



# Brazil: pre-salt outlook

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## Introduction

Less than 10 years ago, at the height of the commodities boom, Brazil was assured a place as an oil world powerhouse, following the discovery of oil in its subsalt basins. Much faith has been put in Brazil delivering the barrels needed to keep the medium-term oil market in reasonable balance. This optimism had been brought to the forefront of the global oil and gas industries by the 2007/8 discovery of the vast pre-salt basins, specifically the Tupi field. This ranks alongside Kashagan as one of the largest and most significant oil discoveries of the past few decades. However, as has often been the case in recent history of the oil markets, a number of project delays and cost overruns have since taken the shine off the initial optimism.

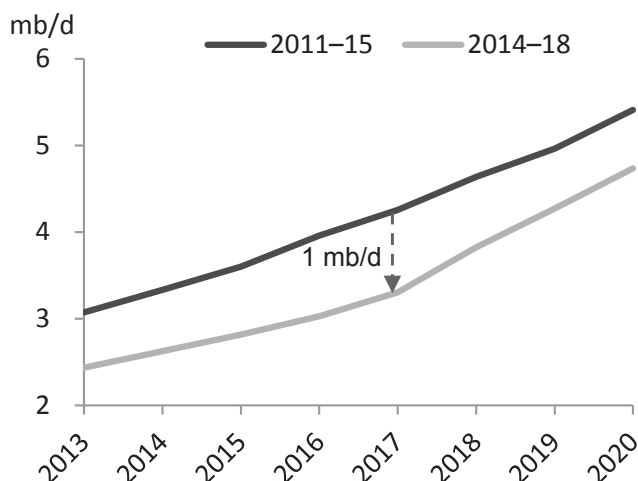
State-owned operator Petrobras accounts for over 90 per cent of Brazil's

production and has been at the centre of development in the country's oil sector. Petrobras has registered a reserve replacement ratio above 100 per cent for each of the past 22 years, with the 2013 figure at an impressive 135 per cent. This comes at a time when other major oil companies have been struggling to add incremental reserves to their portfolios. Despite the addition to reserves, Petrobras missed its annual production target in the period between 2003 and 2011 (revising its production forecasts downwards see graph on the next page), and even saw its annual output decline over the past two years, falling by 2 per cent in 2012 and by 1.6 per cent in 2013.

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So what has slowed progress in the Brazilian oil sector? We argue that Brazil's upstream sector faces a number of challenges which include: regulatory barriers, a massive financial burden (the world's largest corporate expenditure programme amassing US\$220.6 billion and increasingly funded by debt), high production costs, and steep decline rates. There has also been waning interest from major international oil companies (IOCs) in co-financing projects. The country's deep-sea bonanza has become less alluring, whilst oil companies have also been adapting to a changing energy landscape; this has been altered by a focus on capital discipline, US shale, and the emergence of other frontier energy sources, such as in deepwater Africa.

We begin by considering the status of Brazilian liquids production today, with a particular focus on the evolution of



**Petrobras' production forecasts, million barrels per day (mb/d)**

Source: Petrobras

pre-salt production. Brazil produces 2.3 mb/d of liquids output, approximately 75 per cent of which comes from the post-salt reservoirs in the Campos basin. Campos pre-salt production began in 2008 from the Jubarte field located in the Parque das Baleias region. Thereafter, production began at the Baleia Franca field in the second half of 2010, followed by the Baleia Azul region using the FPSO *Cidade de Anchieta* in September 2012. At the end of 2013, pre-salt production in the Campos Basin reached 0.17 mb/d and whilst a split is not available for 2014, anecdotal evidence suggests that the first half of the year has seen an acceleration in well activity, and therefore output.

The Santos Basin is the other main basin in Brazil, home to one of the most promising exploration and production (E&P) areas offshore Brazil. The pre-salt has been a central focus of E&P activities, with 13 of the 15 wells being drilled in that region in 2013. Several discoveries have been made in the pre-salt reservoirs, whilst the development of previous discoveries has allowed Santos Basin output to rise steadily. Output has increased from 0.11 mb/d in January 2013 to 0.28

mb/d by year-end, as five out of nine production units produced first oil during the year. Output averaged 0.19 mb/d in 2013, higher year-on-year by 80 kb/d (thousand barrels a day). The steady growth trend has continued and by August 2014 pre-salt production (Santos and Campos) reached 0.58 mb/d. This was accomplished eight years after the first pre-salt discovery in 2006, and was achieved from around 30 wells, highlighting the high productivity of pre-salt fields. Petrobras has set a target of achieving more than 1 mb/d of output from pre-salt by 2017 in the fields they operate. Future production from the Santos Basin will be predominantly from deep and ultra-deepwater fields, with 13 major projects in the development pipeline.

**Challenges: high decline rates, cost escalation, and regulatory reforms**

**Decline rates**

Analysis of well data available from the National Petroleum Agency (ANP) indicates that rampant, double-digit declines in existing fields are offsetting the efforts made in upstream. A recent report showed that on an annual

basis average production declines are between 17 per cent and 20 per cent. This number increased from 14 per cent in 2005 to 23 per cent in 2011, before falling back to 21 per cent in 2012 and 17 per cent in 2013. In 2014, increased operational efficiency in the Campos basin is believed to have reduced declines further. Assuming a 17 per cent decline on 2 mb/d of liquids output, some 0.3 mb/d of production capacity needs to be brought online each year to keep output stable. Given such steep levels of decline, any equipment and project delays quickly show up in a declining production trend. Broadly speaking, more than one large FPSO is needed each year to offset declines. That number rises as the field ages. This holds particularly for pre-salt discoveries.

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Brazil has installed around four barrels of production capacity for a net gain of one barrel in output over the past 12 years. It is no surprise that Petrobras has had difficulties reaching its various production goals, as presented in the annual strategic plans over the years. Delays in construction are common and, given the aforementioned decline rates, translate into immediate production drops.

**Cost escalation**

Cost escalation has also played its part. The evolution of Petrobras' five-year business plan is a tale of increased costs and production target misses, and though the latter have become a well-known feature for major oil companies over the years, Petrobras perhaps epitomizes the challenges facing the upstream sector.



Petrobras' E&P capex has increased almost 2.5 fold, from US\$65.1 billion in 2008 to US\$153.9 billion in its 2014–18 business plan. The percentage of capital allocated to E&P has increased from 58 per cent to 70 per cent, with Petrobras' total five-year capex increasing from US\$112.4 billion to US\$220.6 billion. The investment programme was revised upwards for five consecutive years, and only in 2014 did Petrobras reduce its overall capex programme, by US\$16.1 billion, although this was solely attributable to a US\$26.1 billion downward revision to spending in the refining, transportation, and marketing division.

Petrobras has seen a sharp rise in production costs for existing wells, as well as in costs related to equipment and facilities, labour, and materials. Production costs in 2011 and 2012 on average were 36 per cent higher than in 2010, and data for 2013 indicate a similar trend. The 10-year compound annual growth rate (CAGR) in production costs is 22 per cent. From 2003 to 2013, production costs have moved largely in line with oil prices (see graph below). However, given oil has,

on a quarterly basis, remained steady at around US\$110 for three years, and Petrobras continues to experience rising costs, the financial picture is, unsurprisingly, looking negative.

Currently, Petrobras estimates the breakeven cost of its production to be US\$45–55 per barrel for the pre-salt. This cost estimation is based largely on both the pool of existing conventional resources and the assumption that all of its reserves will be transformed into revenues. The high degree of complexity involved in deep and ultra-deepwater extraction requires expensive technology and manpower, while the existence of several technical challenges requires further expenditure to overcome. Also, unlike easily accessible conventional oil, there are high costs involved in getting the oil onshore from wells that involve distances of anywhere between 340 and 800 km.

Therefore, the recent pull-back in oil prices will be closely monitored by Petrobras, who in their 2014–18 business plan assumed a US\$105 oil price in 2014 and US\$100 in the longer term.

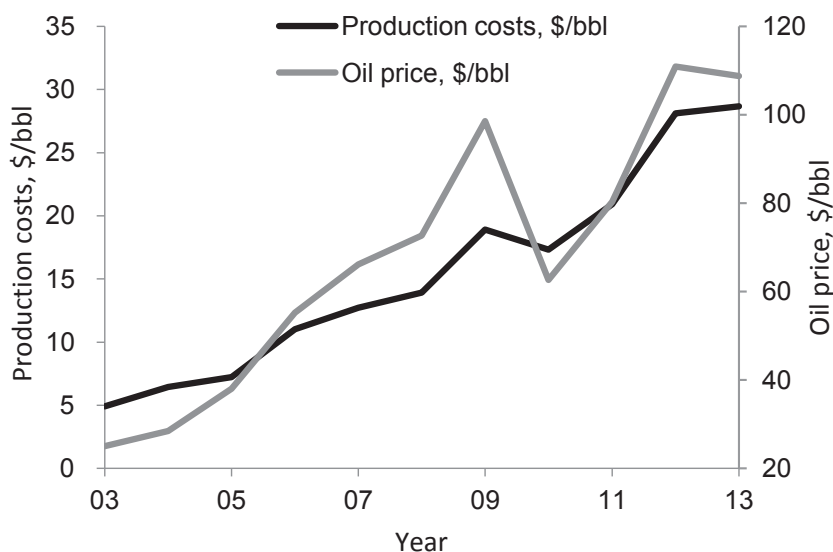
### Regulatory reforms

The change in the regulatory framework in 2010 was an important milestone in the history of the Brazilian oil sector, with the enactment of the following laws:

- *Law 12,351* – aims to regulate the exploitation and production of oil, gas, and other hydrocarbon fluids under the regime of production-sharing in the pre-salt (and other strategic areas) and create a Government Social Fund.
- *Law 12,304* – Pre-Sal Petróleo SA (PPSA), an entirely state-owned enterprise, was created by this law to monitor and manage production-sharing contracts signed with winning consortia. An operational committee will be responsible for the central decisions within these consortia.
- *Law 12,276* – provided for an onerous relinquishment regime, according to which 5 billion barrels of exploration rights were transferred to Petrobras with due compensation.

The reforms have undoubtedly shaped the rate, or rather lack, of progress in the Brazilian upstream sector. Once the scale of the pre-salt region became apparent after the Tupi discovery, the government suspended auction rounds, offering new acreage for exploration to oil companies, and set out to rewrite Brazil's oil laws. Due to the excessive bureaucracy that plagues Brazil (in common with many other resource-rich nations) this process took several years. Some argue that the uncertainty surrounding the reforms halted what had previously been annual auctions – leases sold through such auctions had helped more than double Brazilian crude output from under 0.9 mb/d in 1997 to 1.9 mb/d in 2008.

Petrobras' operational exclusivity in the pre-salt basin and strategic regions granted by Law 12,351 is one of the most criticized aspects of the new



### Petrobras' production costs vs oil price

Sources: Company data, Energy Aspects

statutes, since it may entail important drawbacks in the Brazilian oil sector. Because of the significant investments required in exploring such an enormous area, exclusivity has three possible consequences:

- A considerable reduction in the pace of exploration because of Petrobras' difficulty in coping with the huge investments required to be able to explore this vast area.
- A significant increase in Petrobras' debts to finance exploration activities.
- Reallocation of the company's international projects to allow focus on domestic exploration and the pre-salt basin.

### **Conclusion and implications for global oil market**

Brazil's upstream prospects will undoubtedly play a key role in keeping the oil market in balance over the near term. Discoveries such as Tupi and Libra have catapulted Brazil into the limelight, with key agencies suggesting that Brazil will play a critical role in the broader non-OPEC supply outlook. Back in 2006, the IEA predicted Brazil's output surpassing 3 mb/d by 2009; that expectation now extends to 2018. Petrobras, meanwhile, has lowered its production targets consistently over the past few years as oil output growth continues

to disappoint. This is not due to disappointing results from Brazil's pre-salt production. Quite the contrary; it has reached record highs of more than 0.5 mb/d as of August 2014, and the discovery-to-production period of eight years surpasses previous large discoveries in other parts of the world. The second half of 2014 has certainly seen Brazilian production turn a corner, with liquids output hitting a record high of 2.4 mb/d in August as a steady stream of high productivity pre-salt wells have been brought on stream. However, that said, recent experience suggests that scaling up production will remain a substantial challenge.

