

Robin Sutherland - exploration in Southern Africa

Robin Sutherland, who is working with four different exploration companies in Southern Africa, gave an overview of exploration activities in Namibia, Zimbabwe, South Africa and elsewhere

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South Africa is still subject to frequent power outages, which could be fixed if more gas was available. The power shortage is hampering mining operations, extracting materials being used to make solar panels, wind farms and batteries. So even if you are a fervent supporter of moving away from oil and gas, there are good reasons to continue exploration in Southern Africa.

Robin Sutherland, who is working with four different exploration companies in Southern Africa, gave an overview of activities, speaking at a Finding Petroleum webinar on Feb 9.

Mr Sutherland is former head of Tullow Oil's exploration team for Africa, where he led its well-known discoveries and field appraisals in Ghana,. These were the Jubilee, and the Tweneboa, Enyenra and Ntomme (TEN) fields.

Today he holds a number of roles including technical lead with Monitor Exploration of London, South African adviser to Searcher Seismic from Australia, non-executive director of ASX listed Invictus Energy, and chief operating officer with Anglo Eurasia Power Africa in Cape Town.

The region is attractive for explorers, with many countries prepared to offer attractive production sharing agreement (PSA) terms, without big work programme requirements in the initial phase. So, operators can have options rather than obligations, he said. Another benefit is that you can often find there isn't much competition for onshore licences.

Namibia

In Namibia, exploration is happening in the Owambo Basin in the North, which extends into Angola, and the Nama Basin in the centre.

The most active explorers in Namibia are Mr Sutherland's company Monitor Exploration Ltd (MEL) and ReconAfrica.

Other companies holding acreage in the Owambo Basin are Babecca, Exito, Elephant Oil and Apprentice, he said.

ReconAfrica started exploring the region expecting it to be a "pure Permian play. "That's not what it is. It has been interesting to see what it really is," he said.

Monitor Exploration is a UK privately held company operating solely in Namibia. Monitor holds 55 per cent of the "PEL 93" block in the Owambo Basin, size 18,500 km².

In the Nama Basin, in the centre of the country, Monitor Exploration is about to sign a petroleum agreement with two blocks. "We've negotiated very favourable terms," he said.

A number of other areas around the country are "under application" for exploration licenses by other companies, but there hasn't been much movement since at least August 2023, he said.

Owambo Basin

The Owambo Basin region is on a rail line and has good roads and electricity transmission connections, while being far from "populated and wildlife areas", he said. "We have numerous potentially large hydrocarbon bearing structures."

An Australian operator 88 Energy Ltd is funding a 2D seismic program and will receive 20 per cent ownership in MEL's project in return.

MEL explores through its sister company Geodynamics Worldwide, which has the same majority shareholder. This company specialises in onshore exploration techniques other than conventional 2D and 3D seismic - so remote sensing, passive seismic, magnetotellurics and geochemical techniques.

The Owambo Basin is "not your normal tertiary cretaceous West African play," he said.

The reservoirs are formed in the neo-Proterozoic era (from 1000 to 538 million years ago).

It is not common for rocks of this age to have produced oil, but it has happened, with oilfields of this age in Oman and in the Szechuan basin of China, he said. "It's a bit more risky, because oil has to have stuck around for quite a while."

It is a very deep basin. There are a number of potential reservoirs. There are source rocks, some of which can be seen in outcrops.

There has been limited exploration to date due to a thick layer of sand above the reservoirs known as the Kalahari Formation.

There has already been a discovery in the basin (well Etosha 5-1A, drilled between 1965 and 1970 by the Etosha Petroleum Company, found a barrel of oil in the wellbore post suspension for operational reasons). ReconAfrica were exploring what they thought was a Permian (298mya to 251 mya) layer of the subsurface and drilled a well and "found hundreds of metres of oil shows," drilling through the base of the Permian and into the neo-Proterozoic section.

This was drilled as a stratigraphic well (only for understanding subsurface geology), on a site identified using aero gathered magnetic data.

You can see source rocks, reservoirs, seals, and structure, that formed about 550m years ago.

The first 700m of rock comes from the late Cretaceous, Jurassic, Triassic, and Permian. "Then we get to interesting stuff," he said.

There is black shale, which used to be thought Cambrian. "Recent work suggested this could be Silurian hot shale, seen all over North Africa, Europe and the Middle East," he said. "It's a very good source and seal."

Moving further down, there is the Damara, which is "good reservoir [rock]".

"The Etosha-5-1A well intersected this zone which flowed 1000 barrels a day of water on test without any stimulation," he said.

Further down, you come to tillites (large, detached rock bodies), and basinal shales, "which are good source rocks."

The well which found oil was linked to a carbonate source, which could only have come from here, he said.

There are two repeats of this, layers of shales followed by a layer of potential reservoir rock, "creating a perfect scenario," he said.

For exploration, the area has coverage of "very good quality" gravity and magnetics surveys taken by aeroplane, "which is a great start."

There have only been two 2D seismic surveys done, and they are quite old, done in 1969 and 1990. These have been used together to identify structures.

There has been one geochemistry survey, which found ethane concentration in the soil, with geochemical anomalies.

Passive seismic has been used. Monitor is looking at how passive seismic waves are impacted by hydrocarbon bearing reservoirs they pass through, modulating the frequency of the waves.

"It allows you to calculate probability of hydrocarbons at a specific point in the surface," he said.

With this technique, Monitor has determined a high probability of hydrocarbons in some of the structures which have been mapped using gravity and seismic data.

Monitor is building on this with further 200km of 2D seismic surveys later in 2024. It has 3 areas of interest identified with the passive seismic.

One structure covers 144km² area, so it could be a very large oil reserve if it contains hydrocarbons. Geochemical analysis of soil provides good support to the possibility of hydrocarbons, he said.

"If we were able to acquire thousands of kilometres of 2D seismic, we might get more definition on that."

Analysis shows that there could be "un-risked" recoverable oil of 7.6bn barrels, or 37.2 TCF.

There is some disruption to the data quality where there is shallow lava and layers of calcrete, he said.

"We're not exactly sure whether any hydrocarbons we find will be oil or gas. We think we've got a good chance of finding oil based on what Recon have seen. We will see," he said.

ReconAfrica has been exploring further Eastwards in the basin, and they have more seismic in their block. Some of it shows very clear imaging. There are some igneous intrusions in the area which "have some impact on reservoir quality."

ReconAfrica say they have 28 TCF of gas in place, or 2.3bn barrels of oil in place. They are planning a multi-well drilling program in the second quarter of 2024.

"We're very interested in the results because it has a direct impact on us [Monitor Exploration]," he said.

"We have a collaborative relationship with Recon. The new management are very realistic. They've got a believable story, and we wish them every success."

Nama basin

Monitor's block in the Nama Basin is on the edge of the basin, where there could be good source rock. There is a clear migration route where oil could have come from the central Nama basin.

There is not much coverage with seismic surveys. "It's a function of this enormous country and how much it would cost to cover everything in seismic," he said.

"We believe this has a very similar chance of success as the Owambo, but slightly different," he said. "It's a diversification of our risk."

The rocks have the same age, and there is evidence of a carbonate source rock from samples on the surface. There are multiple reservoir-seal pairs.

"We'll use the same exploration techniques to advance exploration - remote sensing, geo chem, passive seismic," he said.

Zimbabwe

Zimbabwe exploration began in the 60s, when Rhodesia (as it was called at the time) wanted its own source of oil to get around sanctions. There are two basins of interest, the Nama Basin (extending from Namibia into Zimbabwe) and the Zambezi basin. Both show oil seeps to the surface.

Oil producer Invictus has focussed on the Zambezi basin. It is Permian-Triassic, he said.

The background is that in the 1990s, oil producer Mobil used magnetic and gravity surveys taken by plane looking for minerals, to look for oil. There is a great deal of surveying for minerals in Africa.

Mobil found a very deep basin. They acquired a 2D survey to better understand the depth of the basement and the sediments and other rock layers.

They concluded that the Zambezi basin was best, with an enormous anticlinal structure in the middle, and two highs within the block. But they also thought it was likely to be gas, which they did not see a route to market for, and they were not comfortable with the Mugabe government, so decided to exit.

Invictus Energy picked it up in 2018, and they have a license covering the Cabora Bassa Basin in northern Zimbabwe. (Mr Sutherland is a non-executive director of Invictus Energy). They drilled two wells, named Mukuyu 1 and 2.

Mukuyu 1, was a gas discovery, but the company was unable to take a sample due to tool failures. Under Australian Securities Exchange (ASX) rules, it cannot be announced as a discovery.

The Mukuyu 2 well is 6.8km away on the same structure, and led to the Upper Angwa discovery, 450m up dip from the point in the reservoir intersected by Mukuyu 1. It was possible to obtain samples.

An announcement was made of 35m of pay. "It doesn't sound huge, but it's within a very large structure, which is not too common in this part of the world," he said.

The drilling also found a deeper overpressure interval, which could be explored further later.

There are also plans for a 3D survey and other drilling projects.

Invictus is targeting a number of other closures which were found on the Mobil data. One of them shows a 10km long velocity 'flat spot' on the seismic, "something we thought was very much worth following up."

South Africa

In South Africa, there have been some methane and helium discoveries in the Wits Basin.

A company called Renergen has explored further, finding methane and helium from deep sources. "We knew there was an old petroleum system but didn't believe you could make something of it," he said.

Renergen has stated proven and probable (2P) reserves of 407 BCF of methane, but also 13.6 BCF of helium, which is "many times more valuable."

There was a meteor impact in South Africa 2bn years ago, with the impact structure known as the Vredefort Dome. This stopped further development of the basin.

Kinetiko Energy is exploring for methane in the Karoo basin, looking at coal bed methane and "muddy source rocks" in that zone. The reservoir is clastic rock sealed by shale, "so essentially a conventional gas development."

Kinetiko is working in a region where there is a great deal of coal power generation, close to Sasol's Secunda plant. This has been described as the world's biggest single CO2 emitter, with 57m tonnes CO2 a year. The coal is turned to liquid fuels.

The plant operators would prefer to run on gas, and the plant becoming a gas to liquids plant. This would save them money since there is a carbon tax in South Africa. "Let's hope Kinetiko can produce it," he said.

Independent auditors have assessed 6 TCF of recoverable gas, at depths of just 150m to 700m underground.

"There are wells that have been blowing out for 40 years and have not depleted," he said.

Rhino Resources is also exploring in the region and doing environmental impact assessments (EIAs) for future drilling activities. Two other active companies are Bastion Oil and gas and an associated company Bulwark Energy. "So, a massive amount going on."

Other areas

In Angola there has been a "revitalisation", with the government agency Agência Nacional de Petróleo (ANPG) "doing a good job of licensing acreage, attracting people with improved terms and an open attitude," he said. "There's been blocks awarded and there's an ongoing round."

In Zambia, a local company GeoPetroleum is exploring the Mweru basin, it is also interested in helium.

In Tanzania, a company called Helium One is looking in the Rukwa graben. "They recently announced they found helium and hydrogen," he said. "I find it incredible you can find hydrogen in the subsurface."

Also in Tanzania, ARA Petroleum and Aminex are working on development in the Ruvuma Basin, and there is some exploration going on.

In Mozambique, SASOL had a discovery last year in the Bonito formation. "There's a lot going on in a fairly large area."

Energy shortage

Many areas of Southern Africa have a deficit of power generation, and a new supply of gas could help fix that. Mr Sutherland noted that in his home in Cape Town, South Africa, power was about to be shut off for two hours, and the following day there will be no power for 6 hours.

It is known as 'load shedding', taking demand away from the grid by switching people's power off. For people in the region, "it is a fact of life", since 2007.

The load shedding was worse in 2023, when it was common to have power outages of 12 hours. It impacts industry as well as homes, such as with mines unable to operate. "It's having a huge impact on South Africa's economy," he said.

Many mines are building their own solar plants - some as big as 150 MW. But batteries are normally too expensive, so there is still no power when the sun is not shining.

Mr Sutherland has a solar generation system on his own house and sells excess energy to the grid. He would prefer to store it with his own batteries to provide power during the outages but finds batteries too expensive. "Battery economics are difficult," he said.