

**José de Sá, John Norton and Juan Carlos Gay, Bain & Company, show that Brazil's oil and gas industry has tremendous new opportunities onshore, but to make the most of these new reserves, operators will need new capabilities and the ability to operate efficiently.**

**I**f constructing a deepwater well is like building a skyscraper – where detailed planning and excellent project management skills are prized – then think of building wells onshore as more like developing a tract of homes, where efficiency and a repeatable model are essential for success. Both are challenging projects that require a specialised set of skills and operational excellence in order to execute successfully. But simply knowing how to build one is no help when it comes to building the other; new capabilities must be applied to be successful.

Executives in Brazil's oil and gas industry are now wrestling with this challenge. They have spent decades building up expertise in deepwater drilling and production. But to thrive in the country's newly expanded onshore opportunities, they will need to implement a new array of capabilities for conventional and unconventional sites. Until recently, Brazil's oil and gas story was largely about offshore activity and the big findings in the pre-salt layer; the volumes offshore have dwarfed those on land. According to Brazil's National Agency of Petroleum, Natural Gas and Biofuels, production offshore in 2012 was 1.886 million bpd and 340 000 boepd of gas, while onshore, the numbers were only 181 000 bpd and 106 000 boepd of gas, having decreased by approximately 7% and 8%, respectively, between 2006 and 2012.

Nevertheless, in the last couple of years, the onshore frontier in Brazil's Northeast has started to show good promise, especially in the hands of new entrants, who increased the total number of wells drilled in Brazil from 27 in 2010 to 72 in 2012 and brought to life the Gavião Real, Gavião Azul and Gavião Branco fields in the Parnaíba Basin.

Adding to this excitement, this year's 11<sup>th</sup> round of bidding for hydrocarbon blocks re-energised interest in the onshore market. In that round, of the 123 onshore blocks offered, 87 were acquired, with special attention focused on the Parnaíba, Recôncavo and Tucano Basins in the

# Seizing the onshore opportunity in Brazil





Notes: \* - Other potential basins like Potiguar e Sergipe-Alagoas not analyzed due to lack of data  
 \*\* - Other potential fields not included; Considerable % might be used in internal production, flaring and reinjection  
 \*\*\* - Estimate by US EIA/2013 - not endorsed by ANP  
 Source: ANP, EIA, Gas Energy, Credit Suisse, Clippings, Bain analysis

Figure 1. Estimates of unconventional reserves versus pre-salt gas reserves in Brazil.



Figure 2. Brazil's power transmission grid, which could help fill the gap in midstream transport. Source: Sistema Interligado Nacional.

Northeast, which attracted bonuses of R\$ 228 million, roughly 90% of total bonuses paid for onshore blocks. Now, with all the buzz around North American shale gas, Brazilian regulators are planning a 12<sup>th</sup> round of onshore gas fields, unconventional and conventional, to encourage more investment and production. In this round, the total potential unconventional gas reserves could be larger than the pre-salt gas reserves (Figure 1).

In Brazil, it may be 10 years before shale gas is economically viable, given the lack of exploration, wells and field data in more than 90% of the region, a dearth of regulations on shale gas and, most importantly, not enough transportation infrastructure to connect those fields to the market. For example, in the high-potential basins of Parecis, São Francisco and Paraná, Parecis has no available midstream infrastructure, São Francisco has only a few pipelines and Paraná must connect to faraway infrastructure. In the Parnaíba Basin itself, where the Gavião Real field is already in production, the solution was to feed the gas directly into a thermoelectric unit to

connect to the market through the power grid. Regulators have promoted this solution in the advertising for the twelfth round as a way to show how a gas-to-power play can leverage the power grid as midstream infrastructure (Figure 2).

But success onshore could be a game changer for Brazil. The country's daily gas production could jump from 70 million m<sup>3</sup>/d of gas production today to potentially more than 130 million m<sup>3</sup>/d in 2020. In all, the onshore story is poised to fundamentally change Brazil's oil and gas industry, but it will

challenge local resources and abilities, especially on unconventional fields.

## Success onshore

So what should be on operators' minds when they look at this opportunity? Onshore reservoirs are easier to reach, but they present a different set of challenges. Taking into account what had been in the market until 2012, plus the new blocks from the 11<sup>th</sup> round and what will come from the 12<sup>th</sup> round, onshore Brazil will be a mix of new exploration frontiers, mature fields requiring rejuvenation and new unconventional fields. Conventional fields require operators to maintain maximum efficiency in drilling and well construction, as well as squeeze as much as they can out of existing wells, with minimal cost and the most efficient use of new investments. In unconventional fields, success depends on their ability to cost-effectively develop to their full potential those sites in the denser grid required by unconventional oil and gas.

## Winning in conventional onshore

Efficiency is one of the biggest challenges onshore. Using capital efficiently and keeping operating costs under control not only leads to healthy financial results, but also makes new projects viable, thus enabling companies to tap even more new reserves. Efficient well drilling and completion is the key in new sites (similar to the gas wells being drilled in the Solimões Basin) as well as mature fields (such as the wells being drilled in the Potiguar Basin to increase well density and the water injection wells in the Recôncavo Basin). Traditional approaches to improving yield have focused on drilling techniques and new technologies. However, there is just as much potential in improving the processes around drilling and construction, such as co-ordinating work on the field to avoid idle time, coordinating the equipment sequence to increase their utilisation rate and having better logistics.

A continuous improvement programme can keep the needle moving in the right direction. Successful programmes start with a clear vision of the potential, based on solid analytics and backed with a strong commitment from leadership. Reliable metrics let managers track the programme's progress and see how well it is being implemented. Throughout the organisation, clear responsibilities and decision rights ensure that nothing drops through the cracks, while a set of well-aligned objectives and incentives make sure everyone is

Total dollars spent to develop well

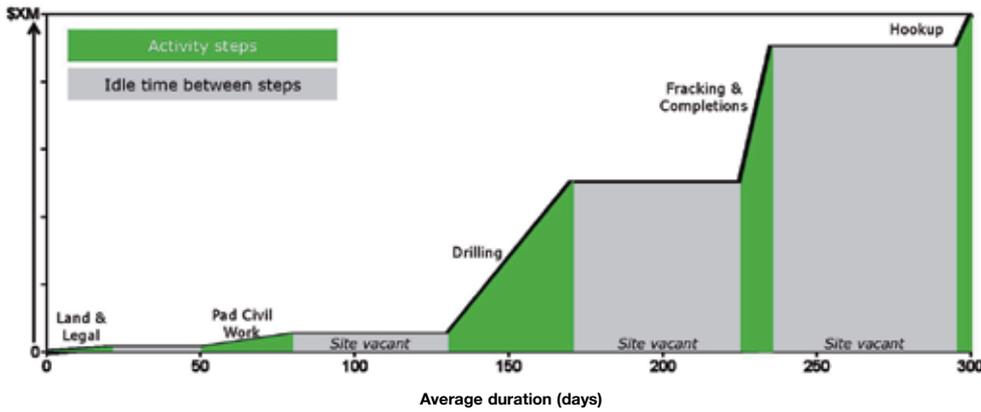


Figure 3. Poor co-ordination can result in long gaps of idle time during development and poor use of capital.

pulling in the same direction. Finally, successful programmes invest in training and coaching, and they put into place systems to feed learning back into the system.

Another big challenge is getting more out of mature fields with the minimum amount of expense. On average, even after 20 years of production, more than a third of recoverable hydrocarbons can remain in a field. Even a small increase in recovery efficiency can extend production by another two or three years in those wells, and the added profitability can help fuel new investments in the portfolio. Here again, many operators focus on the technology, but to capture the maximum possible, a comprehensive approach is necessary. A well-and-reservoir management programme should develop an updated understanding of the subsurface to help define a new approach for extracting more from the reservoir. A systematic process for this includes performance metrics, data mining and reporting tools, as well as systems for managing talent and critical decisions.

## Taming unconventional

Changing tactics to succeed in the unconventional environment may not come easily to organisations that have built their success on the advanced, mission-critical engineering requirements of the deepwater environment. To succeed in this arena, they will need to learn to move at a different pace and under a different profit design. Just as with the contrast between building a skyscraper and constructing a tract of homes, unconventional fields onshore require a factory-like process where speed, efficiency, standardisation and repeatability are the keys to success.

Unconventional reservoirs are easier to reach, but the timelines are shorter. While offshore drilling can require up to six months of up-front planning, unconventional well designs can be standardised and drilled factory style in 20 to 30 days. Onshore wells are less expensive, too, in the range of US\$ 5 million to US\$ 10 million each, compared with more than US\$ 100 million for deepwater wells, which is essential since so many more of them are needed for onshore unconventional.

Success with unconventional requires better and closer co-ordination among different parts of the company. A field can be in exploration, development and production at the same time, requiring people from across the exploration and production organisation to work closely with each other – sometimes almost on top of each other. Most oil companies have separate departments for exploration, development and production, with different personnel. Handover and interactions are not always smooth, and in unconventional projects,

there are many more decisions to be made; handoffs are quicker and more frequent. In deepwater, teams might have months or even years to plan the handoff from one group to another as a field moves from development to production, for example. The initial handoff from discovery to development might still take months, but most other handoffs might take only days or weeks in an onshore, unconventional environment.

The faster pace and intense local operational focus creates a range of new challenges with

production crews, external stakeholders and the supply chain. Wells go in quickly, so companies have to raise the game on keeping deliveries (sand, water, steel) to the well site. There is little margin for error, or sites sit dormant during production (Figure 3). Each well, while similar in design, might have its own particular details depending on its location and the geology under it.

From its experience in the Americas, Bain & Company has noted common pain points that suggest operators are struggling in the onshore, unconventional environment. Long periods of time to develop wells, frequent changes to development plans or schedules, or long lags between phases of development all indicate poor planning or supply chain difficulties. Field operators or contractors complaining about long decision times is another indicator of this kind of jam, as well as the last-minute changes in planned activities that affect third-party logistics and resource allocation. Wells that are declared uneconomical after drilling reveal that either the geology was poorly understood (and there is not as much there as was anticipated) or, more commonly, the company was not able to drill the well at the projected cost, so there is no longer a positive return on the investment.

Some companies struggle to maintain alignment across functional groups, and so they do not co-ordinate in ways that get the most value out of the well. For example, if a well has been completed and is ready to go online, but the gathering system (including the local pipeline) is not in place, better planning across units could have prevented the lag. Overall, a failure to meet production targets or overspending on capital or operating expenses shows the machine is not optimally tuned to the new onshore, unconventional challenge.

Additionally, although the trend over the past 20 years in the energy industry has been to centralise organisations around functions, the nature of unconventional oil and gas favours organisation by asset. This is partly because of the large number of decisions that must be made and the cross-functional nature of development, with different functions treading the same site at once. Even ExxonMobil, which has led the way in functional centralisation, has left the management of its 2010 acquisition, XTO Energy, largely independent.

All this suggests huge opportunities opening up in Brazil for companies that can bring to life the full potential of onshore gas reserves, conventional and unconventional. Those who focus on overcoming the challenges faced by operators and their supply chains will have a better chance of winning in this new scenario. **11**