

## Asia-Pacific's shale gas potential yet to be tapped

Promising plays are scattered across the region, but exploration has scarcely begun

UNCONVENTIONAL gas plays in the Asia-Pacific region are largely unproven with the exception of coal-bed methane (CBM) in Australia.

Shale's potential has been hyped up, yet there are only two wells – one in China and the other in Australia – that have flowed commercial volumes of gas.

So far, early shale-gas exploration wells have only been drilled in China, Australia and India. But there are no plays with more than 100 wells drilled yet – considered the minimum requirement to prove up a basin.

Nevertheless, developers remain excited about opportunities in both China and Indonesia, where on a technical basis the shales signal a high likelihood of being commercial. Both countries are gas-short and domestic gas prices are steadily rising, offering opportunities for investors.

Australian shale has great potential too, but the cost of doing business remains high and most of the plays remote, making break-even costs the biggest question mark. However, it's relatively cheap to farm into the emerging plays.

Thailand's shale resources, though small, also look promising.

But the identification of sweet spots

outside of Australian CBM will take some time.

Australia may not have the most unconventional gas but it's certainly the best at getting its act together, says Dylan Mair, an Asian upstream specialist at consultancy IHS.

Australia is the second biggest CBM producer in the world after the US. China ranks a distant third, followed by India and Indonesia. But in terms of gas in-place, China is number one, followed by Indonesia, India and Australia.

For investors it is about waiting. "They need to be willing to stick it out for the long-run or sell it to someone who is," adds Mair.

Since nothing is really proven yet it's not clear which nation's regulatory environment will work best. Terms in Asia are generally a derivative of production-sharing contracts (PSCs).

"Of those, Indonesian CBM terms are considered reasonably good, however the concept still works with an exploration and production phase," says Mair.

But the unconventional-gas business is generally a continuous farming operation with production and exploration happening in parallel. PSC terms that work with that model need to be developed.

Whether that happens in Asia remains to be seen, given little production to speak of yet, adds Mair.

### Indonesia

Indonesia has significant shale-gas potential. It could eventually be bigger than CBM, which is being prioritized by the government.

Indonesia has an estimated 46 trillion cubic feet (cf) of technically recoverable shale-gas resources out of 303 trillion cf of shale gas in-place, according to the US Energy Information Administration (EIA).

However, Indonesia's upstream regulator has estimated the nation's resources at 574 trillion cf and a study from the Bandung Technology University puts it even higher at 1,000 trillion cf. But the basis for these assessments has not been reported.

Western Indonesia tends to be dominated by structurally simple non-marine shales. On the other hand, Eastern Indonesia – Sulawesi, Seram, Buru and Irian Jaya – is tectonically more complex but has excellent marine-deposited shale source rocks, a report from US consultancy Advanced Resources International (ARI) shows.

The nation has received more than 70 proposals for shale-gas projects,

**Table 1: Size of assessed shale gas and shale oil resources**

Country	Basin	Formation	Risked gas in-place (tcf)	Technically Recoverable (tcf)	Risked oil in-place (Billion barrels)	Technically Recoverable (Billion barrels)
Thailand	Khorat	Nam Duk Fm	22	5	0	0
Indonesia	C. Sumatra	Brown Shale	41	3	69	2.8
	S. Sumatra	Talang Akar	68	4	136	4.1
	Tarakan	Naintupo	34	5	0	0.0
		Meliat	25	4	1	0.0
		Tabul	4	0	11	0.3
	Kutei	Balikpapan	16	1	17	0.7
	Bintuni	Aifam Group	114	29	0	0.0
India	Cambay	Cambay Shale	146	30	54	2.7
	Krishna-Godavari	Permian-Triassic	381	57	20	0.6
	Cauvery	Sattapadi-Andimadam	30	5	8	0.2
	Damodar Valley	Barren Measure	27	5	5	0.2

Source: EIA

the bulk of which focus on Sumatra, East Kalimantan, Central Kalimantan and West Papua.

Only a fraction of these have led to joint studies. But Jakarta said it is aiming to put two blocks up for auction by the end of the year.

The head of upstream oil and gas at the energy & mineral resources ministry, Hendra Fadly, told the *Jakarta Post* recently that his office was assessing the Kisaran Block in North Sumatra and the West Tanjung Block in South Kalimantan, both of which also hold conventional gasfields.

Meanwhile, the ministry is expected to offer up to eight shale-gas PSCs to companies that have carried out studies with the government.

Several firms, including Australia's AWE and Nu Energy, as well as Canada's Bukit and New Zealand Oil & Gas, have reported early-stage evaluations of shale-gas potential in Sumatra, but no PSCs have been awarded nor has any shale-related drilling been reported yet.

But, although Indonesia does not have any formal shale licensing regulations yet, these joint studies could eventually lead to PSCs.

Basins in Sumatra lie close to markets in Java, the archipelago's most populous island, while basins in Kalimantan lie near to the 22.5 million tonne per year Bontang liquefied natural gas export terminal, which is operating well below its nameplate capacity.

Earlier this year, Indonesian national oil company (NOC) Pertamina was awarded the Sumbagut Block in North Sumatra to develop the nation's first shale-gas project. The NOC committed to spend \$7.8 billion to explore the block and hopes to produce up to 100 million cf/d by 2020.

ARI's review shows that a number of onshore sedimentary basins have shale-gas potential. These include the central and south Sumatra basins; the Kutei and Tarakan basins in Kalimantan; and smaller, structurally complex basins in eastern Indonesia. Other basins seem less prospective due to low thermal organic carbon, high clay and carbon dioxide content,

as well as excessive structural complexity.

The US consultancy, whose studies are sponsored by the EIA, estimates risked, technically recoverable shale-gas resources at 3.3 trillion cf from the central Sumatra basin, 4.1 trillion cf from the south Sumatra basin, 1.3 trillion cf in the Kutei basin and near 10 trillion cf in the Tarakan basin.

## India

India finally cleared the way for shale-gas exploration in September saying the sector would be opened up in stages.

In the first phase, the country will allow two NOCs – Oil & Natural Gas Corporation (ONGC) and Oil India – to explore for and produce shale gas in blocks they already control.

At a later unspecified date, the government will allow other state-run, as well as private, companies into the shale-gas industry.

While India has been working on a new policy for shale gas for more than two years, the policy has been delayed by the difficulty of accessing the size and accessibility of gas reserves, as well as disagreements over how to price it.

A draft policy promises market-based pricing for shale gas and aims to discard the cost-recovery mechanism that applies to conventional oil and gas contracts.

A royalty and production-linked payment mechanism for shale gas, similar to the nation's CBM contracts, is being prepared.

India has many basins with organic-rich shales. Along with the Cambay basin, the Damodar Valley basin has been set as a priority for shale-gas exploration by the government. The Krishna-Godavari and Cauvery basins are also thought to be prospective.

India's risked shale gas in-place is estimated at 584 trillion cf and the technically recoverable shale-gas resource is estimated at around 97 trillion cf – equivalent to about 26 years of its gas demand – the latest data from the EIA show.

The Krishna-Godavari is thought to

hold the most technically recoverable shale-gas resources, pegged at 57 trillion cf. The Cambay is estimated to hold 30 trillion cf, with the Cauvery and Damodar Valley basins both thought to have 5 trillion cf each of recoverable resources, according to ARI.

However scant exploration has taken place. Less than five wells have been drilled so far.

But once the new policy is formalized, ONGC and Oil India will start exploration with the help of foreign expertise.

ONGC, alongside ConocoPhillips, will drill up to 10 exploratory wells in blocks spread across western Cambay, eastern Cauvery and Krishna-Godavari basins next year.

Oil India has identified the western Rajasthan and northeastern Assam for initial drilling and could team up with Carrizo Oil & Gas. The NOC holds a stake in the Houston-based firms' Colorado shale assets.

In neighboring Pakistan, risked shale gas in-place is estimated at 586 trillion cf, with 105 trillion cf thought to be technically recoverable. But there has been no exploration and few studies to date.

## Thailand

There has been no shale-gas exploration in Thailand, but the Southeast Asian nation has significant potential in the Khorat, Northern Intermontane and Central Plains basins, according to ARI.

The Khorat basin hosts the most potential and is estimated to hold 5 trillion cf of risked technically recoverable shale-gas resources. The shales can be locally thick, organic-rich, dry gas prone, deeply buried and over-pressured. They are also likely to be suitable for hydraulic fracturing.

The basin has an existing gas pipeline network, local drilling rigs and active independent oil and gas producers, which could drive shale-gas development in future.

Overall, Thailand's shale-gas potential is promising but needs to be better defined by more data gathering and analysis, writes ARI. **DE** ●