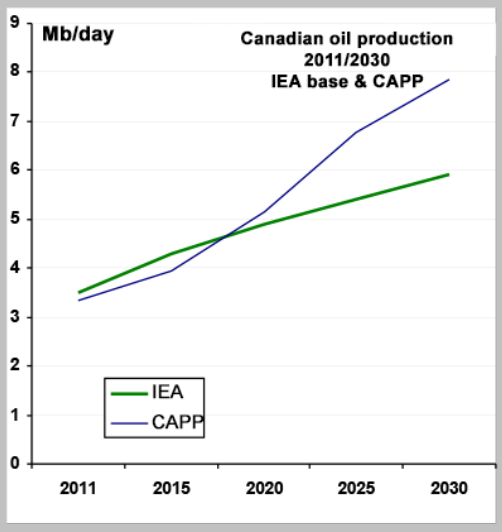


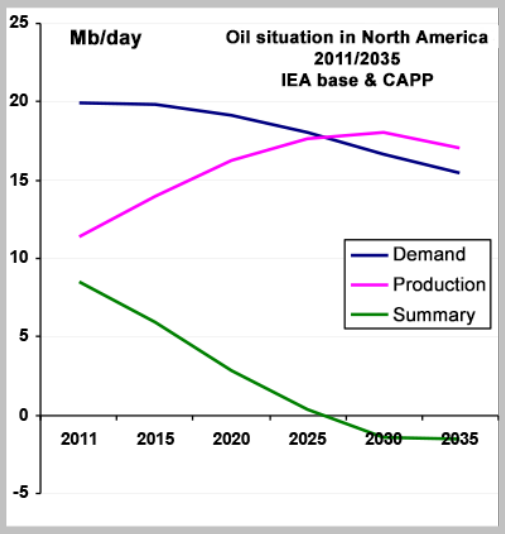
These predictions may seem a little conservative given the potential that was recently valued at 58 billion barrels by the US department of energy. An initial analysis of the most prolific basins suggests a potential 33 billion barrels – the equivalent of 50 years' worth of production at the current rate of 2 Mb/day (0.7 billion barrels per year). The IEA's mid-term report that was published in May 2013 is more optimistic.

As far as **Canada** is concerned, the most recent predictions from the Canadian Association of Petroleum Producers (CAPP) suggest higher production potential than the IEA's predictions (WEO 2012). The difference is as much as 2Mb/day in 2030.

According to these estimates, North America will be oil-independent by 2025.

North American oil assessment for 2035 with forecasts from the CAPP





Shale oils – the main source of uncertainty for future.

An assessment of the oil situation in North America suggests possible independence for the region by 2025, based on the most recent forecast for Canada.

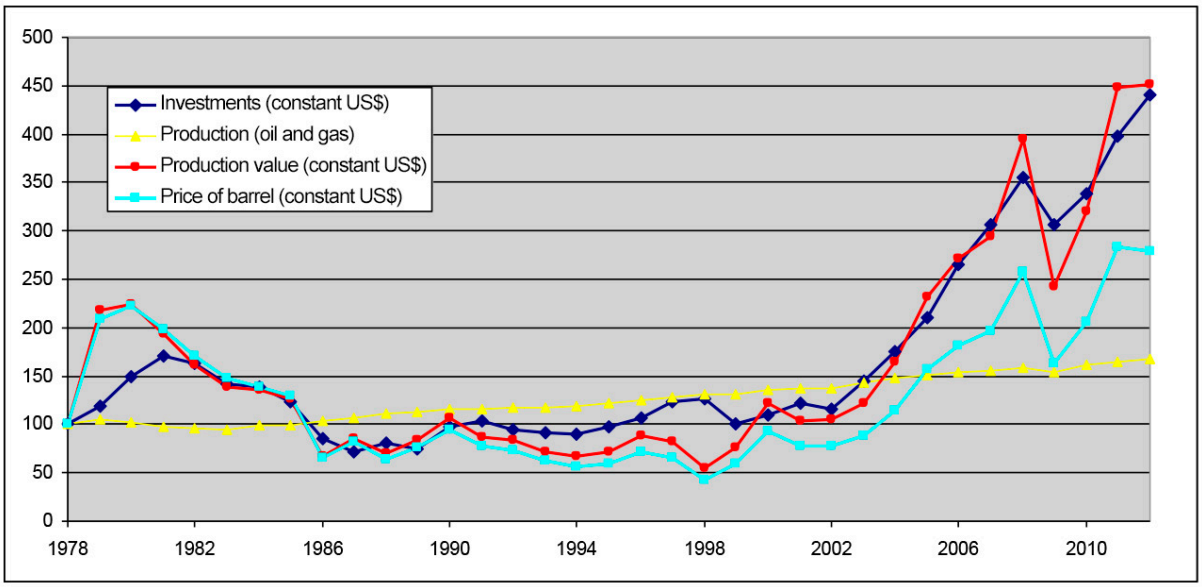
There is major uncertainty associated with the real potential that shale oils represent. Whether or not independence can be achieved will depend on the quantities that can be recovered (in principle, high quantities), the quantities that can be economically used and the social context (growth of stronger opposition?). Whatever the case, it does not seem unrealistic to adjust shale oil production in US upwards. It would seem feasible for the region to achieve oil independence before 2025.

2.3 1978 - 2012: Investments – Production – Price

Between 1978 and 2012, investments in exploration and production increased by 340%, while the price per barrel increased by 180% and oil and gas production increased by 70%.

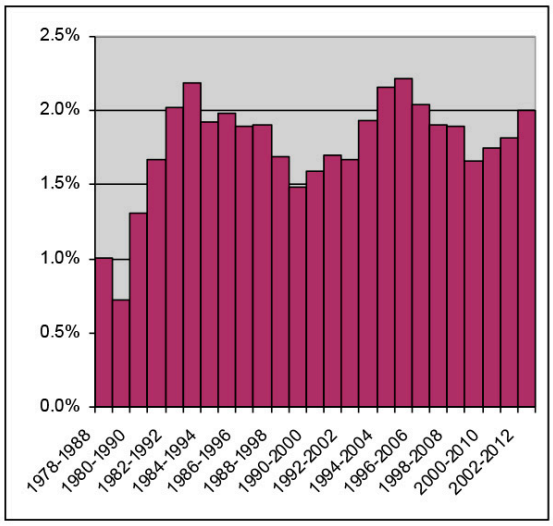
The figure below shows that growth in investments is very closely linked to increases in production value (volume x price). This link has been particularly clear since 2000.

Figure 4: Investments, production, price of crude oil and production value (base 100 index in 1978)



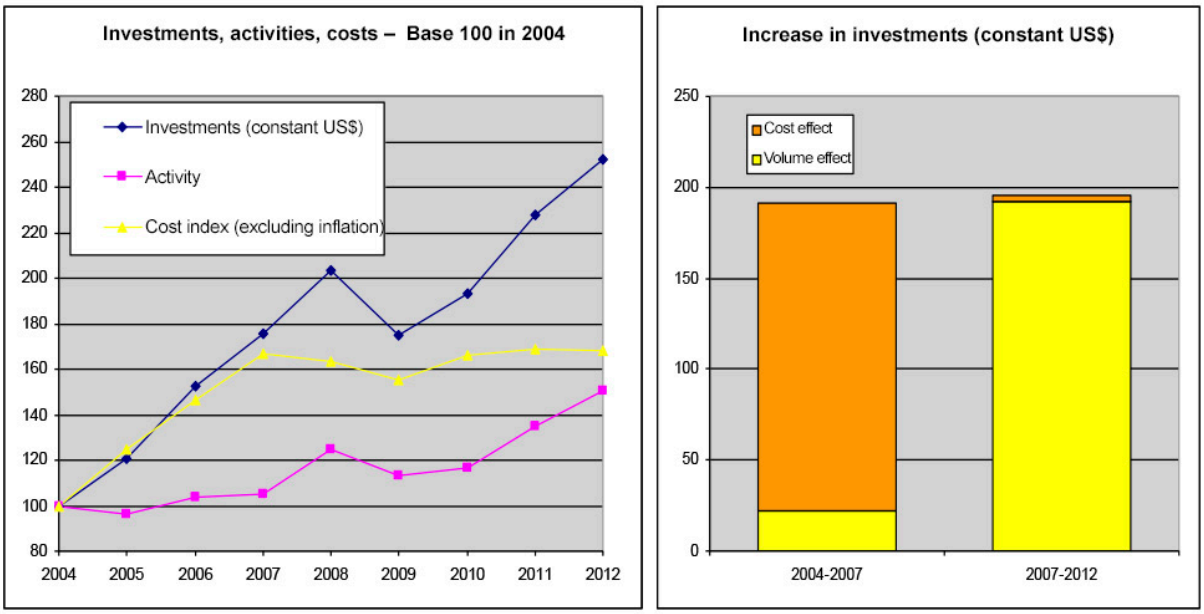
Although the increase in production has been remarkably constant since 1984, with average annual growth rates over 10 years of between 1.5% and 2.2%, the current trend which has seen a stronger growth in investments only really started in 2004, with the price of oil per-barrel increasing (only returning to its 1980-level in 2008 – in constant US$). This upwards trend was only interrupted in 2009 as a result of the global economic crisis which triggered a fall in the price of crude oil.

Figure 5: Average growth rate over 10 years in oil and gas production



The growth in investments between 2004 and 2007 can be almost entirely attributed to unit construction costs rising by 75% over this period (excluding global inflation) – evidence of the tensions affecting the oil equipment and services sector and of the rising costs of raw materials. After 2007, growth in investments can mainly be attributed to the projects themselves. The increase in spending over this period can be explained by an increase in the number of projects resulting from the emergence of new investment opportunities (shale hydrocarbons, Brazil, Iraq, etc.), in conjunction with high per-barrel prices – as well as the increasing complexity of development projects (very deep offshore, heavy oils, LNG, etc.).

Figure 6: Investments, activities and costs – 2004-2012



3 Main markets in the upstream oil equipment and services sector

3.1 Introduction

The money that oil companies invest in E&P is used to look for new oil and gas reserves, assess just how expensive they are and then put them into production.

The exploration phase involves a series of geophysical tests, all of which require instrumentation and data measurement equipment (seismic, electromagnetic, etc.). The data acquired is then processed and interpreted in a bid to locate hydrocarbon reservoirs. In 2013, the geophysical exploration market should be worth around US$18 billion.

If an area is deemed likely to contain oil, an exploration well is drilled in order to ascertain whether or not it actually does. If the presence of oil is indeed confirmed, an assessment phase follows before the field is eventually developed.

Drilling is essential - either onshore or offshore - in order to reach the depths at which the reservoirs lie. A whole set of services and products are involved in drilling (logging, directional drilling, chemicals, etc.), which should together generate total turnover of more than US$250 billion throughout the world in 2013.

Because of their distance from the coast and their locations out at sea, offshore discoveries require the construction of production platforms and pipeline connections so that the crude oil can be exported. In 2013, the offshore construction market should be worth more than US$60 billion.

3.2 Drilling

In 2012, onshore and offshore drilling increased by 3.6% over the year. The recovery which followed the period immediately after the crisis of 2009 is coming to an end.

Onshore drilling looks set to continue to grow less strongly for 2013 (+2%) in all of the world's regions, except in Africa, which will see stronger growth (+8%). Offshore drilling should enjoy stronger growth (+9%), driven by activity in South America and the Asia-Pacific region.

Onshore rig rates should remain stable in 2013, except in North America where they are likely to fall by between 5 and 10%. Offshore rig rates look set to continue with their recovery in the Gulf of Mexico, but will stagnate elsewhere.

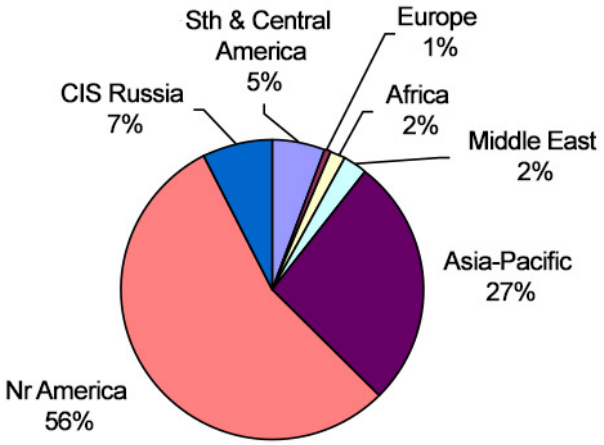
The drilling and associated services market grew by 11% in 2012. More moderate growth of 9% and 6% is predicted for 2013 and 2014, respectively, as a result of a slowdown in onshore activities. The fracking market – which had increased by 150% between 2008 and 2011 – returned to more moderate growth of 5% and 8% in 2012 and 2013.

3.2.1 Drilling activity

3.2.1.1 Number of wells drilled throughout the world

Most oil and gas drilling activity occurs onshore. A total of 102,500 new onshore wells and 3400 new offshore wells were drilled in 2012 - an overall increase of 3.6% compared with the previous year.

Figure 7: Distribution by region of onshore and offshore wells drilled in 2012.



(Sources: IFPEN, Spears & Associates)

North America (US and Canada) accounts for more than half of total activity, followed by the Asia-Pacific region (27%), most of the activity of which is in China.
In 2013, onshore and offshore drilling should involve nearly 110,000 wells – the same level of activity as in 2008 before the world financial and economic crisis.

3.2.1.2 Number of onshore wells

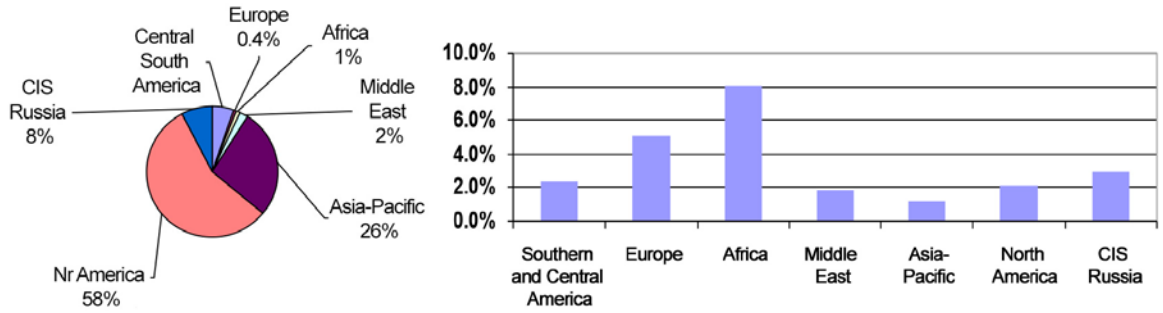
In 2012, onshore drilling increased by 3.6% over the year. Regions throughout the world saw an increase, except for Europe (-1%).
The strongest increase was in the Middle East (+14%) – Iraq in particular as a result of the Kurdistan fields being developed. Drilling in Africa increased by 9%, with Algeria and Libya driving growth, while Egypt actually saw a decline in activity.

Drilling continues to grow in North America (+4%) – catalysed by tight oil projects –, but at a slower rate (it had enjoyed growth of 16% in 2011). The global number of gas drilling operations in the United States continues to fall, with the vast majority of drilling now being for oil.

As far as 2013 is concerned, the first half of the year suggests a slight increase – of around 2% – in onshore drilling operations. Apart from Africa and Europe, both of which are driving growth with rates of 8% and 5%, respectively, growth in other regions throughout the world has only been slight – between 1% and 3%.

Onshore drilling activity has continued to grow in Africa, thanks in particular to projects in Algeria and Libya. In Europe, activity is being driven by Romania, Poland and Germany, all of which are just beginning to explore shale gas.

Figure 8: Distribution of onshore wells in 2012 by region (a), and growth in mid-2013 over one year (b).

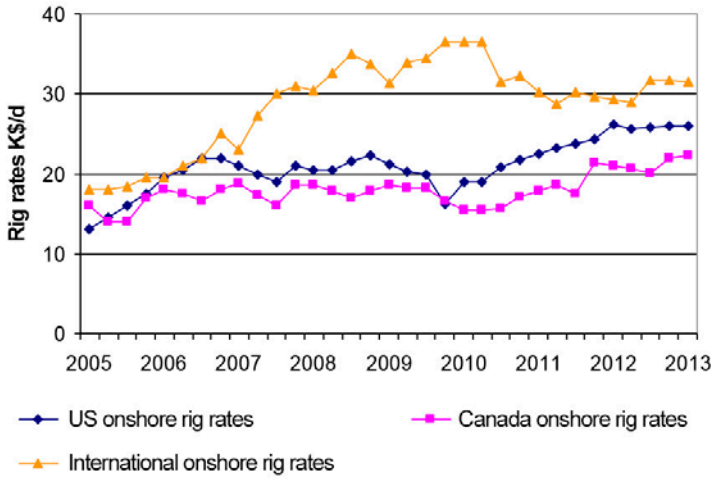


(Sources: IFPEN, Spears & Associates)

Onshore rig rates

In 2012, annual onshore rig rates across the world (except North America) grew by 8%. In the US, however, they remained more or less stable, while increasing slightly in Canada (by 4%).
As far as 2013 is concerned, rig rates have fallen slightly in US (-3%), and more significantly in Canada (-7). Rates should remain stable in other regions across the world (+1.5%).

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



(Sources: IFPEN, Spears & Associates)

3.2.1.3 Number of offshore wells

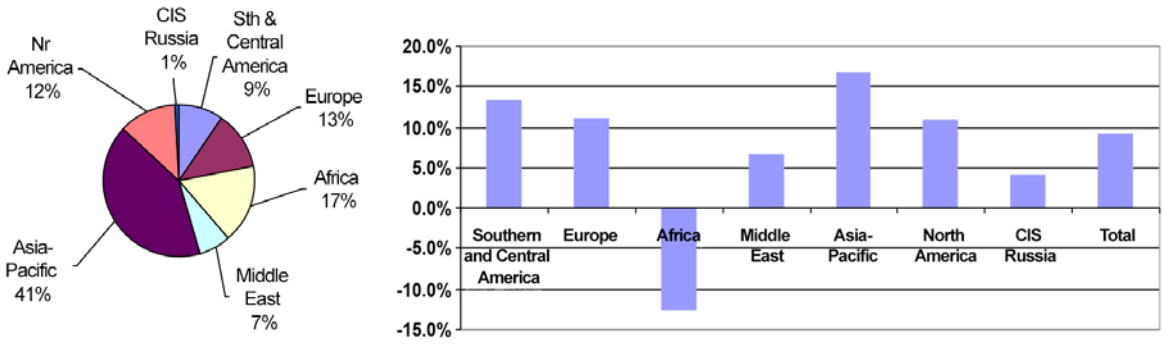
In 2012, offshore drilling increased by 3.4% over the whole year – a similar increase to 2011 which saw a 2.6% increase. The Gulf of Mexico is enjoying a major recovery (45% growth), following two years at the lowest levels. Africa and the Middle East are also two very active regions, which have seen 37% and 21% increases in the number of wells, respectively.

Drilling activity also increased in East Africa on gas prospects (Mozambique and Tanzania) and in West Africa, where a number of new oil fields in the Gulf of Guinea are being developed. A number of exploratory drilling operations are now also under way in Cyprus, the Lebanon and Israel in the eastern Mediterranean. Some of these are actually being developed.

Offshore drilling in the Asia-Pacific and Latin America regions fell by 11% and 15%, respectively.
The country that has seen the greatest decline in the Asia-Pacific region is China – having peaked in 2011. In South America, the number of wells being drilled has fallen slightly, particularly in Brazil – despite the numerous changes that the country is having to address.

As far as 2013 is concerned, forecasts suggest that the number of offshore drilling operations will increase by 9% – particularly in regions which saw a slowdown in 2012, i.e., Asia-Pacific and Latin America. Drilling in the Gulf of Mexico should continue to increase by around 10%.

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



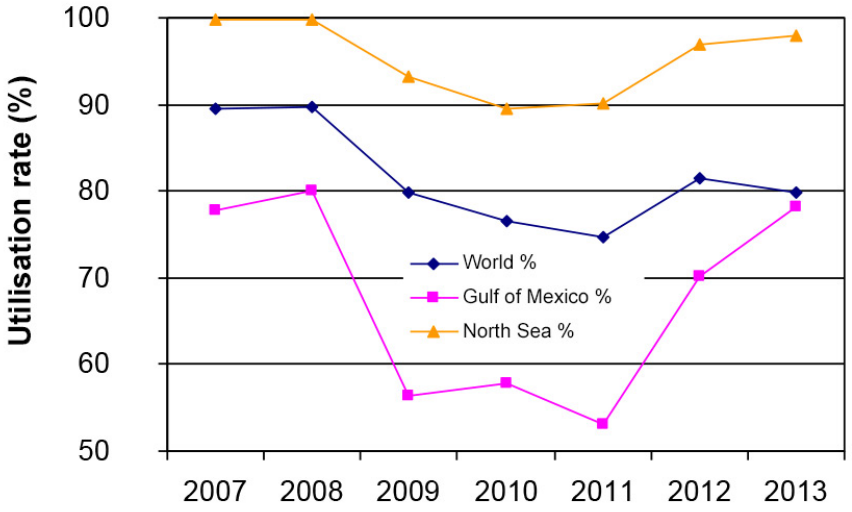
(Sources: IFPEN, Spears & Associates)

Offshore rig utilisation rates

2012 saw a recovery in rig utilisation rates across the whole world, with annual offshore rig rates (all types together) standing at 81% – an increase of 9% compared with 2011. The Gulf of Mexico saw growth of 30% (with a recovery in the number of deep offshore drilling operations), whereas the North Sea only saw growth of 6%.

The first few months of 2013 seem to show a slight decline in rig utilisation rates (-2%) at global level. The Gulf of Mexico should continue with its recovery (albeit at the slightly more moderate rate of +11%), while the North Sea will have utilisation rates of close to 100% – as it has had in the past.

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



(Sources: IFPEN, IHS Petrodata)

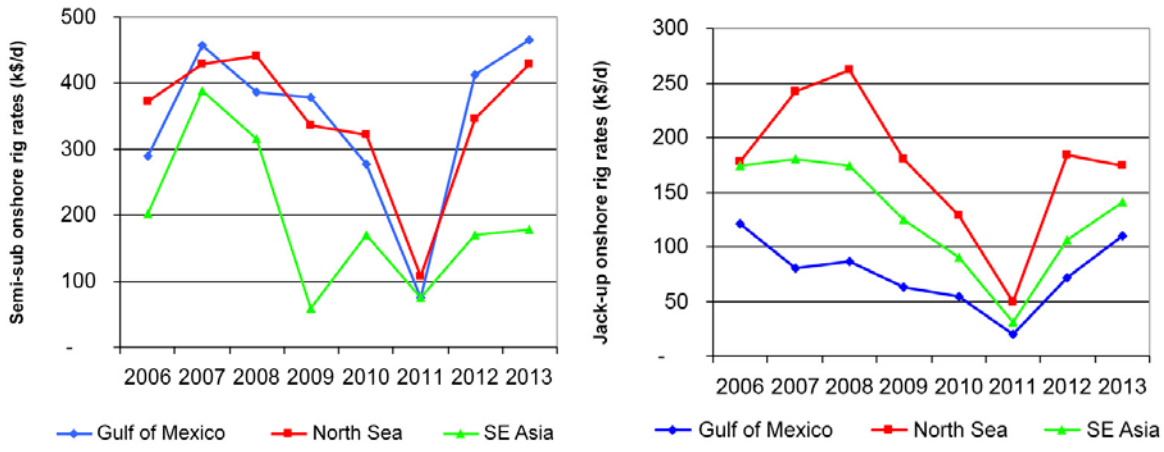
Offshore rig rates

2012 saw a general recovery in offshore rig rates – both for semi-submersibles and jack-ups. This applied to regions throughout the world (Gulf of Mexico, North Sea and South-East Asia).

This recovery continued into 2013, with the exception of jack-up rigs in the North Sea, which saw a 5% fall. In the North Sea, rig rates for semi-submersibles increased by 24%, and in South-East Asia, rates for jack-ups increased by 31%.

The strongest growth in 2013 was in the Gulf of Mexico for jack-ups – a 54% increase across the whole year.

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



(Sources: IFPEN, IHS Petrodata)

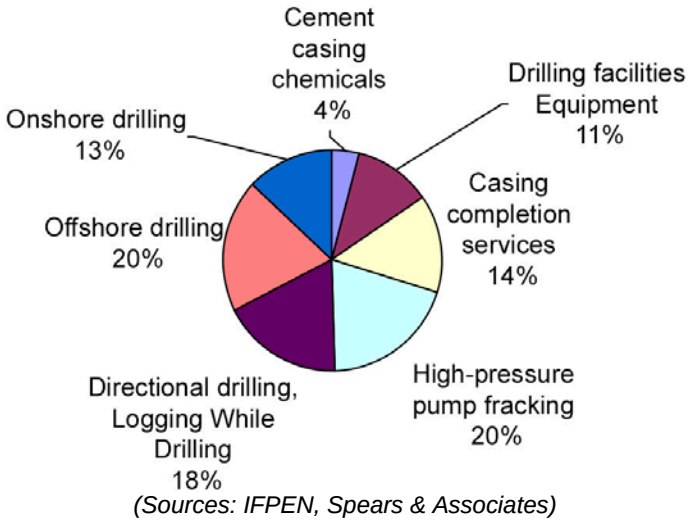
3.2.2 Drilling markets, equipment and services for wells

In 2012, the global drilling and associated services market was worth an estimated US$220 billion - 11% more than in 2011.

Offshore and onshore drilling operations accounted for 20% and 13% of the global market, respectively – US$45 billion and US$29 billion in turnover. Although there are considerably fewer of them, offshore drilling operations are much more expensive. 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$110 billion) of the global market.
- fracking and pumping operations (20% 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 of offshore drilling operations (US$44 billion).

Figure 13: 2012 distribution of the various segments of the drilling market

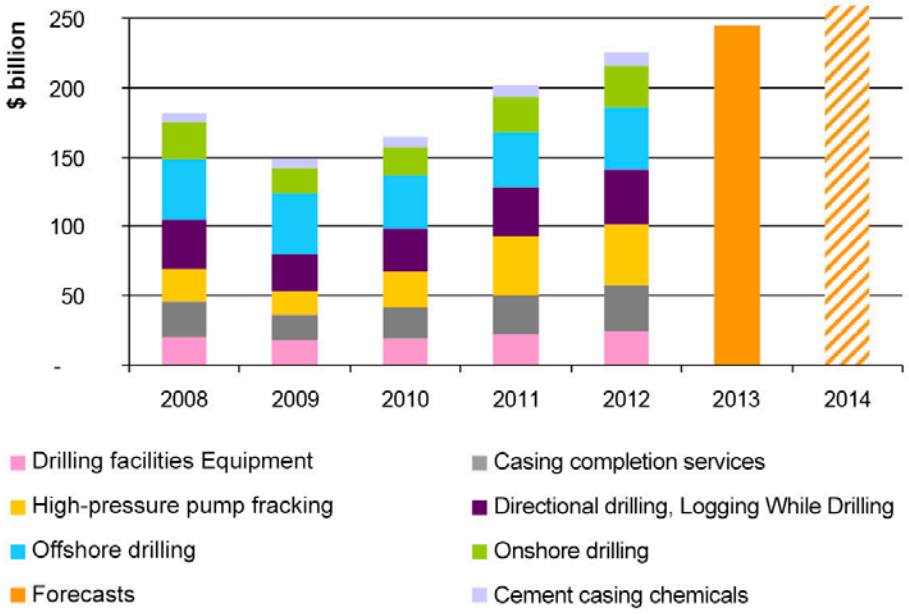


(Sources: IFPEN, Spears & Associates)

For the end of 2013, the whole global drilling market is predicted to continue to grow, with an average rate of approximately 9% growth across the whole twelve-month period.

In 2011, the size of the market had already returned to – and exceeded – its 2008 levels. Between 2009 and 2012, while tight oil and shale gas were being developed in North America, the directional drilling and hydraulic fracking markets enjoyed spectacular growth – increasing by 50% and 160% respectively over the three-year period.

***Figure** 14: Increase/decrease in size of the various drilling market segments and forecasts for the global market in 2013 and 2014.*



(Sources: IFPEN, Spears & Associates)

The global drilling market should grow by a slightly slower rate (6%) in 2014, with the size of the onshore drilling market increasing at more or less the same rate as in 2013 (3%), and the size of the offshore market increasing by around 10%.

3.2.2.1 Onshore drilling market

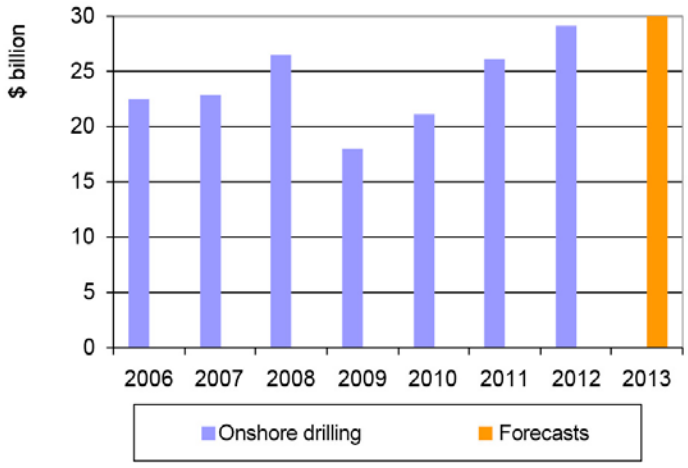
Turnover for onshore drilling operations alone increased by 12% in 2012 to US$29 billion; its increase in 2013 should be more moderate (3%). 11 major groups account for two-thirds of the world onshore drilling market.

The sector leader is Nabors Industries, with a 13% share of the market, followed by Helmerich & Payne (10%).

Eurasia Drilling's market share increased by 2% on 2011, taking it from 5th place to 3rd place. Ensign, Patterson-UTI and Precision Drilling have market shares of 6 to 7%, and are just behind in 4th, 5th and 6th place, respectively.

Saipem and Schlumberger are in 8th and 10th place, respectively, despite their sizes – onshore drilling is not their core business.

Figure 15*: *Increase/decrease in size of the onshore drilling market and market share of the major onshore drilling companies in 2012.



Companies	2012%	total
Nabors Industries	13%	13%
Helmerich & Payne	10%	23%
Eurasia Drilling Co.	8%	32%
Ensign	7%	38%
Patterson-UTI	6%	45%
Precision Drilling Corp.	6%	50%
Weatherford	4%	54%
Saipem SPA	3%	58%
Trinidad Drilling	3%	60%
Schlumberger	3%	63%
San Antonio	2%	66%

(Sources: IFPEN, Spears & Associates)

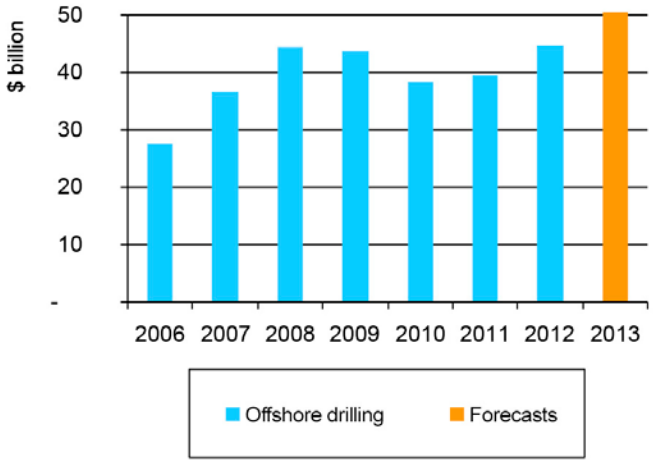
3.2.2.2 Offshore drilling market

The value of the onshore drilling market alone grew by 13% in 2012 to nearly US$45 billion; Continued growth of around 15% is forecast for 2013. This market is also extremely concentrated – 8 major groups account for two thirds of it.

Transocean remains the leading offshore drilling company, with a 20% share of the world market. Seadrill and ENSCO are in 2nd and 3rd place respectively, each with a 10% share of the market. Transocean suffered a 3% fall in market share after the Macondo oil spill in the Gulf of Mexico in 2010.

Diamond Offshore's market share decreased by 2% compared with 2011, taking it from 3rd place to 5th place.

Figure 16*: *Increase/decrease of the offshore drilling market and market share of the major onshore drilling companies in 2012.



Companies	2012%	total
Transocean, Inc.	20%	20%
Seadrill	10%	30%
ENSCO	10%	40%
Noble Drilling	7%	48%
Diamond Offshore	7%	54%
China Oilfield Services,	4%	58%
Maersk Group	3%	62%
Saipem SPA	3%	65%

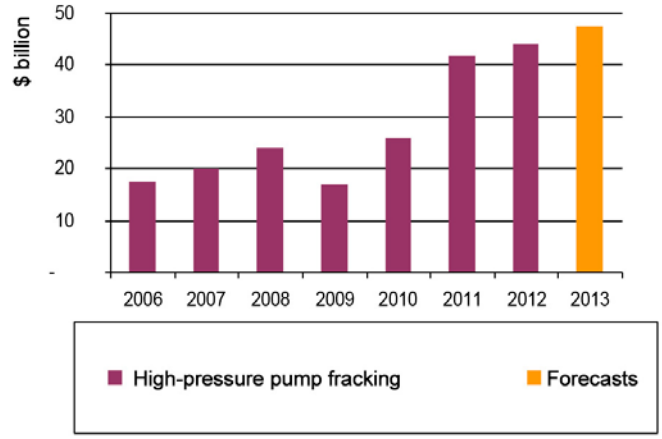
(Sources: IFPEN, Spears & Associates)

3.2.2.3 Fracking market

The value of the fracking market reached US$44 billion in 2012 – the equivalent of the offshore drilling market. Although it only enjoyed modest growth (5%) in 2012, it grew by 60% and 55% in 2011 and 2010 respectively – a spectacular increase of 160% since its lowest point of 2009.
Three companies – mainly located in North America – account for two thirds of global turnover.

Halliburton is the leading company in the sector, seeing its market share grow by 2% compared with 2011. It now has a 29% share of the world market. Schlumberger and Baker Hughes are the other two main players, with a 21% and 14% share of the market, respectively. The other companies that practice fracking have a less than 5% share of the market: Weatherford, Frac Tech Services (FTS), Trican Well Services.

Figure 17: Increase/decrease in the fracking market and market share of the main companies involved in it in 2012



Companies	2012%	total
Halliburton	29%	29%
Schlumberger	21%	50%
Baker Hughes	14%	63%
FTS	4%	68%
Weatherford	5%	72%
Trican Well Service Co.	4%	77%
Calfrac Well Services L	3%	80%
Nabors Industries, Inc.	3%	83%
Cudd Pumping	2%	85%
Patterson-UTI Energy, I	2%	87%
C&J Energy Services	2%	89%

(Sources: IFPEN, Spears & Associates)

3.3 Geophysical market

With high oil prices and a tense geopolitical situation in the Middle East (the war in Syria), overall activity on the geophysical market (data acquisition, processing and equipment) is continuing to grow - driven mainly by the need to find new reserves, particularly in new exploration zones: difficult zones, such as deep offshore, the new provinces being explored in the Arctic, etc.

The complexity of new oil and gas prospects requires increasingly sophisticated equipment, which in turn requires more and more channels both on land and offshore.

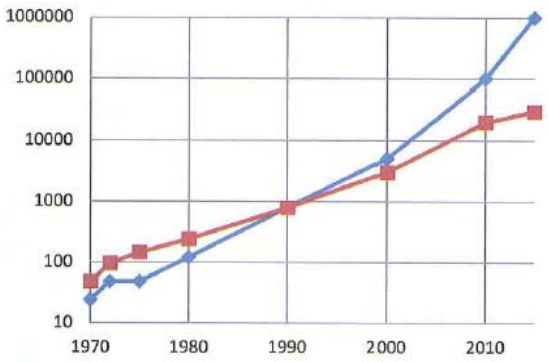
Numbers of marine seismic campaigns across a 12-month period were stable as of mid-2013. Utilisation rates of the ships has increased slightly (+2%) and cost of campaigns has risen: +22% for 3D and +12% for 2D.

In 2013, global turnover on the geophysical market looks set to continue to increase, with growth of around 12%.

3.3.1 Geophysical activity

Since 1970 when the first 3D seismic test campaigns were carried out, the number of recorded channels has continued to increase, rising from fewer than 100 channels (2×48) in 1970 to 1 million today.

***Figure* 18*:* Increase since 1970 in the number of seismic recording laboratory channels. The blue curve is the number of possible channels, the red curve is the number of channels currently in use.**

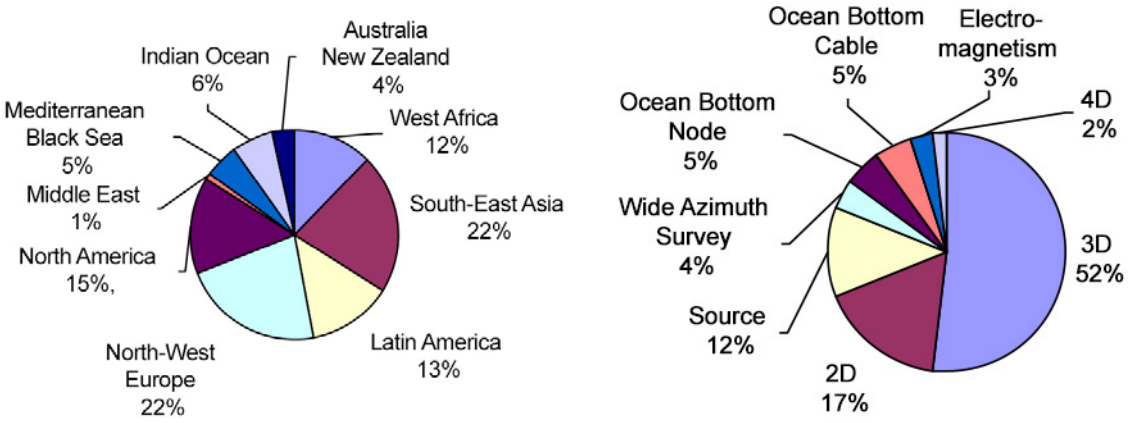


(Sources: Malcom Lansley, Sercel)

In mid-2013, most marine seismic activity was concentrated in five regions: the North Sea (22%), South-East Asia (also 22%), the Gulf of Mexico (15%), South America (13%) and the Gulf of Guinea in West Africa (12%).

Over a 12-month period up until mid-2013, marine activity throughout the world held steady, with around 140 testing campaigns. The regions that have experienced growth are the Mediterranean (which has seen its activity double), South-East Asia (+22%) and West Africa (+12%). Other regions have seen a fall in activity – the Indian Ocean (-28%) and South America (-21%) in particular. The fall in activity has been less dramatic in north-west Europe and North America (6% and 4%, respectively).

Figure* 19*: As of mid-2013, distribution of marine seismic campaigns over the last 12 months, by (a) region and by acquisition type (b).



(Sources: IFPEN, IHS Petrodata)

Marine seismic activity is now dominated by 3D seismic, which accounts for more than half of all operations (52%), followed by 2D (17%). Wide Azimuth Seismic Surveying (WAZ)

accounts for 4% of all operations and source boats for 12%. Acquisition using ocean bottom cables (OBC) or nodes (OBN) accounts for 10% of all operations; this activity doubled in volume between 2011 and 2012. Electromagnetic seismic acquisition now accounts for more operations (3%) than 4D seismic monitoring (2%).

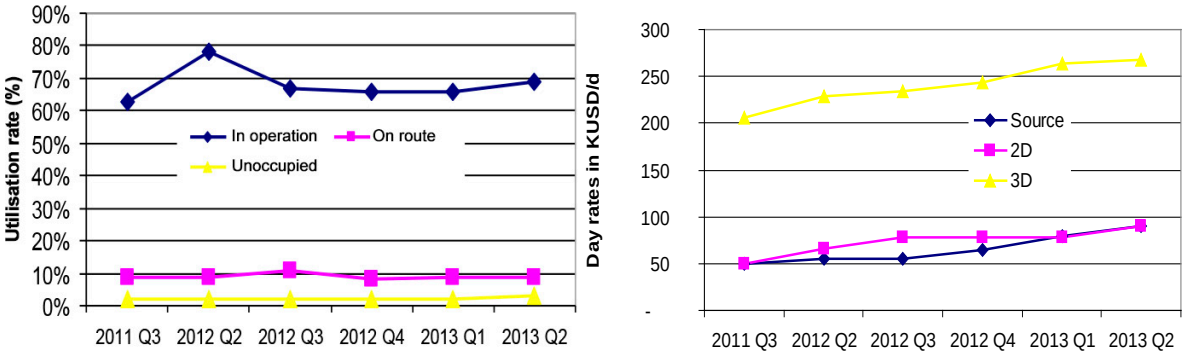
Ship day rates and utilisation rates

As of mid-2013, there had been a clear recovery in seismic ship day rates over a 12-month period, although there had been a number of disparities depending on acquisition type.

Day rates increased by an average of 22% for 3D seismic and 12% for 2D seismic. In July 2012, standard 3-D acquisition costs reached US$230,000/day, as opposed to US$205,000/day one year beforehand. But day rates can double depending on acquisition specifications and ship type.

The cost of a source boat is very similar to that of a 2D seismic acquisition boat, and adding a steamer has very little effect on rigging rates.

Figure 20: As of mid-2013, day rates in thousands of US dollars and utilisation rates as a percentage of ship activity.



(Sources: IFPEN, IHS Petrodata)

Across the world's whole seismic acquisition fleet (that had 140 boats in mid-2013), average ship utilisation rates were slightly up (by 2%) over a 12-month period, and now stand at 69%. The number of unoccupied boats or boats in transit remains stable.

3.3.2 Geophysical market

The geophysical market, which is closely linked to activity on the oil exploration market, is very affected by oil and gas prices and the geopolitical environment. Higher prices mean that more costly and sophisticated technologies can be used.

In 2012, turnover for the geophysical, equipment and data acquisition and processing market reached US$16.5 billion – higher than the level it had reached in 2008 (US$15 billion, taking all segments together). In 2012, the geophysical market grew by 13% across the whole year.

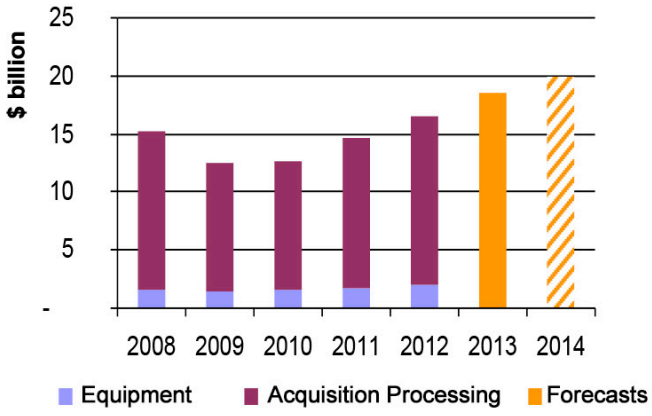
At global level, the equipment segment generates turnover of US$2 billion – 12% of the total geophysical market. In 2012, it grew by 11% across the whole 12-month period – slightly less than the market as a whole.

The marine seismic acquisition and equipment markets are the most profitable. There is still a great deal of competition on the onshore seismic market, from Asia and China in particular, where inexpensive labour means low acquisition prices.

For 2013, marine acquisition prices rising again means that growth could reach 12%.

However, for 2014, industry professionals do not see acquisition prices rising again before the second half of the year, and contractors are forecasting fewer orders than in 2013 – which could mean slight growth in the market (by around 8%) the following year.

Figure 21: Geophysical market (equipment and data/acquisition) and market share of the major companies in 2012.



	2012	Total
CGG	31%	31%
Schlumberger	24%	55%
Petroleum Geo-Service ASA	9%	64%
TGS-NOPEC Geophysical Co.	6%	70%
Halliburton Corp.	4%	74%
Geokinetics, Inc.	3%	77%
ION Geophysical Corp.	3%	81%
China Oilfield Services, Ltd.	3%	83%
Global Geophysical Services	2%	85%
Dawson Geophysical	2%	87%
Integra Group	2%	89%
Seitel, Inc.	1%	91%
Geospace Technologies Corp.	1%	92%
EMGS	1%	93%
Paradigm Ltd.	1%	94%

(Sources: IFPEN, Spears & Associates)

- **Companies**

In 2012, CGG consolidated its leading position by acquiring Fugro's marine and geoscience divisions. This means that only 4 companies account for 70% of total activity on the world's geophysical market.

Schlumberger with its subsidiary WesternGeco is in second place, followed by PGS and TGS-NOPEC.

Geokinetics, which is specialised in acquiring data in transition zones (shallow waters), is in fifth place. EMGS, which specialises in electromagnetic acquisition, moved up one place into 14th position in 2012.

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.

3.4 Offshore construction

In 2012, activity involving platforms increased for both fixed platforms and floating platforms (26% and 15%, respectively). As far as subsea installations are concerned, activity fell by 9% after a number of years of strong growth.

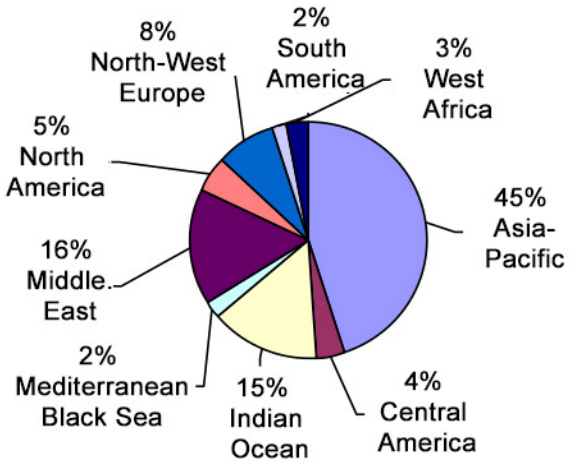
The offshore construction market should grow right across-the-board by 12% in 2013 – as it did in 2012. But growth looks set to be more moderate (5%) in 2014 as a result of a number of projects being postponed and delayed because of their increasing complexity and the shortage of qualified personnel. Another factor is the "local content" obligation, particularly in West Africa and Brazil, and tighter legislation governing deep offshore activities all over the world.

3.4.1 Offshore construction activities

3.4.1.1 Fixed platforms (Jack-ups)

Activity involving fixed platforms recovered in 2012. With 177 units installed in 2012, there was a 26% increase in the total number of installations over a 12-month period.
The Asia-Pacific region is in the lead, accounting for 45% of the world's total fixed platform installations.

Figure 22: Geographic distribution of fixed platform installations in 2012



(Sources: IFPEN, IHS Petrodata)

The fixed platform markets in the Gulf of Mexico and in the North Sea are now mature, and these types now account for 5% and 8% of all installations, respectively. These two regions now have an abundant oil infrastructure that is more favourable for developing subsea installations and tie-back to existing infrastructure.
Unlike the Middle East and the Asia-Pacific markets – which are predicted to grow –, the Gulf of Mexico and North Sea markets are expected to continue to decline over the next few years.

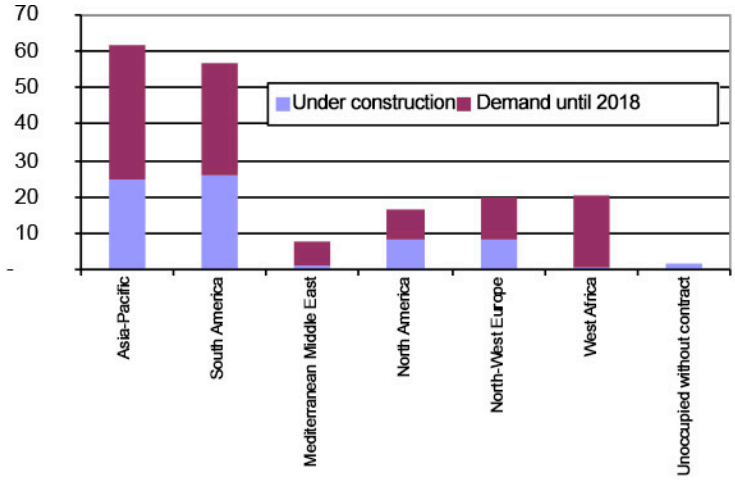
Globally, in the long term, the number of fixed platform installations is predicted to fall.

3.4.1.2 Floating Platform Systems (FPS)

In 2012, 15 floating platforms were installed throughout the world – a 15% increase over a 12-month period.

As of mid-2013, the number of Floating Platform Systems in the process of being built for next years was stable over a 12-month period – around 70 units. Three quarters of all platforms being built are in the Asia-Pacific and Latin American regions, with the remaining 25% in North America and North-West Europe.

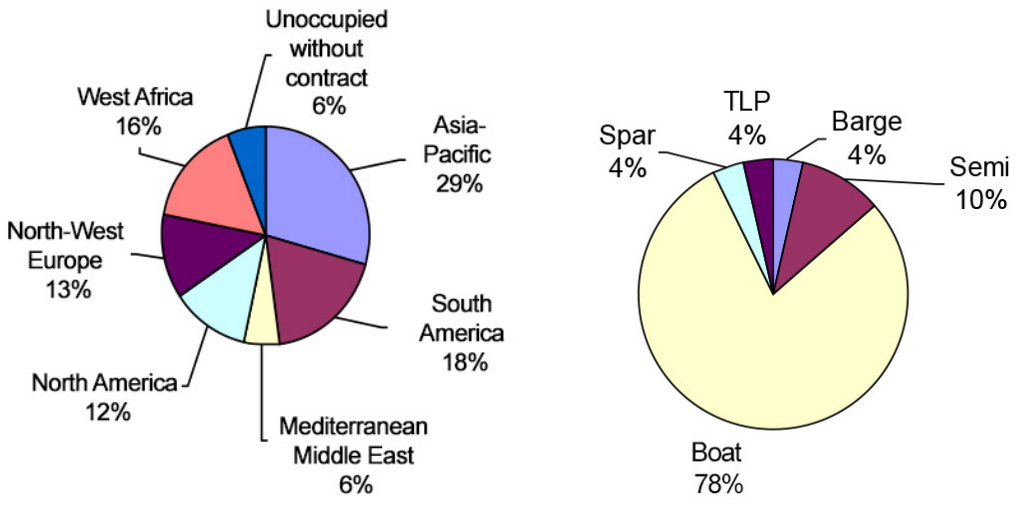
Figure 23: Number of floating platforms under construction in mid-2013 and number of proposed platforms between now and 2018.



(Sources: IFPEN, IHS Petrodata)

The total number of floating platform systems is expected to reach 360 in 2013, distributed mainly over the Asia-Pacific region (29%), South America (18%), North-West Europe (13%) and North America (12%).

Figure 24: Total number of FPS by region as of mid-2013 and types of FPS built since 2005.



(Sources: IFPEN, IHS Petrodata)

Over a 12-month period, the number of FPS scheduled to be built between now and 2018 has increased by 20% to 114 units. Demand is mainly being driven by the Asia-Pacific region, America and Africa.

As far as the various types of floating supports built since 2005 are concerned, 78% of them are ships, 10% are semi-submersible rigs, and the remaining 12% regroups Spars, Tension Leg Platforms (TLP) and barges.

3.4.1.3 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.

As the number of oil and gas discoveries in difficult conditions and at very high depths increases, demand for subsea installations is likely to increase. In 2006, only 25% of all discoveries were at depths of more than 1000 m… but in 2012, 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.

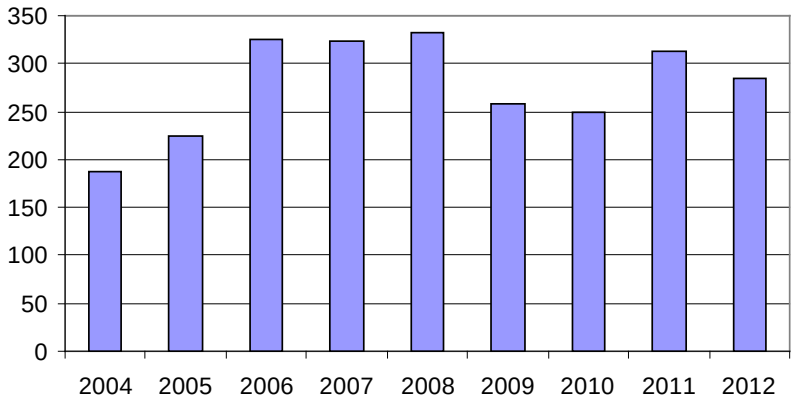
After the record year 2008, subsea activity fell in 2009 and 2010, with only 250 units being built per year. 2011 saw a significant recovery in activity (+25%), followed by a fall in 2012 (-9%). As of mid-2013, subsea activity had increased by 12% over a 12-month period.

The subsea industry is having to tackle increasingly complex projects and a shortage of qualified personnel. The result is a sharp increase in costs – sometimes as much as a fourfold increase – as has been the case in Angola, where they have reached US$35,000 per tonne.

A number of other constraints are affecting the development of the subsea industry. These include the "local content" obligation – in West Africa and Brazil in particular – and the tightening of legislation governing deep offshore activity throughout the world in the wake of the Macondo oil spill in the Gulf of Mexico.

And developing the subsea industry – which mainly uses existing facilities (regional) for developing a new field – raises the question of maintenance and the lifetime of older facilities.

Figure 25: Number of subsea constructions throughout the world between 2004 and 2012.

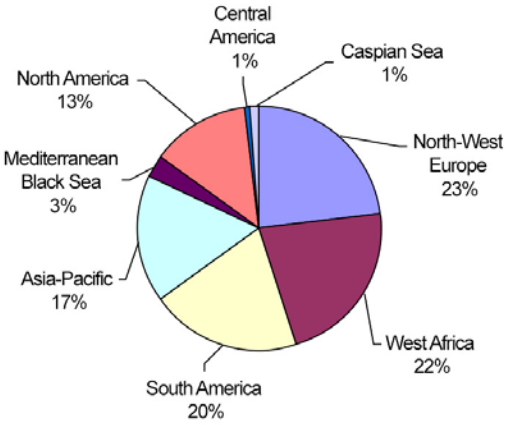


(Sources: IFPEN, IHS Petrodata)

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 already-existing offshore production installations that they have (regional develpments).

Figure 26: Demand for subsea constructions between 2013 and 2017



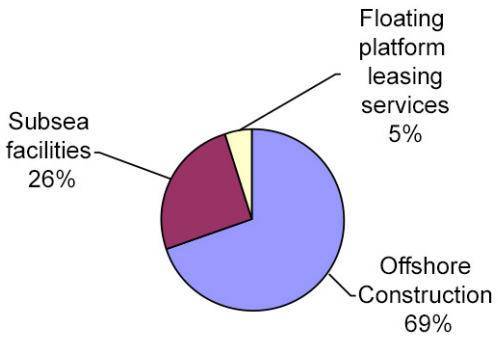
(Sources: IFPEN, IHS Petrodata)

3.4.2 Offshore construction market

The offshore construction market was worth US$55 billion in 2012. This should grow to US$62 billion in 2013 – 12% growth over a 12-month period, the same as in 2012.

The market is made up of three segments: the actual offshore construction market which accounts for 69% of the global market, subsea equipment (26%) and services associated with the leasing of platforms (5%).

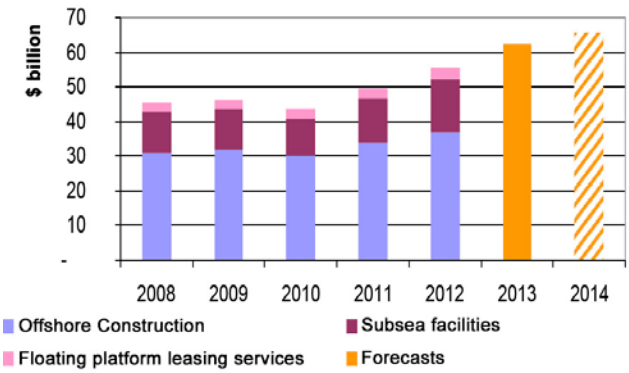
Figure 27: Share of the three segments that make up the offshore construction market in 2012.



(Sources: IFPEN, Spears & Associates)

All of the segments that make up the market grew in 2012, but the subsea equipment segment enjoyed the strongest growth (23%). The offshore construction segment grew by 8%, while the floating platform leasing service segment enjoyed more modest growth (6%).

Figure 28: Offshore construction market (a) and market share of the companies operating on it in 2012 (b).



Companies	%	total
Saipem SPA	13,0%	13%
Subsea 7 S.A.	10,9%	24%
KBR	7,7%	32%
FMC	7,2%	39%
SBM Offshore	6,6%	45%
McDermott	6,5%	52%
Technip	4,5%	56%
Aker Solutions	4,3%	61%
Cameron	4,1%	65%
Fugro	3,4%	68%
Technip	3,0%	71%
Oceaneering International	3,2%	74%
Kvaerner	2,7%	77%
GE	2,4%	80%

(Sources: IFPEN, Spears & Associates)

50% of total world turnover is generated by 6 companies, which are mainly involved in offshore construction. Saipem is the leading company in this field, followed by Subsea 7. Four other companies are just behind them with market shares of 6 to 7%: KBR, FMC, SBM Offshore and McDermott.

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

The whole offshore construction market should grow by 12% in 2013, the same as in 2012.

Given the fact that costs are rising and projects are being delayed, market growth for 2014 looks set to be more modest (5%).

Conclusion

The recovery in exploration and production investment that began in 2012 continued into 2013. All of the various markets that make up the sector have now exceeded their pre-2009 world economic crisis levels. This growth looks set to continue into 2014, but at a less sustained rate (8%).

As far as the geophysical market is concerned, order books are not quite so full for 2014 as they were in 2013, suggesting weaker growth next year (8%).

Exploration projects involving unconventional hydrocarbons are just getting under way outside of North America, so the onshore drilling market in 2014 will most likely only grow by around 3%, as it did in 2013.

Regarding offshore drilling, rig rates rose in 2012 and 2013 in all regions throughout the world, and market growth should be sustained (+10%) by the many fields that are scheduled to be developed.

As far as offshore construction is concerned, the growing complexity of ever-deeper projects, rising costs and the "local content" obligation will most likely have an effect and keep growth down to 5%.

Table 1: Summary table of increases/decreases in investments and markets analysed

	2012	2013	2014
E&P investment	**13%**	**+11%**	**8%**
Geophysical Market	**+13%**	**12%**	**8%**
Drilling Market			
onshore	**+13%**	**+3%**	**+3%**
offshore	**+12%**	**+15%**	**+10%**
Offshore construction market	**+12%**	**+12%**	**+5%**

4 Refining: looking for new equilibriums

In the long term, refining capacity surplus has had a tendency to fall gradually. The reasons for this change can mainly be attributed to demand, which is growing at a faster rate than refining capacity (with a few exceptions, such as in 2008-2009). Mid-term forecasts suggest a reversal of this trend. While these two variables will continue to grow, world demand is set to slow down, growing at a slower rate than refining capacity. Increased spending in the industry is evidence of this trend. A new cycle in which surplus will once again increase is predicted to start in 2015.

However, although this is the trend at a global level, the situation can be very different from region to region. Although growth at global level is being driven by the world's emerging countries, where demand continues to increase and project portfolios are very full, growth in OECD countries – particularly Europe – is starting to slow down, with consumption falling and fewer projects on the horizon. Most of these projects involve modernising existing equipment. So, demand falling or stagnating in OECD countries in the mid-term, combined with very full order books for new projects in the world's emerging countries, will result in an increase in surplus at global level.

Challenges vary greatly from region to region: in emerging countries, demand has to be satisfied in conjunction with the other requirements that strong economic growth brings, while at the same time ensuring compliance with environmental regulations; in OECD countries, the challenge is considerable – the sector has to be restructured so that it better meets demand in terms of volume and products. This new balance has to be struck while at the same time dealing with numerous constraints (specifications, regulations, etc.) in an increasingly competitive environment (revolution that the US is experiencing following the development of shale hydrocarbons, Russian refineries being modernised, emerging countries, etc.).

4.1 Falling excess capacity and regional disparities

Excess capacity at world level fell considerably between 2009 and **2012** – from 5.7 Mb/day in 2009 to 2.6 Mb/day in 2012. This trend can mainly be explained by growth in oil demand being faster than growth in refining capacity. However, the situation in the world's emerging regions is very different from the situation in its more mature economies.

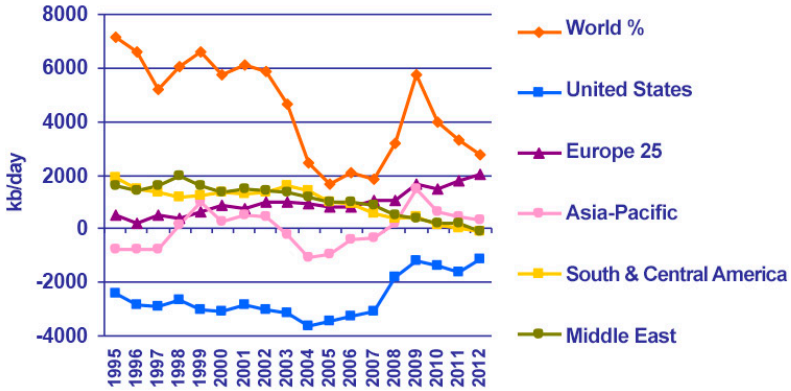
- In the world's **emerging regions**, such as Asia-Pacific, South & Central America and the Middle East, there are a number of refinery projects in development, but companies are finding it very difficult to build enough refining capacity in order to keep pace with growing oil demand. Annual growth in demand during this period was 4.4% in the Asia-Pacific region, 3.3% in South & Central America and 3.5% in the Middle East, while refining capacity only increased by 2.9%, 0.3% and 1.4%, respectively. In 2012, there was equilibrium between oil supply and demand in these three regions. But in the short term, there is a risk of under-capacity. This is a precarious situation in terms of efforts to reduce energy dependency. And it is becoming more serious if refinery utilisation rates are factored in – rates which are still relatively low, particularly in South & Central America and the Middle East (78%). Utilisation rates in the Asia-Pacific region are 84% – a more acceptable level.
- The situation in **Europe and the US** is different. In the US, the capacity deficit has been gradually falling for the last four years (-0.4% on average per year since 2009), but in Europe, overcapacity continues to increase by an average of 6% per year. The relative improvement in the situation in the US can mainly be attributed to fall in demand. Higher oil prices and more efficient fuels used in light vehicles[1] helped reduce road fuel consumption by 290 kb/d between 2010 and 2012. In 2012, the US went some way towards achieving equilibrium by slightly increasing its existing capacity. In Europe, both

[1] See CAFE (Corporate Average Fuel Economy) Standards

oil prices and consumption are falling: the deterioration of the situation – increasing over-capacity – can be explained by demand that is falling faster than refining capacity. Even when the economic recovery takes hold, oil consumption is not likely to return to the levels of a few years ago: a reduction in global energy intensity, combined with improvements in energy efficiency should result in more modest energy consumption in the long term. As far as European refining is concerned, it looks as though it will take time to reabsorb the structural difficulties with which it has been faced. 2012 has only served to confirm this state of affairs.

- Globally, the trends that the world's emerging countries are following are prevailing. Accounting for 45% of oil consumption in 2012 and 48% of refining capacity, these regions are driving the world market in terms of surplus/refining capacity deficit. This trend looks set to become more pronounced.

Figure 29: Gap between refining capacity and demand for products



Source: IFPEN, based on the BP Statistical Review of World Energy 2013

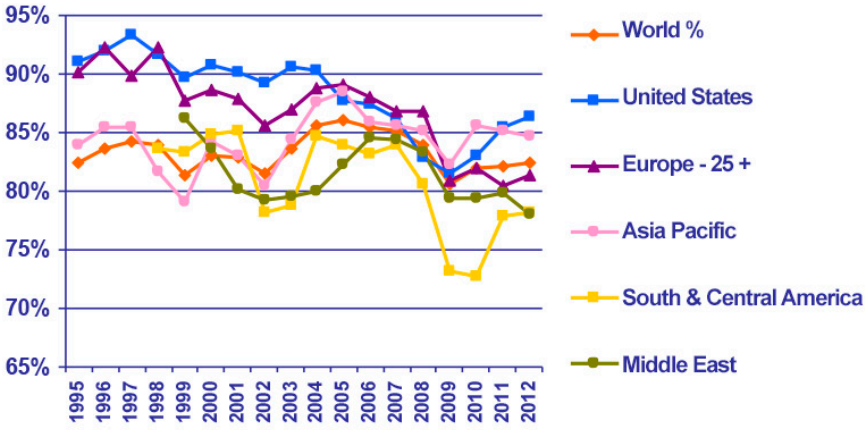
For **2013** and **2014**, the IEA has confirmed its forecasts for growth in demand, with a 1% increase in crude oil consumption in 2013 (to 90.9 Mb/day), and a 1.2% increase in 2012 (to 92 Mb/day)[2]. This is a result of the global recovery starting to take hold. The IEA also sees signs of the differences in the trend for demand between the OECD countries and countries outside the OECD reducing: growth in the world's emerging and developing countries and the contraction of the economies of developed countries have both become more moderate. Nevertheless, "countries outside the OECD will continue to drive world oil demand, while consumption in OECD countries will continue to fall". As has been predicted, demand from non-OECD countries will exceed demand from OECD countries in the third quarter of 2013.[3]

As far as refining is concerned, work on new capacity scheduled to come online in the mid-term is progressing rapidly – in accordance with forecasts for projects that have a high probability of being implemented –, keeping pace with increase in demand. Current overcapacity – which has been falling over the last four years – will once again start to increase in the years to come if the projects which have been scheduled actually go ahead.

[2] OPEC has also revised upwards its forecasts for world oil demand in 2013 and the following year. For this year, the cartel is forecasting demand of 89.74 Mb/day, as opposed to 89.71 Mb/day, the figure it published in its August monthly report. For 2014, OPEC is now predicting 90.77 Mb/day (as opposed to the 90.75 Mb/day it was predicting last month).

[3] The IEA is also predicting a measure of appeasement as far as supply is concerned as a result of a number of favourable factors: maintenance operations coming to end on facilities in several regions, near-record production in Saudi Arabia and continued growth in unconventional oil production in North America.

Figure 30: Refinery utilisation rates



Source: IFPEN, based on the BP Statistical Review of World Energy 2013

4.2 Recovery in capital spending in emerging countries

In 2013, refinery spending across the world reached US$70 billion – a 1.9% increase on the previous year. This moderate increase in spending is characterised by situations which differ from region to region. Investments are mainly concentrated in emerging countries in the Asia-Pacific region, the Middle East and South & Central America. Globally, the low increase in spending is commensurate with the only moderate increase in capacity throughout the world – and the relatively low levels of refining margin are not an incentive to spend more.

Capital spending is starting to rise again (+2.8%), evidence of new capacity and projects recovering all over the world. For the first time after a long period of uninterrupted growth, maintenance spending held steady in 2013. Industrialised countries – which have mature industrial facilities, and whose refining capacity only varies by very small amounts – are more concerned by this spending. Spending on chemicals and catalysts has continued to increase in 2013 (+3.2%), at a rate similar to the year before. There are various factors behind this increase: refinery utilisation rates that have increased slightly all over the world, the expansion of processing units and new units expected to come online in 2013.

Table 2: Refining industry global spending (in billions of US dollars)

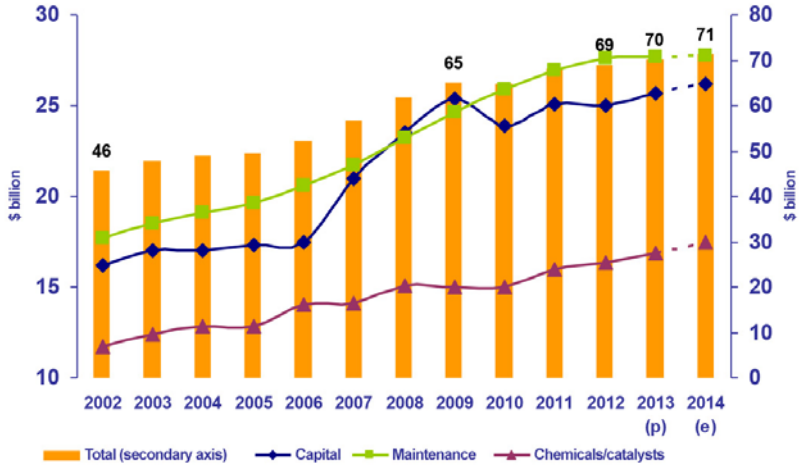
	2010	2011	2012	2013 (p)
Investments	23.9	25.1	25.05	25.7
Maintenance*	25.9	26.9	27.6	27.7
Catalysts and chemicals	15.0	15.9	16.4	16.9
Total	64.8	67.9	69.0	70.3

Source: IFPEN based on HPI Market Data; (p) projected
** 40% for facilities and equipment and 60% on labour and services.*

The consolidation of world growth, the rise in oil demand – even if it is only slight – and the absence of any tension affecting supply all create a climate that is favourable to investment. Order books for new capacity in the years ahead give rise to a measure of optimism as far as future investments are concerned – despite capacity in the world's industrialised countries falling or stabilising. Despite this optimism, there is still a need for caution – given the growth forecasts in the world's emerging countries (the BRICS countries in particular), which hint at a slight decline. There is also a great deal of uncertainty owing to various political situations (Syria, Libya, Iran, etc.), which can compromise supply, and local monetary crises (India, Indonesia and Thailand) which can affect oil demand.

2014 looks as though it will be affected by the same trends as 2013: a cautious increase in overall spending, with the emphasis on capital spending and spending on chemicals & catalysts, with maintenance spending holding steady.

Figure 31: Change in refining industry global spending (in billions of $)



Source: IFPEN based on HPI Market Data; (p) projected

4.3 Asia is still the Eldorado for investment in the downstream oil sector

A distinction should be made between two types of projects. **"Probable" projects** have a high likelihood of going ahead, whereas **"possible" projects** tend to be announced for their effect and are less likely to materialise[4].

- If we only look at probable projects, new **atmospheric distillation capacity** throughout the world looks set to increase by 370 kb/day in 2013 – an increase of 5% compared with projects identified in 2012 – and will reach a total of 8.1 Mb/day, which is 9% of the world's current total atmospheric distillation capacity (92.5 Mb/day). A modest increase, but an increase that follows a sharp decline of 15% between 2011 and 2012.

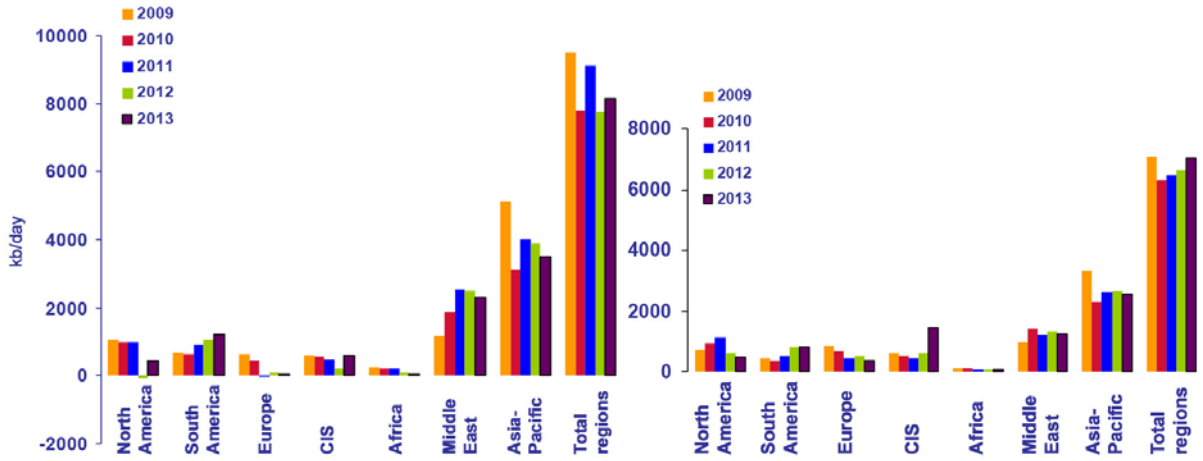
In this context, the Asia-Pacific region and Middle East – the two main regions – which is where 70% of all projects are located, have seen a 10% and 8% decline, respectively. It is worth pointing out that this is the second year in a row that these two regions have seen a fall. Conversely, South & Central America, the CIS countries and North America in particular have all seen strong growth compared with the previous year, simultaneously resulting in an overall increase in distillation capacity.

According to the US federal agency (EIA), the increase in refining capacity in the US is mainly due to Motiva Enterprises' Port Arthur refinery having been extended (50-50 joint-venture between Shell and Saudi Aramco), and to the Trainer refinery (Pennsylvania) having resumed activity (a refinery which previously belonged to Phillips 66, and which is now the property of Monroe Energy, a subsidiary of the Delta Airlines carrier)[5]. Africa should see its activity recover – particularly in Algeria, which has just embarked on a major rehabilitation programme for its refineries in order to bring about significant increases in its refining capacity. Within the framework of this programme, Algeria should more than double its capacity over the next 5 years, increasing it from 25 Mt/year to between 50 and 60 Mt/year[6].

[4] This analysis involves projects that were identified in April 2013.
[5] With an atmospheric distillation capacity of 600 kb/d, Port Arthur is currently the largest refinery in the US.
[6] The programme will involve: modernising the refineries of Arzew, Skikda and Alger, as well as building new ones (we do not have details of these)

Figure 32: Refining projects – <u>distillation</u> capacity by geographic region

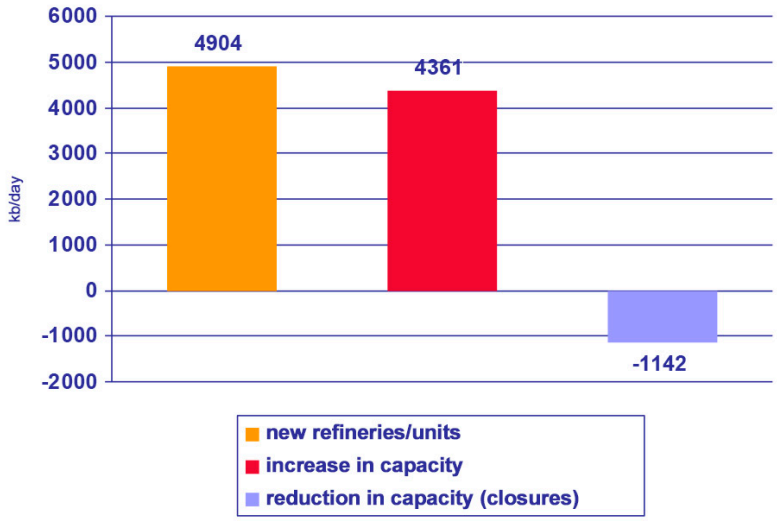
Figure 33: Refining projects – <u>conversion</u> capacity by geographical region



Source: IFPEN based on data from KBC

New refinery projects represent capacity of 4.9 Mb/day, increases in capacity represent 4.4 Mb/day, and projects to reduce or close capacity altogether represent a fall of 1.1 Mb/day, leaving a net total of 8.1 Mb/day. Reductions or closures represent a fall of 40% compared with the previous year. 60% of all closures in 2013 are in the Asia-Pacific region. This goes some way towards explaining how it is that projects have remained almost stable this year; the Middle East and Europe account for 18% and 17% of closures, respectively.

Figure 34: 34 Refinery projects – new atmospheric distillation capacity by type of change



The main projects the refining capacity of which is 200 kb/d or more:

o	IOC Paradip (Orissa), India	300 kb/d	2013
o	PetroChina Sichuan (Pengzhou), China	200 kb/d	2013
o	Sinochem (Quanzhou, Fujian), China	240 kb/d	2013
o	SATORP, Saudi Aramco/Total Jubail-2, Saudi Arabia	400 kb/d	2013
o	YASREF, Saudi Aramco Yanbu, Saudi Arabia	400 kb/d	2014
o	Takreer, Ruwais, (expansion), Abu Dhabi	417 kb/d	2014
o	Petrobras/PDVSA Pernambuco, Brazil	230 kb/d	2014
o	TURCAS / SOCAR, Aliaga Star (Turkey)	214 kb/d	2015
o	PetroChina / Aramco (Yunnan), China	200 kb/d	2015
o	Sinopec Zhenhai Refinery, China	300 kb/d	2015
o	Sinopec KPI/Total (Guangdong), China	300 kb/d	2015

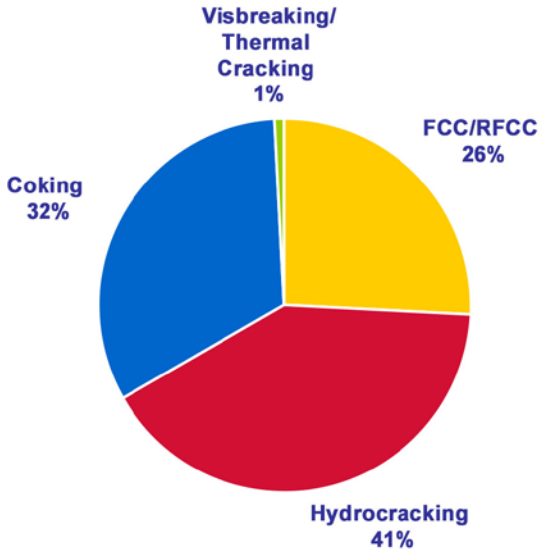
o	CNOOC Huizhou, China	200 kb/d	2015
o	PetroChina/PDVSA (Jienyang), China	400 kb/d	2016
o	Saudi Aramco Jazan (Phase I), Saudi Arabia	400 kb/d	2016
o	PetroVietnam/KPC/Mitsui/Idemitsu - Nghi Son, Vietnam	200 kb/d	2017
o	KNPC, Mina Abdullah, Kuwait	264 kb/d	2018
o	Petrobras Maranhao, Premium I, Brazil	300 kb/d	2018
o	PEMEX, Tula, Hidalgo (Mexico)	250 kb/d	2020

o New **conversion** capacity throughout the world looks set to increase by 386 kb/d in 2013, up 6% compared with 2012 to reach 7 Mb/day. The rate at which new conversion capacity is being introduced is slightly higher compared with annual changes since 2010.

As far as the world's geographical regions are concerned, the number of conversion projects is stable in South & Central America, Africa and the Middle East, and has fallen slightly in North America, Europe and the Asia-Pacific region. Capacity has increased in CIS countries by 133% in a year. In terms of predicted capacity, the CIS countries are now in second place (21%), replacing the Middle East (18%). But they are still a long way behind the Asia-Pacific region (36%).

Out of a total of 7 Mb/day, hydrocracking projects account for 41% of predicted volumes – 2.9 Mb/day. These are followed by coking projects which account for 32% (2.3 Mb/day) and fluid catalytic cracking (FCC/RFCC) accounting for 26% (1.8 Mb/day). Visbreaking and thermal cracking projects only account for 1% of volumes scheduled for the mid-term.

Figure 35: Refinery projects – conversion capacity per type of unit

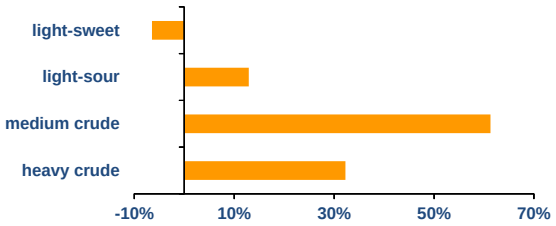


Source: IFPEN based on data from KBC

o After something of an explosion in the numbers of refinery projects in the Asia-Pacific region and in the Middle East, the last two years have seen a slowdown in the creation of new **distillation and conversion capacity** – even though these regions remain the undisputed drivers of growth in investments in this sector. These two regions account for more than 60% of all projects scheduled for between 2013 and 2020.

Overall supply shifting increasingly towards heavy crude oils.

As far as supply prospects are concerned, there has been a notable shift towards increasingly heavy crudes and crudes with a high sulphur content. Processing units will need to be very flexible in order to process the various different types of crude - something which will require major investments. Overall, most of the projects identified meet this requirement: the new capacities are clearly geared towards processing medium and heavy crude oils and this will ensure greater levels of flexibility for production facilities. This trend does not apply fully to the US, where the recent development of shale oils has had a tendency to modify the crude mix (see below).



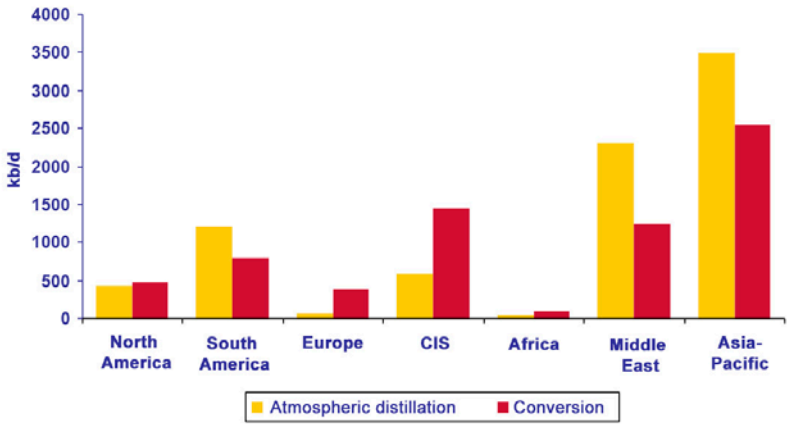
Source: IFPEN based on data from KBC

Globally, there is a more or less equal number of atmospheric distillation and conversion projects (54% and 46%, respectively). But some regions – such as Asia-Pacific, the Middle East and South & Central America – are concentrating more on distillation projects than on conversion projects. Their approach is more focused on increasing new capacity (new refineries and/or increasing capacity at existing facilities) in order to meet the needs of their own local market. For these regions, the emphasis is on capital expenditure (capex).

The situation in Europe and the CIS countries is completely different: here, the absolute priority is to convert existing facilities, adapting equipment so as to meet consumption requirements. In Europe, conversion projects account for nearly 60% of the total number of projects[7] (atmospheric distillation + conversion). In Russia, conversion projects account for more than 70% of the total number of projects – as a result of the country's programme to renovate and modernise its refining facilities. There is a risk of this programme having a negative effect on European refining capacity in the long term.

In the US, investment is evenly distributed. The country has embarked on a programme to restructure its refining sector, which involves optimising – in each district (PADD) – its cut of crude, striking a balance between local light crudes and heavy imported crudes. High margins and an outlook which suggests sustained growth are encouraging American refiners to invest in both deep conversion projects and in processing light crudes[8].

Figure 36: Refinery projects – distribution by project type: distillation/conversion



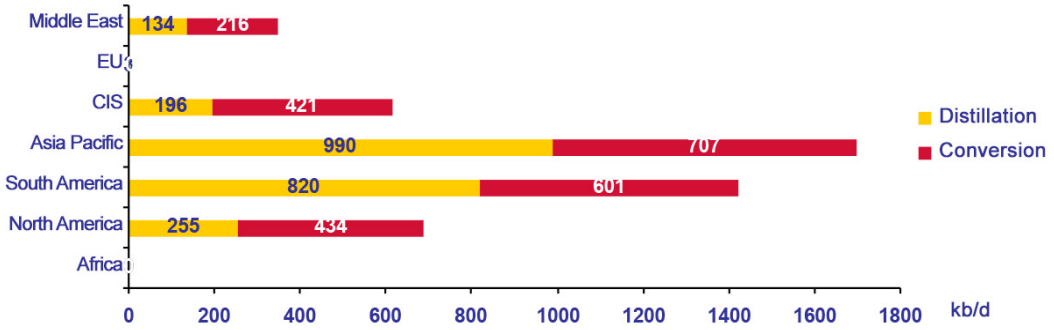
Source: IFPEN based on data from KBC

[7] Without taking asset closures into account
[8] Oil Medium Term Market Report 2013, Market Trends and Projections to 2018, IEA

Postponed projects:
For various technical, economic, financial and/or geopolitical reasons, more than 33% of projects have been postponed by at least a year:

- *30% of atmospheric distillation projects – the equivalent of 2.4 Mb/day. Most of these projects are in the Asia-Pacific region (990 kb/d) and in South & Central America (820 kb/d) – 75% of all projects. The remaining volumes are distributed between North America, the CIS countries and the Middle East. The Jizan refinery should also be included, which was initially scheduled for 2016, but whose commissioning date will probably be postponed; its capacity is 400 kb/d.*
- *34% of all conversion projects reach levels of capacity that are comparable to those generated by distillation – 2.4 Mb/day. Here too, the Asia-Pacific region and South & Central America are the regions that have been the most affected, with 55% of all projects being postponed. These regions are followed by North America, the CIS countries and the Middle East.*

This data shows a level of stability as far as distillation projects are concerned compared with the previous year, but an increase in the number of conversion projects (+75%).



The main conversion projects the refining capacity of which is 80 kb/d or more:

o	BP – Whiting, IN, United States	delayed cokefaction	84 kb/d	2013
o	IOC, Paradip, India	FCC	90 kb/d	2013
o	IOC, Paradip, India	delayed cokefaction	82 kb/d	2013
o	SATORP Saudi Aramco/Total, Jubail 2, SA	FCC	120 kb/d	2013
o	SATORP Saudi Aramco/Total, Jubail 2, SA	Hydrocracking	80 kb/d	2013
o	SATORP Saudi Aramco/Total, Jubail 2, SA	delayed cokefaction	80 kb/d	2013
o	YASREF Saudi Aramco/Total, Yambu, SA	Hydrocracking	124 kb/d	2014
o	YASREF Saudi Aramco/Total, Yambu, SA	delayed cokefaction	80 kb/d	2014
o	Takreer, Ruwais (expansion), Abu Dhabi	RFCC	127 kb/d	2014
o	Rosneft, Tuapse	Hydrocracking	81 kb/d	2014
o	Petrobras/PDVSA, RNEST, Brazil	delayed cokefaction	80 kb/d	2014
o	Sinopec Zhenhai Refinery, China	Hydrocracking	80 kb/d	2015
o	PetroChina/PDVSA, Jieyang, China	delayed cokefaction	120 kb/d	2016
o	PetroChina/PDVSA, Jieyang, China	Hydrocracking	120 kb/d	2016
o	PetroChina/PDVSA, Jieyang, China	FCC	80 kb/d	2016
o	Saudi Aramco, Jazan Ohase II, SA	Hydrocracking	106 kb/ d	2016
o	PetroVietnam/KPC/Mitsui/Idemitsu, Vietnam	RFCC	100 kb/d	2017
o	Lukoil, Nizhny, Novgorod, Russia	Hydrocracking	96 kb/d	2018
o	Petrobras, Maranhao, Train I, Brazil	delayed cokefaction	120 kb/d	2018
o	Petrobras, Maranhao, Train I, Brazil	Hydrocracking	80 kb/d	2018
o	Pemex, Tula, Hidalgo, Mexico	delayed cokefaction	166 kb/d	2020
o	Pemex, Tula, Hidalgo, Mexico	FCC	110 kb/d	2020

4.3.1 Continuing overcapacity in the medium-term

In view of additional capacity, medium-term operating capacity and projected oil demand according to the IEA[9] , which - given the uncertainty regarding the future - foresees a moderate increase in world oil demand over the long term[10], the situation is likely to continue to deteriorate over the next few years, with overcapacity increasing still further.

[9] WEO 2012
[10] Average annual growth in oil demand of 0.6% between 2011 and 2035 under the "New Policies Scenario". In the WEO's recent publication, average annual growth in oil demand was put at 0.5% between 2010 and 2035 under the same scenario.

Refining capacity in 2012 stood at 92.5 Mb/day[11] and oil demand was 89.94 Mb/day – meaning a surplus of 2.6 Mb/day. In 2020, refining capacity will reach 100.7 Mb/day and demand 94.1 Mb/day, meaning a surplus of 6.6 Mb/day - an additional 4.0 Mb/day.

Globally, the medium-term outlook for demand and refining capacity shows that - after after an initial period both these figures will increase at relatively similar rates - from 2015 onwards (which is when the forecasts start to suggest a long-term slowdown in world demand), the difference between these two variables will start to widen, increasing refining capacity surplus.

In the world's regions where demand has been increasing rapidly for a few years, the high number of projects suggests a strong desire to build refining infrastructure in order to meet energy requirements and ensure that the high rate of economic development that these regions are currently enjoying can continue. In these regions, forecasts suggest that growth in refining capacity will outstrip demand, perpetuating the state of affairs experienced in previous years.

In its annual Medium-Term Oil Market Report (MTOMR) report which was published in May, the IEA puts crude oil distillation capacity throughout the world at 96.9 Mb/day. That's 4.7 Mb/day more than BP's estimates in its BP Statistical Review which is published annually and which serves as the basis for our analysis. This difference can be explained by a detailed analysis of independent refineries in China, the combined capacity of which is – according to the IEA – 3.3 Mb/day. Many of these refineries are small – with capacity of less than 40 kb/d. And the vast majority will be closed by the government in the short term.
Based on the IEA's data, distillation capacity surplus is proportionally greater than the surplus detailed in this report: it will increase from 96.9 Mb/day in 2012 to 104.8 Mb/day – a 7.9 Mb/day increase in capacity in five years. It should be remembered that according to our forecasts, capacity will increase from 92.5 Mb/day in 2012 to 100.4 Mb/day in 2018 – the same rate of increase in both cases (7.9 Mb/day in five years).

In Europe and the US, however, demand is falling. In Europe, refining capacity has not yet reached equilibrium (relative to demand) and should continue to fall. Given the current context of structural decline in demand, equilibrium is particularly difficult to reach and new reductions in capacity are expected. This state of affairs applies to all of Europe.

However, in some countries within the EU, such as Spain (which has long been in deficit), there has been a significant increase in refining capacity over the last three years[12] together with a fall in demand (as is the case throughout Europe). This has resulted in a slight overcapacity in Spain since 2012, a situation which looks set to continue in the mid-term. Mention should also be made of Italy, particularly the ENI group which has not taken the same view as other companies in Europe and has instead decided to invest €700 million in the Gela refinery (which has been running at a loss) in order to overcome the site's structural weaknesses, transforming it into a technological hub. The idea was to keep pace with market requirements more effectively, optimising diesel production with the option to discontinue production of petrol[13]. According to ENI, a competitive advantage is possible through innovation and research. The project is proactive and courageous because it will depend heavily on increases in margin. It would seem that ENI is relying on margin recovering in the medium term as refining capacity falls across Europe and consumption either recovers or stabilises, helping the economy to eventually recover.

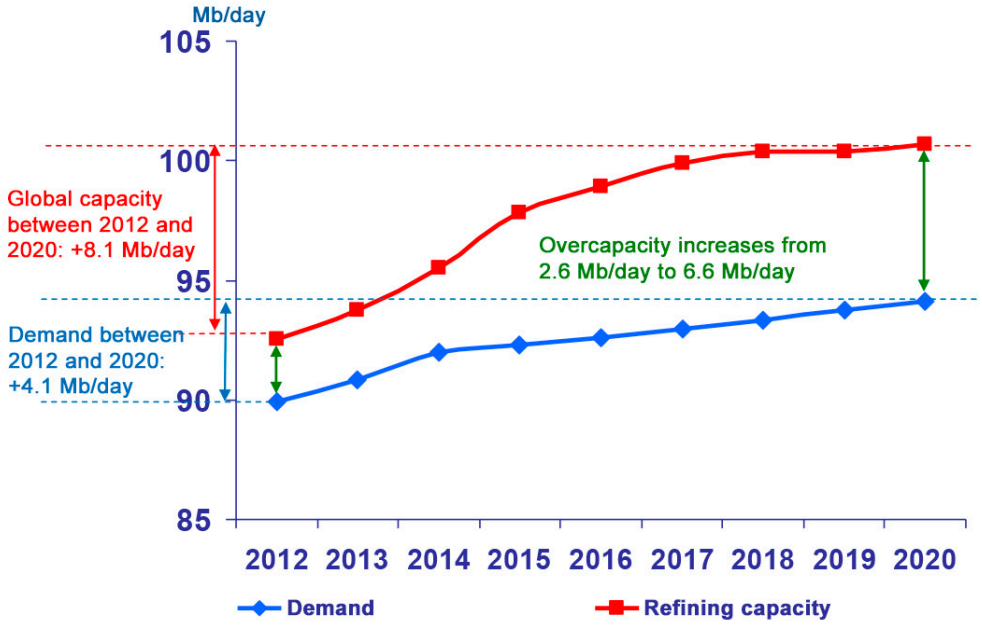
In the United States, where the situation is now more favourable to refining as a result of higher margins – particularly as far as the "Mid Coast" reference is concerned – the deficit should be reduced by a mid-term increase in refining capacity.

[11] BP Statistical Review

[12] Somorrostro and Cartagena refineries (expansion in atmospheric distillation), together with the Puertollano refinery atmospheric distillation project.

[13] and polyethylene. The refinery will therefore get new advanced systems (next-generation hydrocracking technology), a new T-Sand catalysis process (which has been patented by ENI) for producing high-quality diesel and the "zero waste" ENI system for using industrial waste to generate energy. And its research and investment activities for producing third-generation biofuels using algae will also continue.

Figure 37: Medium-term trend in refining capacity and demand, 2013



Source: IFPEN based on data from KBC and IEA

But at the global level, the continuing surplus will affect refining margins. And this will result in the refineries that are less profitable, more obsolete, smaller and less well adapted to market requirements becoming vulnerable – requiring major transformation investments. It should be pointed out that the upgrading ratio should increase from 44% to 47% between 2012 and 2018 as a result of new refinery projects that involve transforming heavy crude oil in the Middle East and in Latin America.

4.3.2 Differing investment strategies

At global level, a more balanced situation between supply and demand will doubtless be required. Investments will have to be authorised in order to provide for:

- **more stringent quality specifications** for petroleum products, especially those pertaining to their sulphur content. Changes in regulations which apply to marine fuels may accelerate the construction of full conversion refineries (coker unit, residue cracking).
- **structural trends in demand**, such as the weight of diesel and surplus petrol in Europe, demand which is more moderate in the long-term in some regions and the need to adjust refining capacity as a consequence, etc. The very high cost of hydrocracking units – needed to cope with the growing numbers of diesel vehicles, particularly in Europe – will continue to inhibit growth, especially on a market where low margins penalise investment.
- **changes in regulations which penalise refineries.** Regulations that are being introduced, especially in Europe, call for a reduction in current local emissions levels (SO2, NOx, PM, CO, etc.), as well as global emissions levels (CO2 for the most part, via quota allocation plans and the Emissions Trading Scheme directive in refineries.[14] As a result, more emissions reduction techniques will need to be deployed, which will act as a drag on investments.

European refiners will have to address these three factors on an increasingly competitive market where once again, there is a risk of European refining capacity being put to the test. Apart from the emergence of major new refining companies from Asia which are increasing

[14] Emission Trading Scheme

world refining capacity and influencing global margin in the long-term, the following should also be added

- recent changes to the situation in the US, where a decline in the demand for petrol and an increase in diesel and biofuel consumption have disrupted the equilibrium of European refining. The US has always been the traditional outlet for surplus petrol from Europe, and this has now been significantly compromised in the long-term. Since 2010, the Americans have even been exporting petrol[15].
- the Russian refinery modernisation programme which, by producing and exporting products in compliance with the most stringent specifications, including ULSD, is running the risk of entering into competition with European markets.

In regions where demand is high, a balance has to be maintained between investment and demand, complying with environmental requirements, while at the same time maintaining a degree of overcapacity margin.

Globally, market watchers are seeing confirmation of the mainstream trend which has been under way for several years now: investments are shifting away from mature economies – the OECD countries – towards emerging countries, Asia in particular. High demand in these regions should ensure that this movement continues in the years to come.

[15] If Washington does not review ethanol requirements in the United States, US refiners may have to increase their petrol exports, according to statements from LyondellBasell's senior vice-president in charge of refining. In order to provide fuels that are in compliance with federal requirements, petrol producers need to acquire ethanol credits for increasing volumes. But at the same time, this forces them to reduce petrol deliveries from the refineries intended for the domestic market, even though the domestic market is declining. Which is why they inevitably turn to exports, since in compliance with the Energy Independence and Security Act of 2007, petrol that is exported does not need to be mixed with ethanol. Every year, blending requirements – which apply to both petrol and diesel (which includes biodiesel from agricultural sources) – are made more stringent. Bip 15/03:2013.

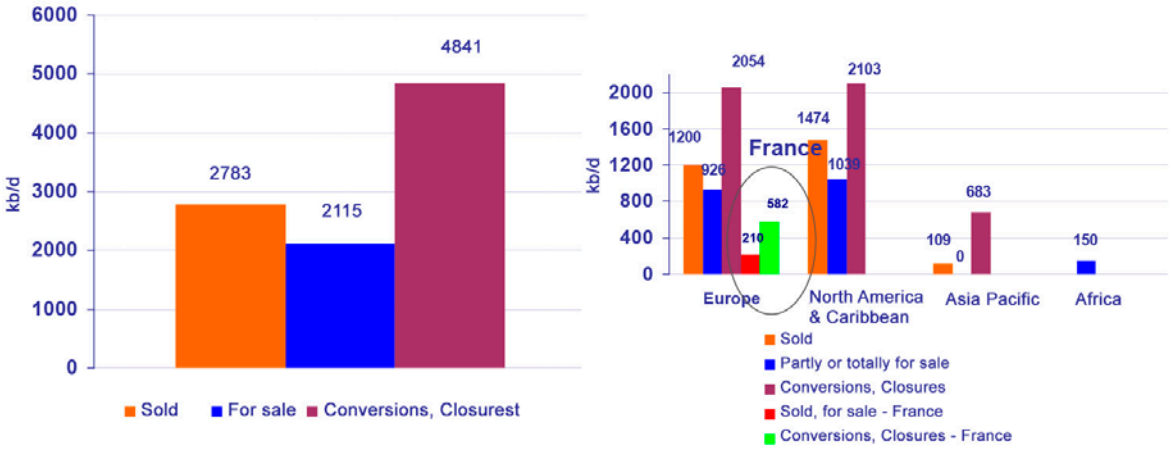
Fall in the numbers of refineries being sold or for sale, increase in the numbers of refineries having to close or undergo major transformations:

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 - carried on into 2013 and looks set to continue in the short term. This process is a reaction to both the poor economic conditions offered by the refining sector and to the considerably higher profits enjoyed by oil companies upstream, moving their investments into exploration-production activities.

Since the world economic crisis of 2008/2009, this trend has become more pronounced. 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 4.9 Mb/day - 0.8 Mb/day less than last year; those that have closed or undergone dramatic overhauls account for 4.8 Mb/day - 1.2 Mb/day more than last year. This makes for a grand total of 9.7 Mb/day, 0.4 Mb/day more than last year. Globally, more progress has been made with the process this year: a number of refineries which until now had not been listed as likely to close have recently ceased production, while others have gone from being "Sold/for sale" to "Undergoing overhaul/closing".

These restructuring operations affect the world's industrialised countries almost exclusively - particularly North America and Europe: 47% of the assets being sold, restructured or closed in this way are in North America. 43% of them are in Europe. These two regions are where 90% of all sales transactions and capacity destruction operations are located. 85% of all operations to destroy capacity are in North America and Europe. The remaining 15% involve closing or undertaking major overhauls of refineries in Japan, making for a grand total of 415 kb/d – 60% of the regional total.

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, according to a survey of refinery managers and analysts[16]. 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 which is seeing a fall in demand for petrol.



[16] including Gemma Parker at FACTS Global Energy. Source: Bloomberg