

# Finding Petroleum

How Sierra became the first independent oil company in Mexico since 1938

There are political and security risks - but don't let that put you off

The Norphlet Fairway in Mexico - "really interesting prospectivity"

How LGO Energy built an oil production operation in Trinidad

TGS' "Gigante" subsurface survey of Mexico

Does the geology distil to one or two "stories"?

Event Report, Finding Oil in Mexico and the Caribbean Oct 21, 2016, London

Special report

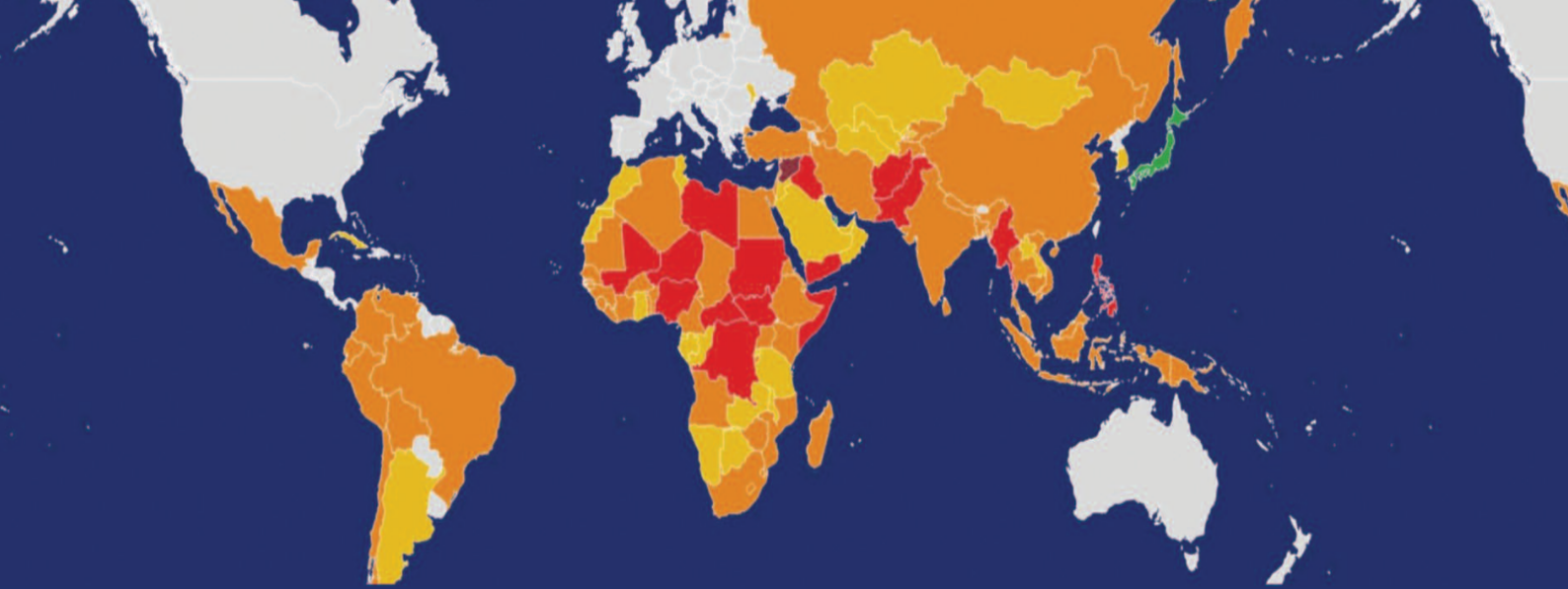
## Finding Oil in Mexico and the Caribbean

Oct 21, 2016, London



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## Finding Petroleum

# Finding Oil in Mexico and the Caribbean

Finding Petroleum held a forum in London on Oct 21 2016 "Finding Oil in Mexico and the Caribbean," looking at oil and gas exploration in Mexico, Trinidad, Barbados and across the Caribbean in general.

This is a report from our conference "Finding Oil in Mexico and the Caribbean" held at the Geological Society, London, on Friday October 21, 2016.

### Event website

[www.findingpetroleum.com/event/3b879.aspx](http://www.findingpetroleum.com/event/3b879.aspx)

Some presentations and videos from the conference can be downloaded from the event website.

Report written by Karl Jeffery, editor of Digital Energy Journal  
jeffery@d-e-j.com  
Tel 44 208 150 5292

### Sales manager

Richard McIntyre  
rmcintyre@d-e-j.com  
Tel 44 208 150 5291

Conference Chairman and Producer:  
David Bamford

Layout by Laura Jones, Very Vermilion Ltd.

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Mexico has enormous oil and gas reserves, with one of the largest oil fields in the world, Cantarell. However it has been nationalised from 1938 to 2013, with only the state oil company, PEMEX, allowed to operate. The reform process was agreed in December 2013, and the first auction for licenses open to private companies closed in July 2015.

The opening talk was from Read Taylor, EVP with Sierra Oil and Gas, an oil company completely focussed on Mexico, which was the only company to win in the first Mexican license round, as part of a consortium.

We also heard from Neil Ritson, CEO of LGO Energy, a small oil company active in Trinidad; Chris Matchette-Downes, CEO of CaribX, a Caribbean focused exploration

company; a political and security update from Tom Bacon, intelligence director with Protection Group International; and talks from Karyna Rodriguez, director of geoscience with seismic company Spectrum, and Chris Corona, director of Latin America with seismic company TGS.

There was a discussion about whether the Caribbean could be looked at as a single petroleum system, or two (one linked to the Gulf of Mexico and the other linked to Venezuela), or a mixture of many different systems.

Note – full wide screen videos and presentations for most of the talks are available online for free download – see [www.findingpetroleum.com/event/3b879.aspx](http://www.findingpetroleum.com/event/3b879.aspx)



# Sierra's Read Taylor – how we got this far

Read Taylor, Executive Vice President of Sierra Oil and Gas, the only company to win bids in the first round, told the story of how the business has got this far



“For companies like ours with private equity money, the reality is that the real battle is a day to day in the trenches battle to keep the company on track sometimes,” said Read Taylor, EVP with Sierra Oil and Gas.

He was speaking at the Finding Petroleum forum in London on October 21 2016, “Finding Oil in Mexico and the Caribbean”.

“I’m never going to say finding petroleum is an easy part of that.”

“In order to find petroleum, you have to be smart, you’ve got to have the right data, you’ve got to have amazing technical staff with new ideas, battling the winds that keep coming,” he said.

One of the latest challenges is the risk that there may be a different political party elected in Mexico in 2018, with different opinions about how the oil and gas reform process should continue, he said.

The current administration has been very proactive on energy reform, covering upstream, midstream and downstream with a sweeping set of reforms, he said.

But it is possible that the new government will take a different view and slow the development down.

Sierra does not believe that the new government will cancel any of the agreements. “We are bullish, we believe in sanctity of contracts,” he said.

## About Sierra

Sierra Oil and Gas is backed by private equity money, including from Blackrock, EnCap and Riverstone.

Sierra has done well out of the oil price crash, raising funding when the oil price was \$100 and spending the money when it is \$50, he said. The costs of services are going down, with drilling rigs available for \$150,000 which were previously approximately \$600,000 a day.

In call 1.1, Sierra was the only bid winner, winning 2 blocks, together with its partners Premier Oil and Talos Energy. 14 blocks were on offer and the other 12 were not awarded.

Sierra Oil and Gas got in very early. “I think we got some of the best contracts out there,” he said.

Mr Taylor said that some oil and gas people ask him how he managed to win the bids everybody else wanted. He replies, “We worked harder, we started earlier, we survived the departure of a partner, and we were a survivor. Sometimes, that’s what it takes.”

There was also a little bit of luck involved – the industry hadn’t yet caught on to the potential of Mexico. But one block had 5 bids, and the consortia won both blocks by less than 2 per cent.

The contracts he agreed were economically viable. Since then the bid levels have gone up, and the onshore and some of the latest offshore contracts agreed are “non-economic in my opinion,” he said.

Sierra Oil and gas is only focused on Mexico, “it’s all we do and all we think about,” he said.

The company is currently working on three separate bid rounds at the time of the conference, with staff working around the clock, he said.

Sierra also sees midstream as a tremendous opportunity in Mexico, storage and transportation of oil (mainly pipelines).

## Bidding process

The history of the Mexican oil and gas industry is that it was nationalised in 1938, so since then there has been no significant external industry investment.

The first bid round of the reform was in mid-2015, and the only winner was a consortium led by Sierra, which took two blocks.

The bidding process is very transparent, with public auctions on specific dates, and a set of guidelines and rules.

“I’ve been in 30 or more countries, and this [Mexico] is one of my favourites,” he said. It’s regular, transparent, and with a few exceptions, you know what the rules are.”

The government oil body, CNH (Comisión Nacional de Hidrocarburos) “is a transparent, hardworking group of regulators,” he said. “They’ve done an incredible job with the process.”

At the time of the conference there are both onshore and offshore rounds taking place. “They’ve offered the best offshore basin but the worst onshore, so there’s a bit of a disconnect there,” he said.

The contract on offer to oil companies has improved over time to make it easier to work with.

The main improvement is in reducing the amount of money required on a ‘letter of credit’. The required work commitment is “a little bit better”.

There was a point when there were more companies in Mexico, including many National Oil Companies, however the low oil prices have reduced much of the interest, he said.

Many private equity companies are putting money in Mexico at the moment, he said, including on midstream and downstream

projects. Blackrock and Riverstone, which invested in Sierra, might also be interested in other Mexican opportunities, he said.

## Offshore round

The first bid round, call 1.1, where Sierra's consortium won two offshore blocks, arguably did not succeed from the government's point of view, he said, with not many companies taking part.

The subsequent onshore round, "was a disaster in my opinion," he said. There was no minimum balance sheet requirement, and consequently many small companies bid, as a means of gaining a position, making offers which will not work commercially, he said.

Some were offering a 90 per cent royalty to the government. "I was watching this on TV and thought, there has to be a mistake," he said. The companies were basically speculators who had got the idea that they had to offer a high royalty.

But it can't work. "No-one's going to spend a lot of time and money at 90 per cent back to the government," he said.

"We did not participate in that round - we couldn't find anything that we liked," he said.

## Future rounds

Many oil majors are participating in a deep-water round, closing on Dec 5 2016.

This should help get Mexico back on track. The bidders are a 'who's who of American oil and gas', although not many UK companies, apart from Ophir Energy.

"People like Chevron and others have spent 10 years working towards this. This is an exciting moment in Mexico," he said.

Sierra is participating in Call 4, as "the smallest of the big boys", he said.

There are very high standards for qualification in call 4. You have to have \$400 to \$500m on your balance sheet just to be a non-operating partner, and the consortium bidding must have a combined value of over \$1.2bn. Sierra would not qualify as an operator by itself, it needed to put together a consortium.

"This is why it's a big company game right now," he said.

Mr Taylor imagines that the government is 'kind of happy about that', because big companies can create the reform it is looking for.

There will be a shallow water round with a deadline of March 2017.

"We'll also be participating in that round, some really interesting acreage," he said.

There are wells which would expect to produce 5,000 to 8,000 barrels per day, with for example shallow water drilling that would cost \$18m per well. "That makes sense," he said. "There is materiality in shallow water, the big materiality is deepwater."

Next year will be a busy year in Mexico, with many wells being drilled, with the first exploration well on offshore Mexico drilled probably in March-April 2017.

In the near term, it is unlikely that new production will be able to offset the 400,000 bopd decline which PEMEX has seen, he said.

There is no secondary market in Mexico (companies buying and selling fields to each other). The only way to get access to fields is to do a bid round. "The government is in control, which has its positives and negatives," he said.

## PEMEX fields

The big opportunity will be when some of PEMEX fields come onto the market, some of which have billions of barrels in place.

There should be work on offer in future helping PEMEX improve recovery on its existing fields, for example taking recovery from 20 per cent to 30 per cent, using a range of enhanced oil recovery or water injection technology.

"PEMEX has produced the easy stuff, the opportunity is to co-invest with PEMEX," he said.

But the government has not yet made these blocks available. "They are not able yet to offer the jewels in the crown, the PEMEX assets everybody has been waiting for."

"PEMEX needs to set up a business development group to look at all these opportunities," he said. "There isn't a process where government and PEMEX are working well together."

There are giant fields with a recovery of only 5 to 20 per cent so far. "These are good investment opportunities," he said.

"They will be very competitive. You'll have to pay a purchase price and a carry to PEMEX, probably half a billion range as an entry ticket to some of these large fields."

## Geology

Geologically, Mexico is a rich structural environment, with a world class petroleum system. "I never make a risk on the petroleum system, certainly source rock, and this is a great source rock," he said.

PEMEX has developed a great deal of expertise exploring for carbonates, Mr Taylor said.

But some of the more recent carbonate discoveries are at great depth and with high pressure, which they have less experience with. "It is a challenge for them operationally," he said. "But it's a very well understood carbonate play."

Then there are clastic plays, which are similar to those seen in the Gulf of Mexico. Companies which have experience in the Gulf of Mexico often show more interest in these, he said.

But the bigger opportunities could be in the carbonates. "There's huge structures there undrilled that should be similar to what's already been found."

PEMEX has also never drilled subsalt, and there is an undrilled subsalt basin. "They drilled the top of the salt but they never drilled through it," he said.

But the same source rock in carbonates has been drilled, and 61bn barrels were found.

"This is a fantastic opportunity. I'm only going to say that once because I don't want to see you as competitors," he joked.



## Data

It can be a big challenge to get the data you need to understand the subsurface. And currently some of the data is better than others, and not all of it is available, and there are multiple data sets.

Annoyingly, some seismic data for one of the blocks Sierra bid on was only made available after it had won the bid, he said.

PEMEX has not been a big explorer in subsalt, so it didn't commission the big wide azimuth (WAZ) surveys needed to understand subsalt.

Many more surveys are being done. "We've made it our goal to buy everything possible," he said. "We own over 60,000km<sup>2</sup> of 3D data, and 2D data, and data of over 1000 wells. No-one can say that except us and our partners."

"We've done some analysis - we're seeing some really interesting improvements in the data."

As an example, Mr Taylor showed the seismic imagery which the company had available when bidding, and a much clearer image it has now. "There's a huge improvement in those two data sets, and that's just part of the process," he said.

## Smaller investors

If the requirements to be an offshore operator in Mexico were moderated, there might be more opportunities for smaller investors, he said.

As a requirement for bidding, you are required to commit to a work program, and additionally have a letter of credit (a promise to pay a certain amount of funds to the government) on your balance sheet.

"So you're double dipping on your balance sheet, which nobody likes," he says.

"This letter of credit (requirement) is crippling smart, good investors, they look at that and think, "I can't put up 163m dollars and drill the well and not get the money off the letter of credit until I finish," he said.

## Service companies

There probably aren't many opportunities for service companies in Mexico, considering that so few companies own acreage in Mexico so far, and they are not in a position to spend much money on seismic surveys and service contracts, he said.

"The volume of work is probably not at the level for successful entry of new technology providers"

For now, PEMEX is still the main client for service companies, and the company with projects going on.

But there could be a big business for service companies in future, for example with a future CO<sub>2</sub> EOR industry. "The service providers have to be patient," he said. Give us a year or two and that's the time for service companies to come."

Watch the talk and slides on high resolution video at

[www.findingpetroleum.com/event/3b879.aspx](http://www.findingpetroleum.com/event/3b879.aspx)



# PGI - the risks of working in Mexico

There are political and security risks of working in Mexico – but they are not so large to mean you should not go there. Tom Bacon, intelligence director of consultancy Protection Group International, provided an update

"Security and political risks will continue to persist in Mexico, said Tom Bacon, intelligence director of consultancy Projection Group International. They will impact your operations. But they can be managed and should not be an impediment to business.

The big picture is that Mexico is going through a vast liberalisation program, and will lead to big changes in the Mexican political and business environment. While the change takes place, there will be elements of regulatory uncertainty, and some regulatory bodies are going to mature.

The Mexican oil and gas industry was nationalised from 1938 to 2013. Constitutional reforms leading to liberalisation were signed by Mexican president Enrique Peña Nieto in December 2013, following a congressional approval.

The reform allocated over 80 per cent of proven and probable reserves to PEMEX, which is still

the 5th largest company in the world in terms of access to proven assets.

In August 2014, secondary legislation was signed into law which set foundations of subsequent bidding rounds.

The first round bidding terms were published in the beginning of 2015, with the first shallow water round concluded in July 2015 and first onshore round in September 2015. The first deepwater round concludes in Dec 2016.

Next year (2017) there will be bidding rounds 2.1 in March and 2.2 in April. "The results of that round could be quite positive and see strong investment," he said.

Reform of the Mexican oil sector was desperately needed, he said. Mexico had seen its production decline from 3.4m boepd to 2.5 boepd over the 10 years from 2004 to 2013. Now the target is to get production to 2004 levels by 2025.

The decline is attributed to multiple factors. "Some must be PEMEX managerial inefficiency, lack of competition, lack of skillset and technology to invest in some of the major subsalt and deepwater deposits," he said.

PEMEX is estimated to have \$135bn outstanding active loans and bonds, putting it under huge financial pressure. "Foreign cash investment to reach production targets has been desperately needed," he said.

## Politics

Ultimately it is a politically stable state, but with pockets of insecurity, he said.

Local politics matter in Mexico, so it is important to understand the politics of the oil states for operations on the ground.

There are a number of regulatory bodies you will need to deal with, including the energy ministry Secretaría de Energía de México

(SENER), the hydrocarbon ministry Comisión Nacional de Hidrocarburos (CNH), the energy regulatory commission Comisión Reguladora de Energía (CRE) and the finance ministry Secretaría de Hacienda y Crédito Público, SHCP.

The heads of the CNH and Energy Ministry have been in their positions a relatively long time, from 2009 at CNH and 2011 at SENER. “That continuity during a period of immense change is valuable and important,” he said.

Over the past two years, there has been a lot of pragmatism and responsiveness from the authorities, improving terms in some of the contracts and improving the results. That was partly because the results from early rounds were not as good as expected, and also from industry feedback.

“That pragmatism has begun to manifest in contractual terms on offer,” he said. “They have simplified contracts, looked at reducing restrictions on consortium bids, extended evaluation periods, drastically reduced requirements for corporate guarantees, offered generally more favourable fiscal terms.”

“There’s been larger size blocks for exploration on offer, and reduced local content requirements, which have been quite burdensome. There are better minimum work requirements and timeframes for drilling.”

Some commentators say that the law is trying to catch up with the pace of reform. There is also a new environmental regulator, which leads to some uncertainty.

There is quite a lot of political uncertainty. “It is unlikely that the [current governing party] PRI will secure re-election in 2018,” he said. “The president currently has extremely low popularity. The PRI also suffered dramatically in state elections in June [2016].”

One key indicator will be state elections next year in June 2017.

A change in the governing party would matter because PRI has been in a strong position for a long time, including holding the state of Veracruz for 90 years [which they lost in June 2016]. In this time, nepotistic networks, without much transparency, can develop. And new governors will often want to move against vested interests connected to the previous regime.

Another possible issue is the election of Andrés Manuel López Obrador, the former Mayor of Mexico city, who set up his own party in 2012, called MORENA, with a central tenet of re-

forming the energy liberalisation process. “It has raised a lot of concern with oil and gas players in Mexico,” he said.

MORENA has suggested a public consultation or referendum on reversal of legislation passed to date, and suggesting that every project should have a minimum level of PEMEX participation. They have also suggested that some contracts issued to date could be revoked.

However Mr Obrador has not been elected and it looks unlikely, Mr Bacon thinks. “He’s lost the party and logistical and support base since leaving the PRD following the 2012 elections,” he said. And secondly, even if he were elected, he would still need congressional approval for the reversal of the energy reforms.

The other party which may win is PAN (the National Action Party or Partido Acción Nacional). “From an investor perspective, that is preferable.” PAN has previously held power, and was instrumental in getting the reform of the oil and gas sector passed in Mexico.

## Security

In terms of security, there are some major pockets of insecurity and organised criminal activity, he said, but it does vary from state to state.

Unfortunately some of the key oil states, Nuevo León, Tamaulipas and Veracruz, are some of the worst affected by violence associated with powerful drug trafficking organisations (cartels).

The violence is typically between gang members and state security personnel, it is rare for foreign nationals to be implicated. But there are murders, kidnapping and extortion.

“Even if you are operating offshore there is a

travel consideration for staff within these states which is important to recognise,” he said.

A second aspect is crime, including personal security and fuel theft.

Some companies are estimated to allocate as much as 10 per cent of their budgets to security.

The 2006 president Felipe Calderón declared a war on drugs, which led to a significant rise in violence and death rates, peaking at 27,000 in 2011, but dropped after that. The crackdown on drug trafficking has led to crime organisations looking for other business avenues, and fuel theft turned out to offer high rewards and low risks of prosecution. PEMEX has claimed that fuel theft rose 43 per cent in 2014 and a further 52 per cent in 2015, with daily theft of 23,500 barrels. This is not just from pipelines – also tankers get stolen and there are thefts from refineries.

Unfortunately Mexico does not seem to be successfully tackling this crime, he said.

## Infrastructure

Another issue is the oil and gas infrastructure, which PEMEX is typically in the middle of.

There are big discrepancies between Mexican states and blocks in how developed the infrastructure is, he said.

For the fields in the Perdido basin, which is a major field in the deepwater round, there are some positive signs that there could be ways to use the existing infrastructure, which would significantly reduce costs.

Download the slides at  
[www.findingpetroleum.com/event/3b879.aspx](http://www.findingpetroleum.com/event/3b879.aspx)

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# Spectrum – Extending the Norphlet Play Fairway

The Norphlet Play Fairway, in the deep water Campeche Basin of Mexico, is a completely unexplored area, which seismic company Spectrum thinks has “really interesting prospectivity”. The company’s director of geoscience Karyna Rodriguez explained further



The Norphlet Play Fairway in the Deep-water Campeche Basin of Mexico is a completely unexplored area. But seismic company Spectrum thinks it offers “really interesting prospectivity.”

She worked in the exploration department of PEMEX, with a remit to give a second opinion (or ‘peer review’) to every opportunity which PEMEX generated.

It is a role which enabled her to develop a very good understanding of Mexican geology, she said.

### Source rock and slicks

One of the biggest risks of working in these areas is source rock maturity, and many PEMEX models over this area showed that the source rock would be immature. “We have found evidence which showed it would be otherwise,” she said.

Spectrum has worked with optical satellite oil slick data to try to see if they prove an active petroleum system, with produce-able oil.

Only light oil will float on the sea surface.

Some people get nervous about slicks because they think it might indicate there is no seal. “You have to do a very detailed analysis,” she said.

But remember that the Cantarell field, one of the biggest oilfields in the world, was originally discovered because of extremely clear oil slicks in the waters above it, she said.

The oil slicks above the Campeche basin are mainly clustering at the edge of the basin, she said. They are probably using the salt diapirs (domed rock formations) as a pathway up to the seabed.

“For us, that’s great indication that we have good thermal maturation of Jurassic source rocks,” she said.

One audience member said he had worked on a pre-salt project in Mexico, but the company gave up on it because there was no proven source rock. Now his

company is trying to see if there is something onshore which proves that a petroleum system exists. PEMEX had drilled an offshore well in the region but it just found mature gas, which did not resolve the issue. It still isn’t clear if these seeps came from the source rock, this audience member said.

“It’s a very fair point, that is seen as the highest risk,” Ms Rodriguez replied. “We can say that post salt Jurassic source rock is very likely to be working, it’s established and proven, [but] we have a bit of a challenge with presalt source rock.”

### Ergs

Something else to look at is the ergs (enormous areas covered with sand) in Africa.

A large area covered in sand could make an amazing reservoir, if it was sealed above.

The Ek-Balam field, a major oil and gas field in the Campeche basin, could be formed from an Erg, she said.

An interesting question is whether the land mass currently in Mexico was ever located in a climate and temperature like parts of Africa are now, with temperatures up to 40 degrees.

The Norphlet erg is around 50,000km<sup>2</sup>, and Ms Rodriguez also found that the potential Norphlet analogue in the Campeche deep basin, named “Pikit” (fan in Mayan) for its fan-like shape in map view, is also around 50,000km<sup>2</sup>.

Note: the talk and presentation included a large amount of geological description, which is not included in this report

The Norphlet Play Fairway region includes 48,600km<sup>2</sup> of blocks which have not yet been offered in Mexico, “We are trying to get them nominated,” said Karyna Rodriguez, director of geoscience at Spectrum.

Spectrum has improved its seismic imagery of the region by carrying out full integrity broadband surveys, with PSTM (post stack time migration) data, which “is showing more detail than I had seen before,” she said.

Imagery of the deep section has been particularly well cleaned up, she said, making it possible to see tilted fault blocks and some of the syn-rift structures.

The Cheyenne well has been used to constrain the main stratigraphic units in the deep water Campeche Basin.

PEMEX never explored the pre-salt. But in the Santos Campos basin in Brazil, there have been record breaking pre-salt fields. You could call it a perfect hydrocarbon system, with shale source rock feeding hydrocarbons into fresh water carbonates, which are sealed by salt.

“We have indications of similar potential structures and potential plays in Mexico,” she said.

Ms Rodriguez previously worked in Mexico for 18 years, before joining Spectrum in 2013, just as the Mexican oil industry was opening up.



## Trinidad and LGO Energy

UK based LGO Energy plc has a small oil production business in Trinidad, partly based on workovers of very old wells. The company's CEO Neil Ritson explained how the company works



London based LGO Energy has a staff of about 20 people working in Trinidad, with a business partly around working over old wells.

### Workovers

The workover effort on the old wells is basically to bail out sand. "These wells sanded up in the 1960s and 1970s and had been left," he said. "The tubulars were covered in oil and were in a good condition to go back in and restart production."

Other work has been to re-perforate. "Perforations done in 1960s and 1970s were done one shot per foot with guns, literally shotgun cartridges downhole," he said. Now we have much better, 6 shots per foot shaped charge explosives and you get much better penetration of the reservoir now.

As a result, "we've seen wells producing a handful of barrels a day go to 25 bopd," he said.

Production from LGO's new wells turned out to decline at a rapid rate, although initial production was up to 1,000 bopd for some of them. The oil was in a deep reservoir, and there was no aquifer support to maintain pressure. So they are now being recompleted over new zones.

"There's not anything hi-tech going on here yet," he said. "As we move to waterflood pilot next year, we would expect to see some higher technologies being applied."

LGO got experience running old fields from its work in Spain, where it has kept the Ayoluengo field going since 2007, using a 40 year old workover rig "and a lot of care and maintenance on every single well".

"One high-tech thing we introduced in Goudron was logging while drilling, which had never been used onshore Trinidad [before]," he said.

It's generally low-tech, but worth remembering our operating cost for a marginal barrel at Goudron is only a dollar a barrel, he said.

### Oil in Trinidad

Trinidad's population is similar to Birmingham, UK, at 1.3m. The land area is about the size of Northumberland, UK. The biggest industry and

driver of GDP is oil and gas, and there is also tourism, mostly in the neighbouring island of Tobago (the island nation is 'Trinidad and Tobago') and some manufacturing. It is politically stable, Mr Ritson said.

However the government is struggling to reform the oil and gas industry, with a lot of resistance to change, particularly from the trade unions.

Trinidad has produced over 3 billion barrels of oil to date and a great deal of gas. Over 10,000 wells have been drilled in Trinidad, but many of them are very old.

Over the past 30 years, most of the focus has been on gas, and mostly offshore. This "has left an onshore opportunity available for new technology and modern investment," he said.

There is much geological debate about how the Southern basin was formed and developed. "But with 3bn barrels already produced you might think that is a little esoteric, I certainly do." The details are important for extracting oil, but knowing this is a place to invest can be seen on a regional map.

Look at a map of where the giant oil and gas fields are in the region. There are many around the Caribbean, in the Gulf of Mexico, Mexico and Venezuela, but none yet within the Caribbean plate itself.

Trinidad has had an oil industry for 100 years, and played a major role in the Second World War supplying fuel to the British Navy.

The first successful well with rotary drilling was drilled in 1903, and the first commercial discovery a few years later, and a refinery built to handle the oil in 1911.

Production peaked in 1982. In 2015, the total drilling in the country was just under 1 million feet, of which LGO contributed about 10 per cent.

Petrotrin (Petroleum Company of Trinidad and Tobago Limited) is state owned, and was formed out of the interests of Texaco, BP and Shell, combining those in what was effectively a nationalisation process, he said.

The company has 100 per cent ownership of the Goudron field in Trinidad, which is in jungle area on the South of the island. The company also has a holding in two small oilfields in the South West Peninsula along with a large under-explored land holding (leases).

The company acquired the Goudron field from a local company in 2012, and since then has brought over 70 old wells back into production, then started drilling new wells, 15 in total, said company CEO Neil Ritson.

LGO got production up to over 2,000 bopd, with a plan to increase it to 4,000 bopd, but then "the oil price intervened," he said. The company's debt became stressed and it was not viable to make further investments.

Over the last four years LGO has commissioned three "competent person reports" (CPRs) where an outside company is asked to work out how much oil there is. "Over that time the P1 (proven) and P2 (proved plus probable) have continued to grow," he said. "The oil in place is now certified to being close to 1 billion barrels."

Altogether, "I'm a great believer in Trinidad as an opportunity," he said.

The government and the state oil people are generally very easy to deal with. "They are very accessible, very transparent," he said.

LGO Energy is listed on the UK's Alternative Investment Market (AIM). It is also the largest oil producer onshore in Spain. That sounds impressive until Mr Ritson reminds you that daily production is only about 100 barrels.

The market capitalisation of the company in late 2014 was over £100m, but as of October 2016 it had collapsed to about £7m.

# Finding Oil in Mexico and the Caribbean

Petrotrin's onshore production has been declining for a long time, he said.

The company is starting to unravel because it has a high level of debt which is unsustainable with the current oil price.

There are two London listed companies active onshore in Trinidad – LGO and Trinity Exploration and Production, with Trinity currently suspended, he said. Also active in the country are Canadian company Touchstone Exploration, Range Resources (from Australia, also having a London listing), West Indian Energy Group, and a number of other private unlisted companies, including some local ones.

Petrotrin still holds around 80 per cent of the onshore land leases. It started introducing farm outs and lease operating agreements for other companies in 1989.

They also launched 'incremental production service contracts (IPSC)', and LGO has one of those. The production from IPSCs has been growing relatively rapidly but have not yet made a huge impact on production overall, he said.

There are also private lands and mineral rights leased to third parties in Trinidad similar to the USA.

A number of international 'junior' oil and gas companies have come to the country and helped Petrotrin to stem the decline. But production from the oil majors operating offshore has also declined by 50 per cent in under 10 years.

Gas production is also declining, because there wasn't as much interest in investing as world gas prices have fallen, and there is less demand for LNG. "We'll see that trend continue down for foreseeable future," he said.

Trinidad is third largest exporting country of methanol in the world, with methanol made from the gas. Currently the methanol plants are undersupplied in gas, which means they are struggling to be efficient, he said.

The country's gross revenue from oil is now a third of what it was 2 years ago (in October 2014), due to both the drop in production and the oil price crash. "There is a great need for a focus by the government and by foreign investors if we are going to see Trinidad's economy recover," he said.

The Pointe-a-Pierre refinery in Trinidad has a capacity of 165,000 bopd and was running at about full capacity to mid the 2000s. Now, there is a spare 80,000 bopd of refinery capacity available.

The oil ministry calculates that by importing oil rather than producing its own oil, the government is missing out on about \$1bn a year in fiscal impacts.

After Texaco, Shell and BP exited from their onshore activities in the mid-1980s, very little investment was made until 1989, when the government started to bring in foreign capital.

## Poor condition

Trinidad has done little new field development onshore since the mid-1980s when the previous leases came to an end – and exploration stopped earlier than that, since companies were not inclined to do exploration towards the end of their leases.

The data collected in the past is limited and some of it has been lost. "You can only do modern activities with good data, and we need all the data," he said.

As an example, when LGO Energy acquired the Goudron field in 2012, they found a well equipped with a large jack pump which had not been included on the inventory documentation.

"No-one seemed to know it was there," he said. "There's 100 psi on the well head, and this well flows oil." It is very remote and the bridge over a river has collapsed. "So it flows during periods when it's been worked over, then it has to wait for the dry season when we can get back and work it over again."

"That's the nature of operations here, when we arrived the flowlines, tanks, and everything else was in a state of considerable decay."

The field was discovered in the 1920s, and oil recovery to date is less than one percent. "This is an overlooked asset," he said.

Part of the history of Texaco's operations, which Mr Ritson has learned from a former Texaco manager, was that Texaco had operations on the beach and in the jungle, and they drilled three times as many wells on the beach properties, simply because people preferred to work there.

There is lots of CO2 available on the island, as a by-product from the numerous chemical plants, which could be used for enhanced oil recovery.

"Trinidad is dotted with these opportunities. They are mostly in Petrotrin's hands and getting them out of Petrotrin's hands and into foreign investment is a process we believe may accelerate," he said.

"Petrotrin cannot go on operating the way they do today," he said.

For example Petrotrin is currently looking to bring in a partner to its marine operations, so further investment can be made. But the trade unions are challenging this, with a threatened strike.

## Geology

Although Trinidad is culturally part of the Caribbean, geologically it is part of Venezuela, with South West Peninsula, where LGO is developing new operations, just 6 km from the Venezuelan coast.

Perhaps not for deepwater operations to the north and east, but for the onshore and southern basin operations, "it is part of Venezuelan geology", he said.

"We believe there is substantial exploration potential, and there's plenty of opportunity onshore," he said.

Trinidad also has one of the largest bitumen lakes in the world, which has been exporting for over 200 years.

"We have acquired all the data that exists in the South West Peninsula" he said. "We flew a high resolution aero gravity survey over the entire south of Trinidad, and we have carried out a soil geochemistry survey with good results."

"BHP are currently drilling a program of deep-water wells. The first one seems to have found gas. Trinidad probably doesn't care, oil or gas, as long as they develop it."

"Getting the fiscal situation right to encourage that will be the key."

Download slides at  
[www.findingpetroleum.com/event/3b879.aspx](http://www.findingpetroleum.com/event/3b879.aspx)

# TGS's "Gigante" Mexican survey

Seismic company TGS has put together a giant survey covering the whole of Mexican Gulf of Mexico (MGOM), which it calls 'Gigante'. It means that interpreters can get a much broader view of the subsurface, said director of Latin America Chris Corona

Seismic company TGS has completed its giant "Gigante" survey of all offshore Mexican waters, including seismic data, bathymetry (seabed depth) and piston core samples.

Before this, most of Mexico had been shot with seismic over very small areas, by Mexican state oil company PEMEX. These are "postage stamp type things," said Chris Corona, director of Latin America with TGS.

Now interpreters can have a regional view of a much larger area of the MGOM. "Interpreters seem to be having a lot of fun mapping things they haven't seen before," he said.

Mr Corona showed a regional map showing how much seismic TGS has acquired in Mexican waters compared to other companies, PGS, Spectrum, Dolphin, MCG and Searcher, and it shows "we shot more than 50 per cent of the new 2d acquired in comparison to our competitors." The TGS survey is 188,000km.

It helps that TGS has worked in US Gulf of Mexico waters for many years.

TGS is also processing seismic data from US waters, and creating 'interpretation products' showing a structural interpretation of the subsurface.

TGS has also acquired gravity and magnetic data in conjunction with the seismic data and is working together with Bain Geophysical Services, a specialist in integrating gravity, magnetic and seismic data.

The gravity data has proven especially helpful in the Perdido Fold and Campeche areas helping to provide a guide to the salt thickness, he said.

TGS and Bain Geophysical plan to utilise gravity data previously acquired by PEMEX along with publicly available gravity data in the US Gulf of Mexico to produce gravity maps that cover the entire Gulf of Mexico basin.

TGS also did bathymetry (water bottom analysis), coring and geochemical analysis for the whole MGOM basin.

Five vessels were used for the seismic survey, operated by Seabird Exploration. The survey has 12km offsets.

The company, presently, has available a fast track PSTM (Pre-Stack Time Migration) of 188,000km, a final PSTM of 112,000km, and a preliminary Kirchhoff Pre-Stack Depth Migration, he said.

"As all the data comes in, we'll create a smoothed 3d velocity cube so all the lines will tie," he said.

For the location of the piston cores, customers input along the seismic is utilised.

Piston cores sample sea floor sediments at varying depths from 6 to 20 meters.

For core samples showing a strong presence of hydrocarbons more detailed geochemical analysis is used.

Many cores from the Perdido area have high fluorescence levels (which correlates to an anticipated presence of hydrocarbons). "We had to change our limits for what we would consider prospective," he said.

The coring survey was done in some areas after the seismic data was acquired, in these cases the seismic data was used as a guide to determine where coring should be done.

The final coring should be done by early January 2017.

"It's a new world for us, integrating magnetic and gravity in such detail - but it's driven by industry," he said.

The Mexican government body for hydrocarbons, Comisión Nacional de Hidrocarburos (CNH), and the Mexican Ministry of Finance, are "trying to move through the bid rounds at a pretty good clip, trying to show some success," he said. "So if there's a challenge from other political parties, some financial success can be shown."

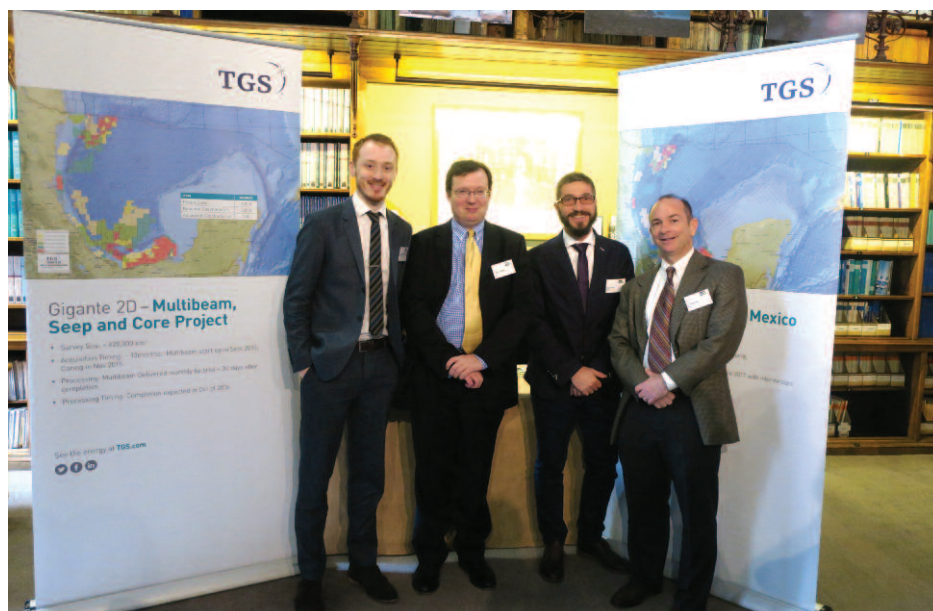
A geological analysis of Mexico was presented by Mr Corona's colleague, Cian O'Reilly. (Note - we are not including geological description in this report because it is very hard to cover in written form, but the video and slides are available online).

It showed that the area is very structurally complex with lots of different basins, with different structural styles and play concepts. TGS has put together a "very good catalogue" of the structural styles, Mr O'Reilly said.

There are many 3 way and 4 way dip closures yet to be drilled and some very large stratigraphic prospects as well."

Watch the talk and slides on high resolution video at [www.findingpetroleum.com/event/3b879.aspx](http://www.findingpetroleum.com/event/3b879.aspx)

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# Regional geology

Can the geology of the Caribbean be looked at with a single 'story' – or is it made up of many different ones? Analysing source rocks and product oils can provide some answers

There is evidence for oil across the Caribbean, from offshore Cuba and the Dominican Republic to Honduras and beyond

Elements of the "Gulf of Mexico play" can extend to Eastern Caribbean to include Honduras, and similar aged source rocks as the prolific Upper Cretaceous Venezuelan La Luna are also thought to be the source the oil in Trinidad, Barbados and other shows seeps within the greater Caribbean said Chris Matchette-Downes, CEO of Caribbean and Central American specialist exploration company CaribX.

Mr Matchette-Downes has been undertaking petroleum geochemical analysis of oils throughout the region and has built a regional understanding of both the Upper Cretaceous regional play and the younger Eocene oil play.

The La Luna was deposited in the late Cretaceous and has a total organic content of 4-5 per cent, he said. It has an elevated sulphur content; displays a mid-range C13 isotope content; possesses a distinctive biomarker assemblage and Nickel/Vanadium ratio.

"You can get a lot of information from examining an oil's make up – for instance the maturity of the precursor source rock, age of source rock," he said. "So if you can get a seep it is well worth looking at."

"To try and understand areas where there hasn't been much drilling - you've got to go to the field, collect [seep] samples. I've been looking at Caribbean over a decade and a bit now, collecting samples. Sometimes you walk for miles and can't find anything, sometimes you do."

Over time Mr Matchette-Downes has built up a database of oils from different parts of the Caribbean. By looking for similarities, you can see which parts of the petroleum system are connected.

You can theorise about how the terranes were connected in the past, before the plates and component parts moved around, similar to making analogues between South America and Africa, which were connected in the past, only in the case of the Caribbean more complex.

"Isotope analysis is a powerful tool - you are look-

ing at large portions of the oil, as opposed to picograms in the case of biomarkers" he said.

There is also a Tertiary source rock system on Jamaica, and elsewhere within the region but it is broken up due to plate movement.

"There are not so many Jurassic source locations within the Caribbean," he said. "On the fringes, there appear to be some."

"As with the Gulf of Mexico, the Caribbean has multiple source systems. Cretaceous seems to be most obvious, followed by Tertiary, with some hints of Jurassic. It takes a little time to unravel it all. You have to forget all the country borders."

"I would say there are regional source systems, probably two, with some older source rocks," he said. "But you have to remember, it is all moved around - a lot of work is needed to pull it back together again."

[Note Mr Matchette-Downes' short presentation included a more detailed discussion about the various source rocks, their age, and where oil was found, which has not been included in this report, but is available on the online video].

## Regional economics

LGO's Neil Ritson said that he has been to a wide range of Caribbean conferences over the past 5 years, and they often discuss the idea of some unifying force in the region (perhaps similar to the European Union).

But often we walk away concluding that there is little that binds the Caribbean energy interests together, he said. "Even the geology is not that much of a unifying force, though obviously there are similarities as you move away from Trinidad and its close affinity to Venezuela."

It is certainly useful for states to share ideas, but they do not have any clearly unifying interests, and the policy decisions made by the various Caribbean states are completely disparate. "Essentially it's every man for himself when it comes to energy," he said.

For example, "if you're in a small, energy poor island, where the sun shines a lot, photovoltaics is

your main interest, with a desire to get cheap gas if you can," he said. "But who is going to put the infrastructure in to get you LNG or CNG in small quantities?"

Many islands are talking about attracting compressed natural gas or micro LNG projects, but there doesn't seem to be a great interest from investors.

Trinidad itself has a shortage of gas, because it set up a big gas based industry, including LNG, methanol and urea plants, based on having a large gas supply. Supplying CNG to other islands looks good on paper, but not much is happening on the ground.

## Barbados

Barbados currently produces about 1,000 bopd, and imports 10,000 bopd. This means that at an oil price of \$50 a barrel, the country is sending \$500,000 a day outside the country, said conference chairman David Bamford.

Barbados has a population of 240,000 and is the size of Oxfordshire. "That's a burden for a country like that to take," said David Bamford of Finding Petroleum in the final discussion session.

Barbados leased all of its acreage to Conoco in 1999. Conoco drilled one well, known as "Sandy Lane One". This well produced some gas. When Conoco merged with Phillips, "they dropped the lot," Mr Bamford said. "That was the peak of drilling activity in here."

Geologists at Barbados National Oil Company (BNOC) say that all their oil comes from the same source rock as Venezuela, named "La Luna". The main reservoir is clastics (fragments of pre-existing rocks) which have come from the Orinoco River, which enters the Atlantic Ocean close to Trinidad.

Mr Bamford said that because Barbados is such a tourist destination, "they worry about oil drilling, their real heart's desire would be a trillion cubic feet of gas discovery."

Watch the panel discussion and slides on high resolution video at [www.findingpetroleum.com/event/3b879.aspx](http://www.findingpetroleum.com/event/3b879.aspx)

## List of attendees 'Finding Oil in Mexico and the Caribbean'

Christian Bukovics, Adamant Ventures

Paul Murphy, Airbus Defence and Space

Geoffrey Boyd, Antium Frontfield

Julian Moore, APT UK

David Craik, Atlaslocal

Christian Richards, AustinBridgeporth

Robert FE Jones, Caithness Petroleum

Chris Matchette-Downes, Caribex and MDOIL Limited

Rory Scott-Russell, CaribX

Mike King, CGG

James Andrew, CGG

Andrew Webb, CGG

Antonio Gian Luca Palombo, CGG

Siebe Breed, CGG - NPA

John Glass, Cloverfield Consulting Ltd

Mark Robinson, Consultant

Peter Farrington, Consultant Geophysicist

Ian Newth, Count Geophysics

Dan Kunkle, Count Geophysics

Stephen Norman, DNV GL

Brian Donnelly, Donnelly

Howard Davies, DownUnder GeoSolutions

Faye Glover, DrillingInfo

Darren Jones, DrillingInfo

Donald Campbell, DrillingInfo

Ian Blakeley, DrillingInfo

Ali Zolalemin, Emeres Ltd

Shereen Nairne, Engie E&P UK

Julian Kennedy, Entrada Oil & Gas Limited

Martin Riddle, Envoi

Nasser Bani Hassan, ERC Equipoise

Murray Johnson, Europa Oil & Gas

Karl Jeffery, Finding Petroleum

Richard McIntyre, Finding Petroleum

Avinga Pallangyo, Finding Petroleum

Farzad Moshfeghi, Finity Asset

Helena Zapata, Geoscientist

Jim House, GeoSeis Ltd

Martine Davis, Getech

Tom Whittington, GMP FirstEnergy

Anna Brookfield, Halliburton (Landmark)

Rebecca Head, Halliburton (Landmark)

Wally Jakubowicz, Hampton Data Services

Alastair Reid, IHS

William Slade, Ikon Science

Peter Dolan, Ikon Science Ltd

Mark Jones, INTECSEA

Jonathan Brown, JB Geosciences

John Griffith, JJG Consulting International Ltd

Sangeeta Jordan, JOGMEC

Tue Larsen, JX Nippon

Fergus Jenkins, LGO Energy plc

Neil Ritson, LGO Energy plc

Colin Clarke, LR Senergy

Mathew Steward, LR Senergy

Joseph Woodward, LSBU

Richard Bootle, Lukoil

Kai Gruschwitz, Lukoil

David Peel, Lukoil

Dr. Anne-Mette Cheese, Lukoil UK

Brian McCleery, M2C Energy Advisers

John Ege, Marine Exploration Geophy

James Dodson, NEOS

David Bamford, New Eyes Exploration

Mike Hohbein, Ophir Energy

Stephen Wood, Ophir Energy

David Sendra, Petrophysical Consultant

Henry Dodwell, PetroVannin

Ryan Turner, PGI

Denis Potapov, PGS

Joshua May, PGS

Pete Jeans, PJ Exploration Ltd

Tim Davies, Premier Oil

Ramesh Shukla, Private Investor

Tom Bacon, Protection Group International

Jennifer Bates, Protection Group International

Charles Brown, Protection Group International

Josh King, RAB Capital

Mark Redway, Redstream Fund

Robert Snashall, RGSConsult

Robert Stevens, Richmond Energy Partners

Patrick Taylor, RISC

Norrie Stanley, RPS Energy

David Webber, Sceptre Oil & Gas

Read Taylor, Sierra Oil & Gas

Glyn Roberts, Spec Partners Ltd

Karyna Rodriguez, Spectrum

Ed Shires, Strategic Fit

Vibhusha Raj Sharma, StrategicFit

Jon Ford, Tedstone Oil & Gas

Dr. Faouzi Khene, Terra3e

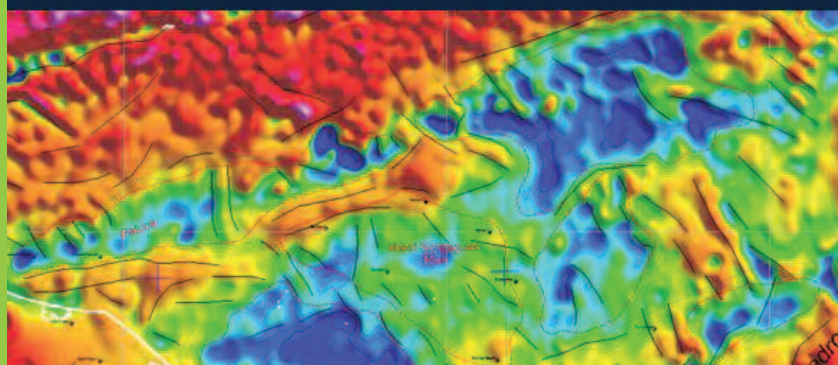
Daniel Plant, Terrabotics

Roel Dirkx, TGS

Chris Corona, TGS

Kourosh Kohan, Thyssenkrupp

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# What did you enjoy most about the event?

**Very useful overview of the region - particularly good PGI talk.**

*James Andrew (CGG)*

**I thought Neil Ritson's presentation on LGO's activities in Trinidad was really interesting. The presentations on Mexico's potential for future exploration were excellent.**

*John Glass (Cloverfield Consulting Ltd)*

**The insight of what is going on in Mexico and the Caribbean nowadays.**

*Antonio Gian Luca Palombo (CGG Robertson)*

**Read Taylor's update and the TGS multi-beam Movie - as well as LGO presentation on how they run Things on Trinidad.**

*John Ege (Marine Exploration Geophysical)*

**Interesting presentations about Mexico and what companies are doing to differentiate themselves.**

*Alastair Reid (IHS)*

**Range of speakers and pitch level to audience.**

*LR Senergy*

**Networking.**

*CaribX Limited*

**Interesting to see the different perspectives on investing in this region.**

**Presentations from Sierra, PGI and LGO.**

**Quality of some of the discussions.**

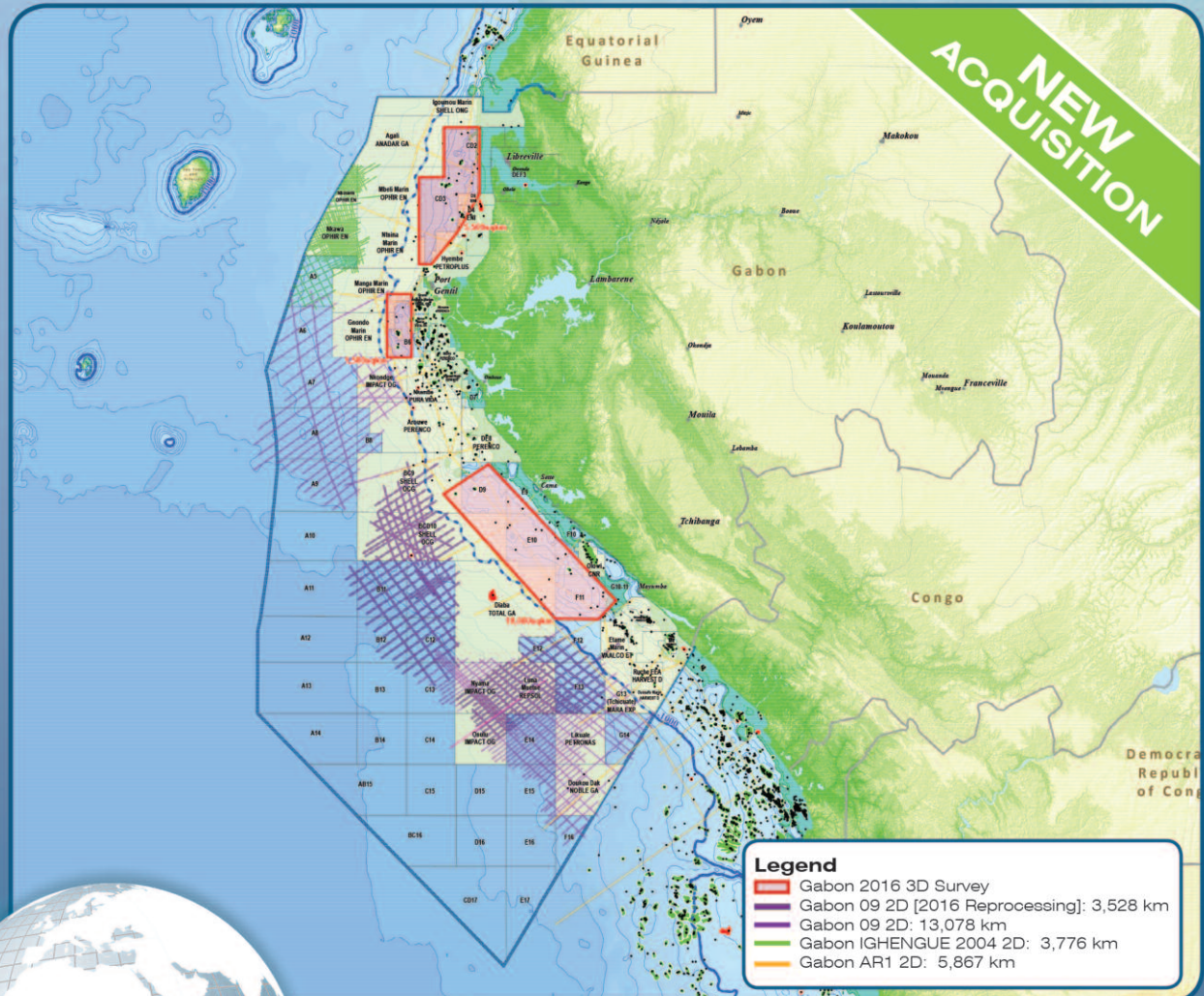
**I enjoyed gaining a greater understanding of the geopolitical issues of Mexico and the Caribbean.**





# Offshore Gabon 3D

New Multi-Client 3D Seismic in Open Acreage + Regional 2D



Spectrum, in collaboration with the Direction Générale des Hydrocarbures (DGH), is undertaking a series of 3D Multi-Client seismic acquisition programmes offshore Gabon. These programmes are located in under-explored, shallow water, open blocks with the objective of offering the most up-to-date 3D imaging. To accelerate exploration, this data will be made available for future License Round evaluation facilitating immediate activity when the blocks are awarded.

The 10,500 km<sup>2</sup> Gryphon 3D in southern Gabon has already secured industry support and is now underway. Following this, Spectrum will begin the acquisition of a 5,500 km<sup>2</sup> 3D survey over open acreage in Northern Gabon.

Data is expected to start becoming available toward the end of 2017 ahead of anticipated future Licensing Rounds.