

# Energy Outlook

FIRST QUARTER 2019

*Abra cadabra...!*

WILL TRUMP PULL ANOTHER RABBIT OUT OF THE HAT IN 2019?

**Gulf Intelligence**

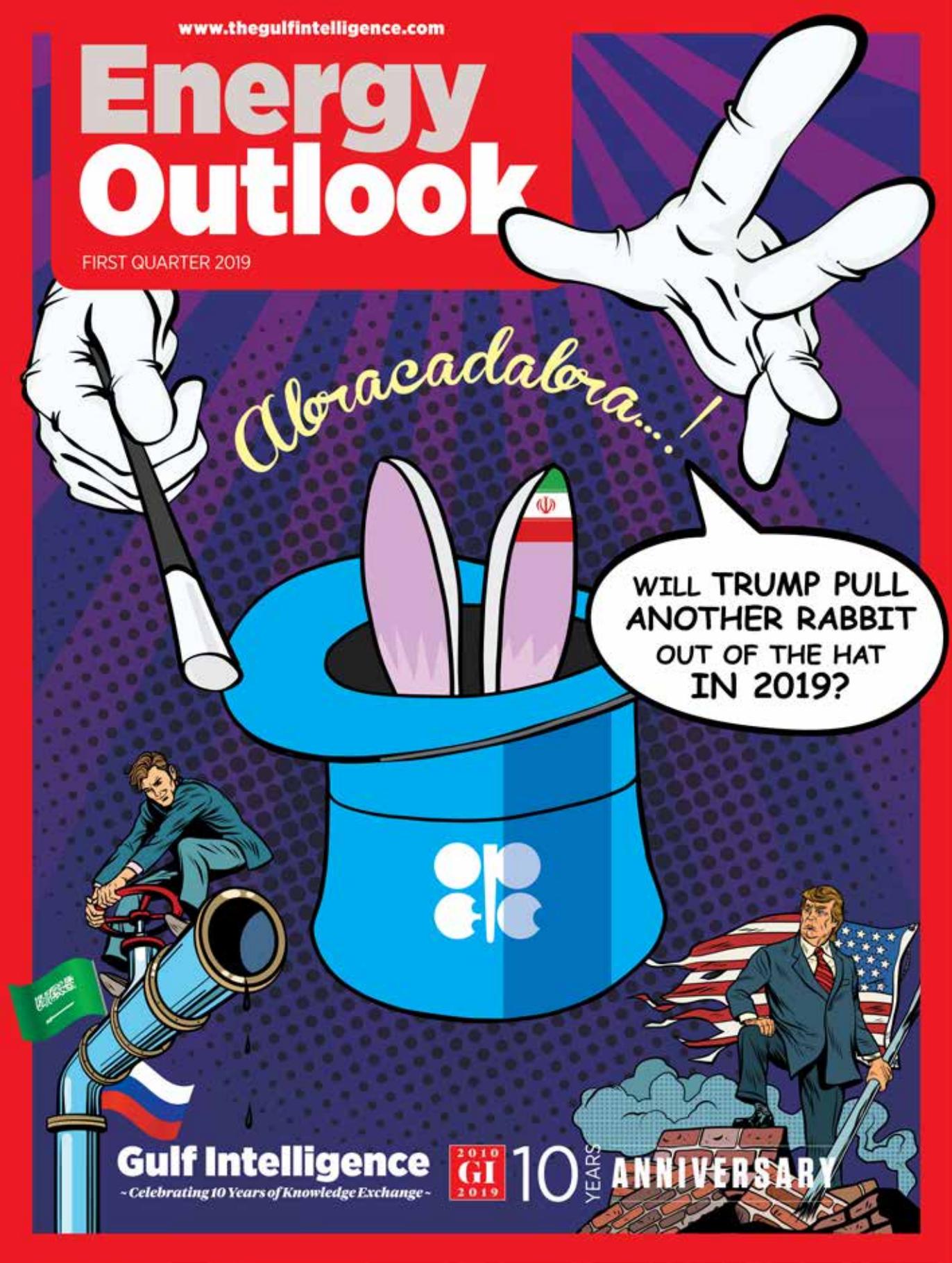
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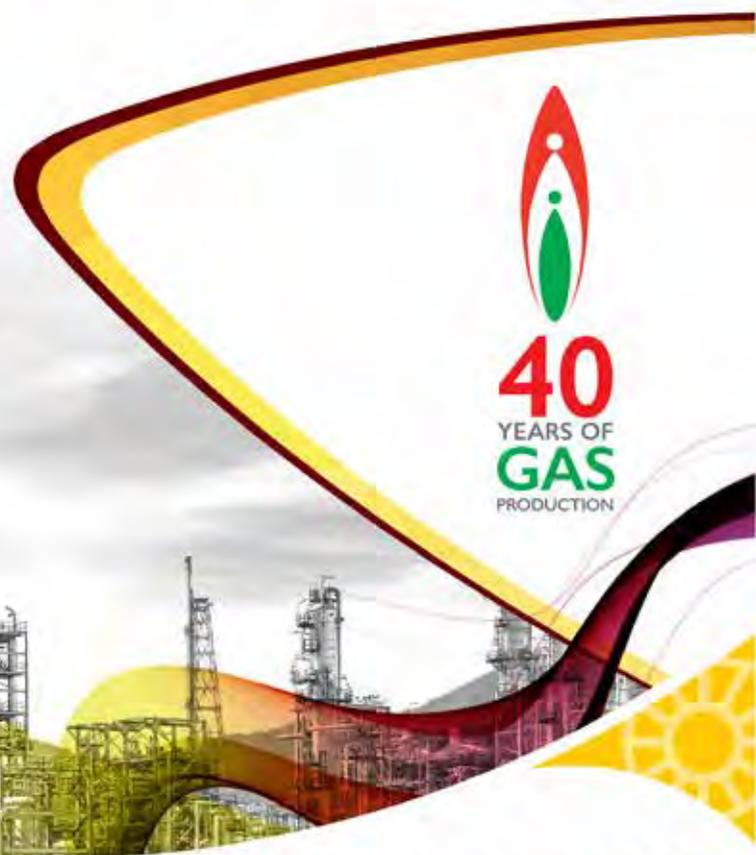
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# THE NATION'S ENERGY PIONEER

## CELEBRATING 40 YEARS AS A GAS PRODUCER



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## THE GREAT ENERGY TRANSITION *Will it Reenergize OPEC's Oil Price vs Market Share Debate in 2019?*

BY SEAN EVERS  
*Managing Partner, Gulf Intelligence*

**A**T THE SAME MOMENT THAT THE International Monetary Fund (IMF) and their reliable cheerleaders at the World Economic Forum (WEF) were giving all things Chinese a clean bill of health as recently as August – declaring that China's strong GDP growth will continue – the oil demand tide was already receding. China's GDP growth was testing new 30-year lows of close to 6%.

In many ways, the Central Banks' removal of the 10-year old punch bowl of quantitative easing free money could come face-to-face in 2019 with the same existential question as end-of-cycles past: should OPEC+ chase higher prices or fight for market share?

As each economic cycle passes into the dustbin of history, this question gets louder. The answer eventually succumbs to the weight of gravity, like an astronaut reentering the earth's atmosphere after a few months floating around on the international space station. While OPEC may feel it can continue to float on the

air of supply-restrained elevated oil prices without consequences, the shale oil roughnecks in Oklahoma keep pulling many more millions of barrels of new oil supply capacity out of the ground.

I am increasingly becoming a convert to the doctrine of Sir Mark Moody-Stuart, the former Chairman and Managing Director of the Royal Dutch Shell Group, and the non-Executive Chairman of Anglo American, who advocates that "low-cost oil producers have carried higher cost producers for far too long!" Sir Mark, who still sits on the board of Saudi Aramco, likes to remind any industry colleagues who are willing to listen that: "for normal commodities, such as iron ore or copper, the lowest-cost producers command the largest market share."

The great energy transition currently underway may be about to tip the scales in favor of the market share argument once again as the peak crude oil demand drum bangs ever louder, with China at the forefront of the transformation to a lower-carbon energy world. Beijing has spent an estimated \$60 billion subsidizing its electric car industry over the last decade and it is now turning a similar velocity of attention to hydrogen fuel cell vehicles.

Watch this space in 2019! ■



**OIL**  
**Reading the Tea  
Leaves in 2019?**

EXCLUSIVE INTERVIEW

# 2019 Will be About Less Oil – Not More

H.E. SUHAIL MOHAMED AL MAZROUEI

UAE Minister of Energy & Industry and Former President of the OPEC Conference

**Q:** Oil market dynamics clearly changed dramatically in the fourth quarter of 2018. How has that impacted the decision making within OPEC. For example, were the US-Iran sanction waivers to so many countries a surprise?

**H.E. Suhail Al Mazrouei:** Market dynamics will always change – we are used to that. Maybe the pace of fluctuation was higher in recent weeks; we would say October was the most volatile month of the year. But that is driven not only by market fundamentals, but also geopolitics, trade wars, sanctions and many other things. Market sentiment is always going to play a role, and sometimes the pendulum is pushed to the extreme, but OPEC and non-OPEC are set to deal with those changes in the Declaration of Cooperation. Our target and focus should be on avoiding the build-up of inventories and we are watching these, whether they are in the Organization for Economic Co-operation and Development (OECD) or in the US. But it's almost impossible to predict which direction it will go and we have to deal with the unknowns. The challenges for 2019 are going to be totally different than how we saw the market in 2018, which means we may have to adopt new strategies.

**“The challenges for 2019 are going to be totally different than how we saw the market in 2018 – we may have to adopt new strategies.”**

**Q:** The dominant OPEC+ (OPEC and non-OPEC combined) conversation for most of 2018 was about increasing production, but ended the year agreeing to supply cuts. Will the conversation in 2019 be about more oil or less oil?

**H.E. Suhail Al Mazrouei:** We went into the June meeting looking to increase supply into the second half of 2018. But going forward, there will be a new level. What is that level? I think obviously it's not going to be an increase.

What levels of reduction or adjustment do we need to do? We need to monitor and depending on the market conditions at that time, we will take the right measures. We will always adhere to what is good for keeping the five-year average for inventories at a reasonable level. This will be one that drives the world economy towards healthy growth, rather than going back and building inventories and starting what we saw in 2014.

**Q:** What are the top three factors that we should be watching in 2019? The

China slowdown seems to be coming along in a way that's surprising for some, for example. What issues will you be most focused on?

**H.E. Suhail Al Mazrouei:** One is supply. We need to look at the supply and ensure that we are not overdoing our portion of that. This applies to OPEC and our friends in the non-OPEC group. We also need to watch geopolitics and avoid any overreactions to a potential trade war between the superpowers.

**Q:** The demand forecast for next year has been falling, according to the International Energy Agency (IEA), which had forecast 1.6 million barrels a day (b/d) growth in demand for 2019. The agency is now saying it will be closer to 1.4m b/d or 1.3m b/d. What are your expectations?

**H.E. Suhail Al Mazrouei:** Yes, but let's remember that those are forecasts. They have never been 100% right. We are in an environment where even three months ago, everyone was saying that there is a risk that we may

have an under-supplied market. Now everything has changed. So, we need to take whatever is said with a pinch of salt and think about fundamentals. The risk would be if we were not able to move quickly. But we can assure you that this risk is not there; we can meet and make decisions when needed.

**Q:** Has the President of the US become one of the wildcards in your calculations? He took a lot of credit in his first press conference after the midterm elections saying he was the cause of the oil price decline in October.

**H.E. Suhail Al Mazrouei:** No. We in OPEC are not concerned with becoming a political tool. We are a commercial organization working to achieve what's good for all oil producers, the US included. Sanctions obviously are a factor affecting supply, but Iran is an OPEC member country and we will deal with those sanctions, as we are dealing with sanctions with Venezuela. As a group, we need to target a group production rate that is reasonable and based on the demand for all of OPEC oil. And we now also have non-OPEC partners. As a whole (OPEC+), we represent almost 50% of global supply. I am confident that we are all concerned about market stability. We will work together to achieve this, regardless of external factors that we cannot control.

**Q:** At the start of your year as OPEC President in January 2018 you were committed to the idea that the OPEC and non-OPEC countries would maintain a future partnership after the current oil supply agreement expired. Do you remain confident that this collaboration will last in 2019?

**H.E. Suhail Al Mazrouei:** I do! As an example, the fact that His Excellency Alexander Novak, the Co-Chair of the



**“Supply will be one of the issues we keep an eye on in 2019, plus geopolitics and avoiding any overreactions to a potential trade war between the superpowers.”**

Joint OPEC/Non-OPEC Ministerial Monitoring Committee (JMMC), came to Abu Dhabi in November on what was a very tight schedule tells you how important this group is to Russia. We also had representation

from Kazakhstan, Bahrain, Oman – all of those are non-OPEC. That's testimony that this group is working well together and it will continue working well together. ■

\*Edited transcript

# Biggest Trends & Greatest Consequences in 2019?

PAUL YOUNG, *Head of Energy Products, Dubai Mercantile Exchange*

MARIOS MARATHEFTIS, *Partner & Chief Economist, The Governance Creed*

DR. MOHAMMED HAROUN, *Associate Professor, Khalifa University*

Moderator: *Sean Evers, Managing Partner, Gulf Intelligence*

**Sean Evers (SE):** How do you explain the collapse in oil prices in the fourth quarter of 2018 after a rather stable and predictable year?

**Dr. Mohammed Haroun:** OPEC and non-OPEC states joined hands in 2016 for the very first time to effectively remove the oil surplus from the market. But countering this effort has been the rise in US shale oil. We're talking almost 3 million barrels a day (b/d) of additional oil over this period. And now we also have concerns about Chinese demand.

**Marios Maratheftis:** What's happened has been the perfect storm in many ways. You've had too many shocks all at the same time. We have also had volatility and downward pressures on almost all other asset markets – not just on oil – so there is a general nervousness at the moment. The peak in economic activity was this time last year and it was as good as the world economy will get for a few more years. We have been slowing down since then. This year will be slower, with the biggest

deceleration probably in the US. The oil market is still tight in terms of extra capacity. I understand the negativity in markets, yet there are no signs of a global recession. Shocks next year could be on the upside for oil prices – they may not hit the \$85 a barrel (bl) we have seen. But given the tight extra capacity and the possibility of political shocks, I would be mostly focusing on the upside. Let's not forget we have elections in India and in Nigeria coming up.

**Paul Young:** What a difference a few weeks makes. In September last year, I was at an oil conference in Singapore when oil prices were approaching \$80/bl-\$85/bl and we were all asking when it would hit \$100/bl. It looked at one point that sanctions on Iran were going to tip the market over the edge and cause a huge shortage. So, throughout September, the market was chasing every drop of oil and creating a genuine squeeze. That has all changed with the the sanction waivers. Ultimately, the sanctions on Iran were a massive trigger for prices to fall as it took the market

by surprise. Now the waivers have kicked everything into 2019, so we're kind of at an impasse as we don't know what's going to happen.

**SE:** Do you think US President Donald Trump represents an unpredictable wild card for 2019?

**Marios Maratheftis:** He's a wild card mostly when it comes to the possibility of a real trade war. If that materialized, the impact on economic activity would be devastating. Interest rates in the US would move much higher, emerging market balances would fall sharply and there would be no winner. The US would probably be hurt the most. When you look at the last year of trade maneuvers between China and the US, Chinese exports to the US have actually gone up whereas US exports to China have dropped. US farmers have been suffering from the recent tariffs, for example. China is very slow right now. In October last year, economic activity slowed down significantly. If I was to put a growth rate on China today, it would be around 5.5%, so it's a



**“ The average price in 2019? Likely \$65/bl. Yes we are in a downcycle and geopolitics are taking their toll – but a collapsed market benefits few.”**

**“By 2029, every NOC in the region will have fully-fledged and active trading companies. Global trading firms – the likes of Vitol, Trafigura and others that have dominated that space – will adapt and survive.”**

significant shift. But I also believe China has the room to ease policy, so I would expect it to grow closer to 7% in 2019. And I don't think we're going to see a real trade war.

*SE: Did OPEC misread the market fundamentals in June 2018 i.e. increasing output when they should have maintained supply cuts?*

**Paul Young:** OPEC, and particularly Russia, have enjoyed the price rise in the market since 2016. It is no secret that the US has also done relatively well from higher oil prices. I don't know how many points of GDP growth it has delivered, but it has been a very significant contributor. It doesn't suit anybody at all to track the oil price back down to \$40/bl. Now that Iranian oil is not going off the market as expected, in the short-term at least, it has corrected prices lower back into the \$50s/bl-\$60s/bl, which maybe is the right level. It moved too quickly for OPEC to change course in time. They faced a dilemma: should you react on the basis of one month or do you give it two or three months? Extremely difficult. Will the US flood the market now?

*SE: What is your expectation for Russia's continued engagement in the OPEC+ group? They've been a very solid partner for two years but there are rumblings that may no longer be the case.*

**Marios Maratheftis:** It's 100% in Russia's favor to continue the relationship. It's an economy that is almost entirely dependent on high oil prices. Geopolitically, they're under pressure from the west, so if they become more relevant internationally through oil prices and through the collaboration with OPEC, it will be in their own interest.

*SE: What will be the biggest trends to watch in 2019? We've seen the US Federal Reserve start to tighten, some would say a bit too aggressively...*

**Marios Maratheftis:** There is going to be more tightening in 2019 for several reasons. We may see rates climb to 3.5% or 3.75%. The US economy is growing above trend and this is not natural and cannot happen for too long. A healthier job market with unemployment at historically low levels is giving the Federal Reserve the room to hike interest rates.

In the past when you had a recession in the US, the Federal Reserve had to lower interest rates by 5 percentage points to stimulate economic recovery. If there was a recession today, there would not be enough room for the Federal Reserve to cap interest rates and stimulate growth, so they need to bring them up now. If we do fall into a recession, it won't be because of the recent rate hikes. Instead, it will be because of what we call the 'Minsky moment' – everything striking at once with no room to cap – following a complacency in the markets for the last 5-6 years. So, is it more important to get interest rates back

to the historic average of 5% at the cost of having a recession?

**Dr. Mohammed Haroun:** I would keep an eye on China's changing market in 2019 – investments, imports and exports. And we also need to watch India in an election year, as its 'Think West' policy is a very important initiative. We will probably also see Libyan oil exports come back to the market, which could take global supply up to 102m b/d – potentially dangerous for oil prices. We would need to stabilize that.

**Paul Young:** A slowdown in China is certainly there. On the oil side, refining rounds have been very good and that was one of the reasons the price got pushed into the \$80s/bl in the last quarter of 2018. Global refining will see a slowdown in this quarter (Q1 2019), but the Middle East is in a sweet spot. It is supplying a lot of distillate into Europe where there is a shortage. We remain very bullish for the Middle East's refining sector and we like the outlook for demand growth, with Africa and India on our doorstep with huge potential. Things are very bright for Middle Eastern refiners. It makes perfect sense for national oil companies (NOCs) to manage the whole value chain – from producing crude to selling it. Over the next ten years, we'll see every NOC in the region with fully-fledged and active trading companies. The global trading firms – the likes of Vitol, Trafigura and other classical traders that have dominated that space – will adapt and survive. They never completely relied on NOCs anyway. Some of the NOCs don't even deal very much with trading companies. And companies like Vitol and Trafigura are also getting more and more into downstream assets themselves, becoming mini majors.



**“The top 20 countries leading global growth are holding debts of 115% to 230%. China alone has \$23 trillion of debt; the greatest volume in the shortest amount of time ever. When will this mountain of global debt start to derail growth targets?”**

They may become fully fledged majors at some point.

*SE: How well do you think the Gulf states have utilized the era of lower oil prices to drive much-needed economic reforms and efficiencies?*

**Marios Maratheftis:** What the Gulf states did in terms of removing fuel subsidies and introducing VAT was the right thing, but it was the wrong time. The oil price collapsed in 2014 and sentiment was already weak with the US dollar getting stronger and interest rates moving up. So, we got three negative shocks to growth at the same time. Right reforms, wrong time and timing is very important in economics. But once you do it, you have to see it through, and maybe the austerity impact on growth in 2019 will be neutral. The impact of the oil price on growth next year will also probably be neutral. Where we will have

negative impact on growth will be further monetary tightening from the Federal Reserve. The key here is what we call in economics profit mentality: when things are good, we add more fuel to the economy and the economy overheats. We don't need fuel when the economy is booming. Then when things were slow because oil prices fell, we tightened everything else. So, we have very violent business cycles. The challenge for the Gulf in 2019 will be that the world economy will not grow beyond trend - the US will slow down significantly, and interest rates will rise further.

*SE: The top 20 countries leading global growth are holding debts of 115% to 230%. China has \$23 trillion of debt. When will this mountain of debt impact global growth?*

**Marios Maratheftis:** There is a high ratio of debt levels and no

country has accumulated as much debt in such a short period of time as China has. Beijing will avoid a crisis, but the negative is that it will lead to slower growth later on. If we have a recession, is there room for governments to increase spending when debt levels are so high? No. Is there room for central banks to cut interest rates when they are still so low? No. That is my main concern. We don't have a lot of ammunition to deal with an economic crisis.

*SE: We saw an average oil price in 2018 of almost \$70/bl and \$54/bl in 2017. What will be the average price of Brent crude oil in 2019?*

**Dr. Mohammed Haroun:** We should find ways to make it \$50/bl so we can help certain economies recover as best as they can from these trade deficits and debt.

**Marios Maratheftis:** We're going to be closer to \$70/bl in 2019 because the main scenario is for normalization; a slowdown and not a recession. However, one key component of the great financial crisis in 2008 was international cooperation and collaboration. Countries and sensible minds worked together and coordinated moves and that's why we avoided a depression. The global stage of geopolitics now suggests that this would not be the case.

**Paul Young:** In the credit crisis of 2008-2009, the oil price went from \$140/bl into the \$20s/bl. It doesn't quite feel like that yet, so that would be my silver lining. Right now, I would say the average price will be \$65/bl in 2019. We are in a down cycle and there was a shock to the market with the sanctions on Iran, but nobody wants the market to collapse. ■

*\*Edited transcript*



# TOP 5 Tweets

Q4 2018 @gulf\_intel



## Oil Price

- 1 #Oilprices slumped to 2018 lows in thin but volatile trading, pulled down by concerns of an emerging global supply overhang amid a bleak #economicoutlook. #OOTT bit.ly/2AjCKFt
- 2 Investors still haven't forgiven #oil companies for being ill-prepared for a crude-price collapse four years ago. Perhaps more than half a trillion dollars will change their minds...
- 3 With #oilprices plunging into bear territory — having fallen over 20% from recent highs @SPGlobalPlatts expects to see a slow rise in prices going into 2019. http://bit.ly/2TvqPgE
- 4 .@IEA expects #petrochemicals to account for more than a third of growth in global #oil demand by 2030. http://bit.ly/2E5cmUL
- 5 What's in store for end-2018 #oil prices? http://bit.ly/2DScxTk @btmu\_official #OOTT

## Gas & LNG

- 1 Beijing turns to Russia and Iran, leaving Trump a void to fill... https://s.nikkei.com/2E9Z89p #tradewar #LNG #OOTT
- 2 #Egypt new form of #gas exploration agreements in Red Sea! bit.ly/2zdQroG #natgas #OOTT
- 3 A silver bullet to post-2020 bunkering remains elusive. But among the plethora of options #LSFO & #LNG #bunkering are emerging as preferred for #energy stakeholders seeking an economic and environmentally sustainable route. @uniper\_energy
- 4 .@Petronas and joint venture participants reach final investment decision in #LNG Canada Project. http://bit.ly/2lwDY3X #MELI
- 5 Big #oil companies are betting on #naturalgas as the #fuel of the future — and working hard to ensure new projects deliver profits of the future.

## Renewable Energy

- 1 There is a pressing need to accelerate #renewableenergy programs to achieve sustainability. http://bit.ly/2zcZPct #energymix
- 2 The explosion in #renewableenergy projects on #blockchain is already promising — there are 122 start-ups operating in the space, with nearly half launching since 2017... http://bit.ly/2yVWz2T #EnergyStorage
- 3 #Egypt can tap #renewableenergy at a faster pace. bit.ly/2Eu0qfs @ACWAPower #OOTT via @ArgaamPlus
- 4 Burgeoning investments in #renewableenergy projects — harnessing solar, wind and waste-to-energy resources — are expected to ramp up the contribution of renewables to around 20%. http://bit.ly/2BbbNUW #OOTT
- 5 .@ENOC has put into operation five new solar-powered service stations, increasing its fuel network to 122 stations nationwide. #renewableenergy

## OPEC & non-OPEC

- 1 Exclusive Interview: H.E. Mohammad Sanusi Barkindo, Secretary General, @OPECSecretariat on What's Next for OPEC+?
- 2 Will OPEC+ deal to remove 1.2m b/d from 2019 support #Brent crude above \$60/b? https://bit.ly/2RD1aVc #OPEC #OOTT
- 3 The #OPEC agreement to cut #oil production over the weekend marks the first of three important policy decisions being made this month. The other two will be #brexit vote and the Fed's interest rate policy.
- 4 #OPEC and its #oil producing allies have agreed to cut production by 1.2m b/d, defying Donald Trump's calls to keep output high and sending crude prices higher. on.ft.com/2UtEgxN #OOTT
- 5 OPEC members produced 33.08m b/d in November, a 40,000 b/d rise from October, according to the @SPGlobalPlatts survey http://bit.ly/2AX6ubx @HermTheWord #OPEC #OOTT

## Energy Transition

- 1 Saudi Arabia: The Kingdom's #EnergyTransition finally starting to shape up http://bit.ly/2yZXC41 @bbrunettienergy SPGlobalPlatts via @Saudi\_Gazette #OOTT
- 2 With a new year upon us, what does the 2019 magic eight ball present with regards to #EnergyTransition? Join us at the UAE Energy Forum where over 250 key #energy industry stakeholders will congregate to give an outlook to the year ahead! @gulf\_intel
- 3 Implications of the forecast for the #oilandgas industry and insights into how the #EnergyTransition is unfolding in practice in the #MENA region and globally?
- 4 Energy policy remains a topic of intense debate worldwide. What are the remaining challenges that #Oman needs to overcome for its #EnergyTransition to succeed?
- 5 Is the existence of a competent and integrated local #supplychain critical for #MiddleEast countries to accelerate their #EnergyTransition?

## The Middle East LNG Institute

@MidEastLNG

## Gas & LNG

- 1 If #Japan is successful, up to \$600bn worth of deals may be adjusted and the volumes of potential resales could position Japan as a quasi #LNG hub.
- 2 The #LNG outlook shows favoritism towards shorter length contracts with greater flexibility. How do such contracts benefit LNG importers and exporters?
- 3 Japan's Jera, the world's largest buyer of #LNG, has signalled ambitions to become a leading #trader of the supercooled fuel by linking up with the London-based trading arm of EDF. https://on.ft.com/2THAEYa
- 4 Do the shorter length #LNG trading contracts pose a risk in terms of supply guarantee for the market players dependent on LNG imports?
- 5 #Tradewar looms over #LNG industry. https://bit.ly/2sjPJ6z



# The Data Point to Watch?

## ASIA'S ENERGY DEMAND!

INTERVIEW: KEITH MARTIN, CEO, UNIPER GLOBAL COMMODITIES SE

**Q:** What is your outlook for the supply and demand dynamics of crude oil in 2019?

**Keith Martin:** The oil prices that we've been enjoying over the last couple of years have been a surprising combination of the cooperation between OPEC and non-OPEC. It appears that this alignment remains sound. The main influencer going forward will be Asia's massive demand appetite for oil and gas products. As long as that is still there, the fall in oil prices that we saw in the fourth quarter of last year could just be a bump in the road. This year will have a lot to do with what happens in Asia i.e. is the demand going to be as robust as we've seen before? Beyond that, digitalization and how much of an impact it will have on every part of our process is going to be immense! It's being embraced and is already starting to have a deep impact in all

**“Mr. Trump is actually very predictable. ‘America First’. He says it very clearly, he articulates it and he does it.”**

aspects of what we do. We'll see that more visibly in the coming year.

**Q:** On the subject of the energy transition, we have seen some headline grabbing developments, including Germany's recent announcement to ban all carbon-emitting cars by 2040. Are you concerned about policy makers over-reaching?

**Keith Martin:** It really depends on where you are in the world. If you take Europe, there is definitely an incentive to get rid of all forms of carbon emissions. We are seeing coal being taken out of the power stack, and nuclear power in Germany is also being closed. Even gas (probably the most efficient complement to renewables) is

being talked about as a bridging fuel to a lower-carbon economy. In Europe, you can afford to have these views, whereas in other parts of the world people simply do not have access to energy for basic household needs, never mind for job creation and economic growth. That's why you do need a balance. The reality today is that there are 1.3 billion people in the world without electricity. We can do two things at the same time – improve people's quality of life and give sustainability to the economy. If you take gas, there more than 40 floating storage and regasification units (FSRUs) projects around the world that allow the import of gas in a relatively cheap way. As well as providing basic energy needs,

that is creating jobs and creating sustainability.

**Q:** As an international energy company facing these transformational policy changes, such as a ban on coal and nuclear power generation, how do you map out a way forward for your business when there is still demand for these fossil fuels?

**Keith Martin:** In Europe's case, tariffs were offered to make it effective to bring in renewables and this was at the expense of thermal generation. If we look at what happened in Germany, investments were wiped out if you were invested in the latter, so that's a difficulty in the future world if you've got new decisions to make. We need more consistency. There's a bigger role for governments to play in terms of ensuring that a market is liberalized and competes on cost, or that there are clear rules if it is subsidized. Otherwise, you'll simply choke-off investment. If we look at the UK, for example, it's the first time in 100 years that the country has not burned coal since the Industrial Revolution because of the change with the pricing of renewables. Nobody is willing to invest now in thermal generation in the UK without subsidies. Otherwise, you simply cannot compete against the government, which can change the rules at any time. The other issue now is, due to advancements in technology, renewables are becoming cost competitive for certain forms of power generation. So, from a company perspective, it's about being flexible and being part of the solution, while accepting the fact that we are now in a transition to a lower-carbon economy.

**Q:** Does this uncertainty risk suppressing the potential investment that could go into new technologies, such as clean coal?

**Keith Martin:** Without a shadow of a doubt, because people will always think in terms of how long it takes to recoup an investment. But we also need to look at geographies. In Europe, renewables have been established for a long time because of subsidies. In the rest of the world, we're seeing gas emerge as a direct competitor to oil in power generation as it's cheaper and more efficient. E.ON at its peak was an €80 billion company, but it missed the transition to renewables, it missed deregulation, it missed incentivization by government to encourage renewables at the expense of thermal. That wiped out €60 billion from the company's valuation – because it did not see those changes coming. Going forward, the key question for anybody will be how sustainable is the return on my investment. The important thing when we make a decision is to understand the prevailing climate and what will happen in the future to underpin our investment as the climate continues to change.

**Q:** How big a factor is US President Trump when it comes to the predictability of policy makers? For example, with the US pulling out of the Paris Agreement, where does that leave carbon as a policy?

**Keith Martin:** I think Mr. Trump is actually very predictable. 'America First'. He says it very clearly, he articulates it and he does it. And he is sitting on a wealth of natural resource of shale so that's a huge benefit for the US. He has made it clear to his voters that he doesn't like high energy prices and that's why he claims credit for them falling. Again, his policy is very clear – political expediency – that lower oil prices at that moment in time was good and made sense.

**Q:** Would you spend \$10 billion investing in a coal plant in America based on 'Trump Likes Coal'?

**Keith Martin:** I think what Mr. Trump is saying when he says that he likes coal is that he didn't like when it was not being favored with other forms of energy for subsidies. I don't see many people investing in new coal mines, but what you do see is very healthy coal demand. More coal is being exported from the US than at any time in its history. Ironically, despite the fact that Trump has pulled out of the Paris Agreement, US coal has gone elsewhere in the world. And as a result, the US is one of the few countries where carbon output has actually gone down. It's a crazy world.

**Q:** How secure is gas as part of the future energy mix and energy security?

**Keith Martin:** Europe at the moment relies on gas for the majority of its peak demand power generation. Going forward, gas will play an important role as there is instability caused by the growth of renewables.

We do import liquified natural gas (LNG) into Europe, but we only use about a third of the import capacity. Having said that, because of the loss of coal and the loss of nuclear plants, alongside the decline with indigenous oil production in the North Sea, we're going to have to import more LNG than ever before. We see LNG as a complement to gas pipelines in Europe, because gas is important in this transition to a lower-carbon economy. We are already heavily involved in Nord Stream 2 and we see it as very important to ensure security of supply for gas in Europe. ■

\*Edited transcript



# **Excelling in New Territory?**



# INNOVATIVE R&D

## *Transforming Ideas into Realities*

BY SAIF HUMAID AL FALASI  
GCEO, ENOC Group

**W**

**HAT IS A CORNERSTONE IN THE GLOBAL**

quest for energy security? Innovative and successful research and development (R&D). Transforming innovative ideas into applicable technologies and policies requires three pivotal ingredients: consistent expertise, money and time.

Still, R&D cannot be sidelined until budgets are flush and stresses are low. Steady and fluid investments create a robust knowledge foundation that sharpens the energy resilience of countries and companies during both

prosperous and volatile times. Energy R&D is also a key component that lends support to the UAE's National Vision to become a knowledge-based and globally competitive economy.

Global awareness and momentum to support energy R&D is on the rise again. The total public energy research, development and demonstration (RD&D) budget neared \$18 billion last year among member governments of the International Energy Agency (IEA). After four years of decline since 2012, the budget rose significantly to

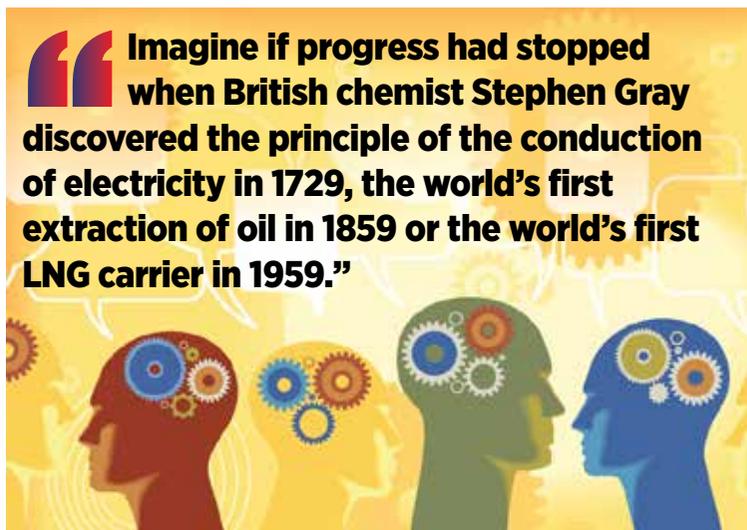
## EXCELLING IN NEW TERRITORY?

reach 2014 levels – climbing by 7% between 2016 and 2017.

Vigorous efforts have long been underway in the UAE. Recently, Dubai Electricity and Water Authority (DEWA) said investments at the R&D Centre at the Mohammed bin Rashid Al Maktoum Solar Park will hit AED500 million (\$136 million) by 2020 and Abu Dhabi-based RDPETRO (Research & Development Petroleum Conference and Exhibition) is now establishing itself as a global hub of the brightest innovators for technologies of the future in the petroleum industry. Mubadala, a global investment company with a mandate to create sustainable financial returns, has shared plans to invest another AED82.5 million (\$22.4 million) for R&D into its Aerospace, Renewables & ICT platform over the next five years.

### GREEN INTELLIGENCE

Energy companies and investors' efforts to strengthen environmental awareness is also playing an integral role in spurring innovative R&D. Spending in low-carbon energy technologies reached \$17.3 billion last year, noted the IEA. Unsurprisingly, more ground-breaking projects that highlight the



**“Imagine if progress had stopped when British chemist Stephen Gray discovered the principle of the conduction of electricity in 1729, the world’s first extraction of oil in 1859 or the world’s first LNG carrier in 1959.”**

limitless opportunities of combining fossil fuels and renewables are emerging with the aim of reinforcing energy security in the 21st century.

Greener enhanced oil recovery (EOR) is one sphere of much-lauded cutting edge progress. Oman’s Miraah solar-thermal plant uses 36 glasshouses to generate 6,000 tons of steam per day to support state-owned Petroleum Development Oman’s (PDO) existing thermal EOR technology. In the UAE, al-Reyadah officially inaugurated the first commercial-scale carbon capture, utilisation and storage

(CCUS) facility in the Middle East in late-2016. Al-Reyadah will capture up to 800,000 tons a year of carbon emitted from Emirates Steel and pipe it to Abu Dhabi Company for Onshore Petroleum Operations for use in EOR.

Innovations are also prevalent in other areas of energy and engineering. GE Power funneled \$2 billion into R&D and three years of intensive development by a team of 1,800 to create the 9HA gas turbine, which gained a spot in the Guinness World Records due to its 62.22% efficiency rate. And the Troll

**“A student cannot jump to a PhD level of knowledge overnight; stepping stones are laid in early education so that expertise can be reaped later. The same applies to R&D. Efforts made today to push the boundaries of what we know pay dividends later as it can take years – if not decades – for a novel idea to transform into a commercial innovation.”**

A gas platform is one of mankind’s engineering marvels as the largest construction ever moved on the earth’s surface.

### WHAT’S NEXT?

What else can we achieve? This is a pertinent question raised by the examination of the rapid progress of the energy market over the last century, from output, scale, affordability, safety, transport and many other successes.

How can more ideas on paper be transformed into innovative policies or technologies that streamline efficiency and affordability? How can talent be incentivized to share ideas

and how can those ideas then flourish in incubator programs within government, industry and academia? What is the best approach to send the right message to financiers to ensure that the much-needed funds that underpin R&D keep flowing?

There is no one right answer to address these complex questions. What we know for sure is that nurturing a R&D ecosystem is a never-ending effort and that early starters reap the greatest rewards. Energy companies must ramp up their efforts now in order to see the benefits in the 2020s and beyond. The exploratory path of R&D is a marathon and not a sprint.

## R&D: EBBS & FLOWS

**40**

Investment from IEA member countries in energy RD&D has become progressively more diverse over the last four decades.

**8%**

RD&D budgets for fossil fuels were at their highest in the 1980s and 1990s. They have fallen from 14% in 2013 to 8% in 2017 – their lowest share since 2000.

**1974**

Nuclear was dominant in 1974 with 74% of the total public energy RD&D budget. It witnessed year-on-year reductions, sliding to 19% in 2017.

**1st**

The US and Japan have the largest absolute spend on energy RD&D among IEA member countries. France, Germany, Korea, the UK and Canada are next in line.

**#3**

The total budget of the European Commission, under the Horizon 2020 program, ranks 3rd place when compared to IEA member countries after the US and Japan, respectively.

Source: IEA Energy Technology and RD&D budgets 2018

## Incubator programs

### UNLOCKING POTENTIAL

A key goal should be to uproot and change the way we all think and do business via incubator programs in companies, government and academia. This creates positive disruption in markets, delivers quantifiable value to the ‘host’ entity and value for the end user. Essentially, we must provide answers to new and unseen challenges.

### FOUR CORNERSTONES

Curiosity, commitment, courage and compassion are the four pillars of a flourishing and innovative ecosystem. Examine every point of view; evaluate opportunities with a critical eye; and focus on connections and collaborations. Following these directives will capitalize on untapped potential and release vast economic, social and cultural value – all key growth points in the UAE’s National Vision.

### NATIONAL GROWTH

Incubator programs give employees and partners the confidence to bring their ideas forward. It is essentially an intellectual safe haven where ideas can be freely shared, nurtured and evolve into innovative commercial technologies and policies. A healthy and sustained R&D ecosystem can identify and address weak points in the value chain while leveraging new opportunities that can ultimately strengthen energy security and the UAE’s global competitiveness. For example, pushing intellectual and practical boundaries enabled the discovery of oil in the Middle Eastern region in 1908 to transform the region into the global epicenter of fossil fuels. What other ideas are waiting to be unlocked? ■

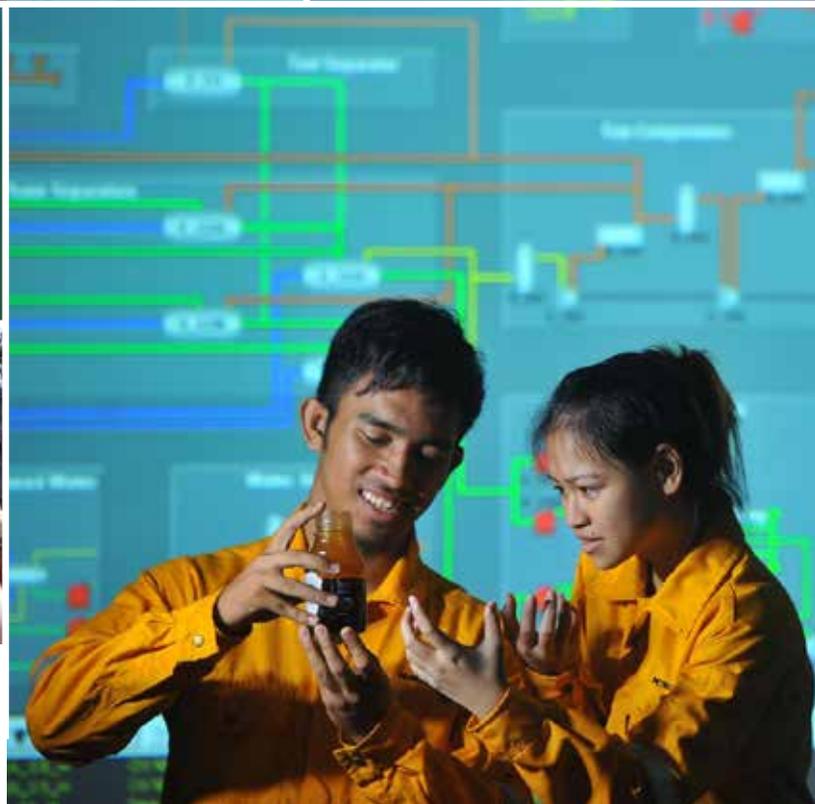
## Mastering a tightrope

Leveraging R&D to achieve a nexus of reliability-affordability-efficiency in the energy market will only become more pressing. BP Outlook estimates that the Middle East needs to meet a 54% rise in energy consumption by 2040, while obliging the ambitious lower-carbon targets outlined in National Visions and the Paris Agreement.

Add the United Nations’ (UN) warning that the global population is rapidly rising to these increasing demands; a growth rate that is echoed in the Gulf countries. The number of UAE residents alone could swell by 40% to 13.1 million by 2050. R&D is one of the primary pressure relief valves for energy companies grappling with how to meet these highly

challenging energy and environmental demands while safeguarding budgets. R&D is often an unsung champion of positive disruption. Consider the state of today’s energy market without curiosity to discover what lay around the hypothetical corner. Imagine if progress had stopped when British chemist Stephen Gray

discovered the principle of the conduction of electricity in 1729, the world’s first extraction of oil in 1859 or the world’s first LNG carrier in 1959. Imagine if energy companies shunned the 4th Industrial Revolution for pen and paper, essentially putting themselves in the digital dark ages while other industries finessed their digital fluency.



PETRONAS

# National Oil Companies & Partnerships: How to Prosper in the Digital Age?

An excerpt from the Whitepaper harvested from a roundtable session for PETRONAS in Abu Dhabi on the sideline of ADIPEC week 2018 under the Chatham House Rule. The full Whitepaper can be accessed via GI's website.

**T**WO HATS MUST BE worn by national oil companies (NOCs) in the Arab Gulf and beyond; one as custodians of national energy security and the other as competitive players on the global energy stage. Mastering this juggling act amid intensifying pressures is no small feat. Leveraging forward-thinking partnerships and the digital toolbox as part of the 4th Industrial Revolution will help NOCs thrive in new territory.

A mountain of challenges too steep to scale alone confronts many NOCs and energy entities; unity will trump fragmentation (*Shifting sands: see right*). The consolidation and diversification of Gulf NOCs' assets is gaining pace as stakeholders try to trim spending, increase output and support the region's National Visions for energy security and globally competitive, knowledge-based economies.

**REALIZING** this goal means Gulf NOCs must continue their transformation into savvy INOCs – national oil companies with influence worldwide – according to 74% of respondents to a GIQ Industry Survey. Following in the steps of Asian peers (i.e. PETRONAS and Sinopec) and European peers (i.e. BP and Statoil) over the last two decades means evolving from the traditional dynamic between NOCs and international oil companies (IOCs). The simplified version of this relationship historically saw IOCs taking the lead in developing Gulf partners' plentiful oil assets; largely a win-win for both parties.

But the dramatic reduction in oil prices since 2014 has especially spurred a change of tact in NOCs' asset management and ambition. A new lease of life was given to oft-discussed plans to increasingly grow horizontally through



## Shifting sands

Collaboration and innovation are vital tools for NOCs and other energy producers trying to solve the 21st century energy puzzle. How to meet rising energy demand, hit the lower-carbon targets detailed in the Paris Agreement while preserving competitive balance sheets? Consider that this quandary must be solved against a backdrop of unpredictable oil prices, geopolitics and a talent shortage. In the Middle East alone, BP Outlook expects energy consumption to rise by 54% by 2040 and data from the United Nations (UN) suggests that the 39% rise in the UAE's population to 13.1 million by 2050 will be echoed across the region.

diversification and vertically through integration. For example, many NOCs now have trading desks, which has historically been a remit of IOCs only.

Combining forces can yield greater economic, environmental and intellectual dividends (*Collaborative sweet spots: page 24*). This includes broader access to government and third-party capital, a wider array of research and development (R&D) expertise, technologies and talent. In the UAE, the ADMA-OPCO concession was divided into three new separate concessions to maximize commercial value and expand state-owned ADNOC's partner base, for instance. This method also sought to develop partnerships that stretch along the entire oil and gas value chain.

This more collaborative ethos has helped NOCs overcome challenges in deep water oil

## Will you catch the train?

The rate of change – and the pace at which industry must react – has drastically altered. Roundtable participants likened the need for agility and awareness to a 'man trying to catch the train of progress.' When the man sees little happening and bores of waiting on the platform, he briefly leaves to buy a coffee. Suddenly, the train pulls into the station and quickly departs before the man returns. Only a few people were ready and managed to board. Their vigilance will be rewarded; the first train enables forward thinkers to reap the dividends of the first mover advantage. The second train carrying the 'first followers' is also valuable, but the competitive and innovative edge of every train thereafter becomes increasingly dulled. Will your partnership get a coffee or be prepped on the platform?

production, brownfield enhanced oil recovery (EOR) and gas development in recent years, roundtable participants said. Careful navigation is still needed. For example, the experience of operating in competitive markets without a monopoly position is considered the biggest hurdle for Gulf INOCs that want to broaden their success internationally, according to 55% of survey respondents.

The compass setting for progress must point towards the horizon, especially as the industry seeks goalposts amid a myriad of unknowns i.e. unpredictable oil prices and geopolitics. Long-term partnerships are a key pillar of NOCs' risk management strategies, as well as other energy entities. Such commitments

**“ What is one factor that NOCs and all other energy companies share? No matter what, they must keep evolving and keep moving. Hedging risk is often easier in a pack than alone, especially on a route littered with unpredictability.”**

require firm but flexible financial structures, ambitious but realistic technology developments, sustainable corporate and social responsibilities (CSR) and deep-rooted talent enhancement. Confidence that both parties are fully engaged is also essential. Commercial divorces risk expensive reputational damage. Budding partnerships must also consider changing corporate structures. For example, the initial public offering

(IPO) of 5% of state-owned Saudi Aramco that is scheduled to go ahead by 2021 – originally penciled in for 2018 – could influence the energy giant's data sharing practices and risk appetite later on.

**DIGITAL FLUENCY**

What appeared as a wave of technological jargon in recent years is increasingly finding its feet as valuable digital knowhow that can boost efficiency and affordability.

**Collaborative sweet spots?**

Partnerships that combine intellectual, technological and geographic resources will help solve the conundrums busying boardrooms in energy companies (*Shifting sands: page 23*). Enhanced oil recovery (EOR) is just one area that can be a pressure relief valve. EOR has been a core facilitator in exploration and production (E&P) for more than a century; a trend that continues to gain pace. Transparency Market Research expects the valuation of the global EOR market to soar from \$38.1 billion in 2012 to \$516.7 billion by 2023. Thermal recovery, steam injection, miscible gas injection, chemical recovery and Co2 injection are all on the 'menu' of traditionally

popular options. Solar is a recent addition, thanks to a partnership between state-owned Petroleum Development Oman (PDO) and GlassPoint to build the Mirraah plant. The generation of 1,021 MW of peak thermal energy via solar panels that will direct 6,000 tons of steam a day towards EOR efforts at the sultanate's Amal field is a world first. The value of forward-thinking partnerships also applies to thriving rather than surviving regulatory shifts. Take the International Maritime Organization's (IMO) ruling to introduce a 0.5% sulfur cap on bunker fuels, down from today's 3.5%, by the 1 January 2020, for instance. How could more dialogue between NOCs, IOCs, INOCs, technology

companies and financial institutions lift the veil on the ambiguity surrounding one of the biggest changes in the shipping industry since engines replaced sails in the late 1800s? Energy companies' collaborative journey is just beginning; there are a multitude of avenues to explore together. How can partnerships hasten the electrification of energy markets? How to affordably diversify refineries' crude palette to increase the supply of biofuels in the Middle East? Finding solutions by 2021 is key to support the UN's International Civil Aviation Organization's (ICAO) new offsetting scheme, the Carbon Offset and Reduction Scheme

for International Aviation (CORISIA). How can partnerships improve the utilization of wastewater in energy production amid warnings by the World Economic Forum (WEF) that scarcity is a top global risk? How can partnerships help increase energy efficiency along the value chain? How can they create a common platform for data sharing and talent enhancement i.e. nurturing the intellectual pioneers of the future? How can partnerships enable the Middle East's oil and gas export market to support the almost doubling of energy demand that the Asian Development Bank anticipates in the Asia-Pacific up to 2030? Great effort precedes great reward; the clock is ticking.

The World Economic Forum (WEF) defines the 4<sup>th</sup> Industrial Revolution as “a fusion of technologies that is blurring the lines between the physical, digital and biological spheres.”

Oil and gas companies – both independently and in partnerships – must first understand and then take advantage of this new digital ecosystem. Open mindedness can unlock a treasure trove of economic efficiencies. Lloyd's Register (LR) said predictive analytics are saving companies \$7 million on gas pipelines in the eastern US by giving a heads up on an upcoming failure, while Grand View Research estimated that the Internet of Things (IoT) will witness \$933.6 billion of investments by 2025.

In alignment with Moore's Law, computer power has doubled every year since the 1970s. More data has been generated in the last two years than in all of previous recorded history. Data generation is not the challenge; transforming it into valuable insight is. This will be one of the most valued skills in the next decade at least, so NOCs and the wider energy market should get a head start.

Roundtable participants pointed to the need to properly classify data to iron out time-consuming communication hurdles in partnerships. Classifying data into 'piles' that are private and public is key i.e. intellectual property (IP) versus information that can be shared in the collaborative process. This seemingly simple process is often overlooked. Getting the fundamental processes right really does matter.

Ensuring that the migration of these digital lessons and knowledge flows freely in NOC-NOC, NOC-IOC, NOC-IOC-Tech, and every other type of partnership, will help remove the bricks in the walls that



**Three is not a crowd**

A new player is stepping into the arena with NOCs and IOCs; Silicon Valley-esque companies. The growing influence of digitalization means technology and IT companies are helping the energy industry finetune their digital acumen. Nearly a quarter (24%) of survey respondents expect alignment between NOCs and companies from Silicon Valley to emerge as a popular partnership in the 2020s. This joining will lead the charge over the next decade, bar the prevalence of NOC-IOC partnerships (48%). Meaningful progress is already underway. Microsoft said its new partnership with Chevron will infuse the energy company with even more computing power to accelerate its work in data analytics and the Internet of Things (IoT). The partnership is part of Chevron's efforts to digitize its oil fields and accelerate deployment of new technologies. For example, engineers in Houston monitor data that arrives in five to ten seconds from drill sensors six miles beneath the earth's surface and across four continents. What's next?

are halting knowledge exchange (*Three is not a crowd: see above*). Equally, due diligence is critical to flag any weak spots in a potential partner's digital firewall before increasing said flow of information and data. Cyberhackers, the world's new and largely invisible mafia, are continually widening their destructive influence. The cost of cybercrime in 2017 neared \$600 billion, or 0.8% of global GDP, warned McAfee.

Having an 'intellectual army' to bolster protection against cyberattacks feeds into the importance of capturing the digital hearts and minds of both established and emerging talent. By 2020, more than a third of the

desired core skill sets of most occupations will be comprised of skills that are not yet considered crucial to the job today, according to the WEF. Clearly, strategies to develop talent must be more proactive, imaginative and dynamic across all age groups and skill sets. A partnership is only as brilliant as the minds involved.

Partnerships are not a silver bullet, but they are awash with potential. Clear communication, transparent data and a zest for digital experimentation should underpin NOCs' offering as they seek sustainable and smart partnerships. Together, the industry can start climbing the mountain of challenges – safely and sustainably. ■



# PREDICTIVE ANALYTICS

## Lifting the Veil on Energy Inefficiency

BY GARETH KIRKWOOD

*Managing Director for Middle East and India, Lloyd's Register*

**A** S THE WORLD'S BIGGEST OIL companies, including the UAE's ADNOC and Saudi Aramco, ramp up investments in new production capacity amid \$60/bl oil prices, they are eagerly eyeing new digital tools that could deliver millions of dollars in savings. Enter predictive analytics – the closest an industry beset by uncertainty and technical complexity can get to a crystal ball.

Already, more than half (57) of the world's 100 largest oil and gas firms – several in the Middle East – are already using or have plans to use predictive analytics, according to LR's latest Technology Radar Special Report, titled 'Predictive Analytics in Oil and Gas: The future in focus'. The report was launched in Abu Dhabi on the eve of ADIPEC 2018.

One tool alone, machine learning and predicting failures has, for example, been found to generate savings of many hundreds of thousands of dollars per drill rig and

**57**

More than half of the world's 100 largest oil and gas firms are using, or have plans to use, predictive analytics.

For example, integrated oil majors, such as Shell, Chevron and ConocoPhillips and field service companies, such as Schlumberger and Halliburton, are applying predictive analytics across their global value chains.

multiple millions on gas pipelines in the eastern US. Giving predictive analytics a cold shoulder would be a costly mistake for Middle Eastern oil, especially when you consider there are 160 offshore rigs alone operating across the Gulf.

This advanced form of analytics expands on the digital journey established by artificial intelligence (AI), big data and others. It promotes visibility – the bedrock of reliability and efficiency in global energy security. How to glimpse into the future – i.e. leveraging predictive analytics – will be at the top of the digital agenda of boardroom conversations in the Middle East in 2019.

Sweet spots abound. Within the top 100 companies, evidence of predictive adoption is most extensive upstream, in oil-field equipment and services, exploration and production.

The largest firms, mainly integrated oil and gas companies appear to have advanced

**“Digital tools have been shedding light on the dark corners of operational inefficiency for years. Now, predictive analytics means switching on more lights than ever.”**

furthest. Midstream and downstream can also significantly benefit in the Middle East, especially since the region took the aged refining reins from Europe to establish one of the world’s most sophisticated and flexible hubs.

Imagine the enormous impact on profit and loss accounts, balance sheets and competitiveness if predictive analytics can be properly applied to the large number of refineries around the region and to the raft of new facilities being planned and soon to come on line. This has durable value, as the International Energy Agency (IEA) expects the region to have the world’s biggest growth in refining capacity up to 2023.

Over the next five years, this cutting edge digital tool can bolster production while streamlining costs and cutting risks. That’s a very good deal for those willing to grab the opportunity.



**40%**

Of these 57 companies, 34 are using or have plans to use predictive analytics. Nearly half (40%) still need to catch up.

**\$325,000**

Companies using predictive analytics are benefiting from a \$325,000 saving per rig by using machine learning to predict drill-bit locations.

**\$7m**

Predictive analytics are saving companies \$7 million on gas pipelines in the eastern US through predicting failures.

**DIGGING FOR DIAMONDS**

‘Data diamonds’ are key to unlocking the most valuable insights via predictive analytics. The global data sphere will grow to 163 zettabytes (ZB) by 2025, which is a trillion gigabytes and a staggering ten times the 16.1ZB of data generated in 2016, according to the International Data Corporation (IDC).

As data volumes surge, tools like predictive analytics will enable companies to focus on the quality of information rather than an overload. Quality over quantity will prevail! The more data intelligently gathered, the more it is analyzed, the more lessons are learned, and the more efficiencies and visibility will be achieved.

This intelligence will be a much-needed release valve in what is an increasingly intense pressure cooker in the Middle East and beyond. Energy stakeholders face tall orders on every front. Energy consumption in the Middle East alone is expected to rise by 54% up to 2040, according to BP Outlook, while the near-30% gain that the United Nations (UN) expects in the global population by 2050 is also echoed in most Gulf countries.

Demanding environmental regulations spawned by the Paris Agreement and cross border geopolitical tensions that hinder collaborations are also ramping up the ante. The pressure cooker cannot afford to blow.

Smart and swift solutions that maximize the clout of the digital revolution are the safest answer in an industry renowned

**“Predictive analytics provide a much-needed release valve in what is an increasingly intense pressure cooker – one that we can’t afford to blow.”**

for its myriad of unknowns. The OPEC+ agreement (the deal between OPEC and non-OPEC members to manage output), the US’ sanctions on Iran, trade wars and environmental regulations like the International Maritime Organization’s (IMO) sulfur cap of 0.5% on bunker fuel from 2020 are all potential triggers for volatility in the Middle East’s oil market.

The multi-billion-dollar savings identified in LR’s Technology Radar special report have the power to help stabilize Middle Eastern oil stakeholders’ balance sheets and spur much-needed research and development

**1.2%**

Just 5 of the 425 patent applications relating to predictive analytics filed around the world between 2012 and mid-2018 are specific to oil and gas – an unnerving 1.2%.

**\$50bn**

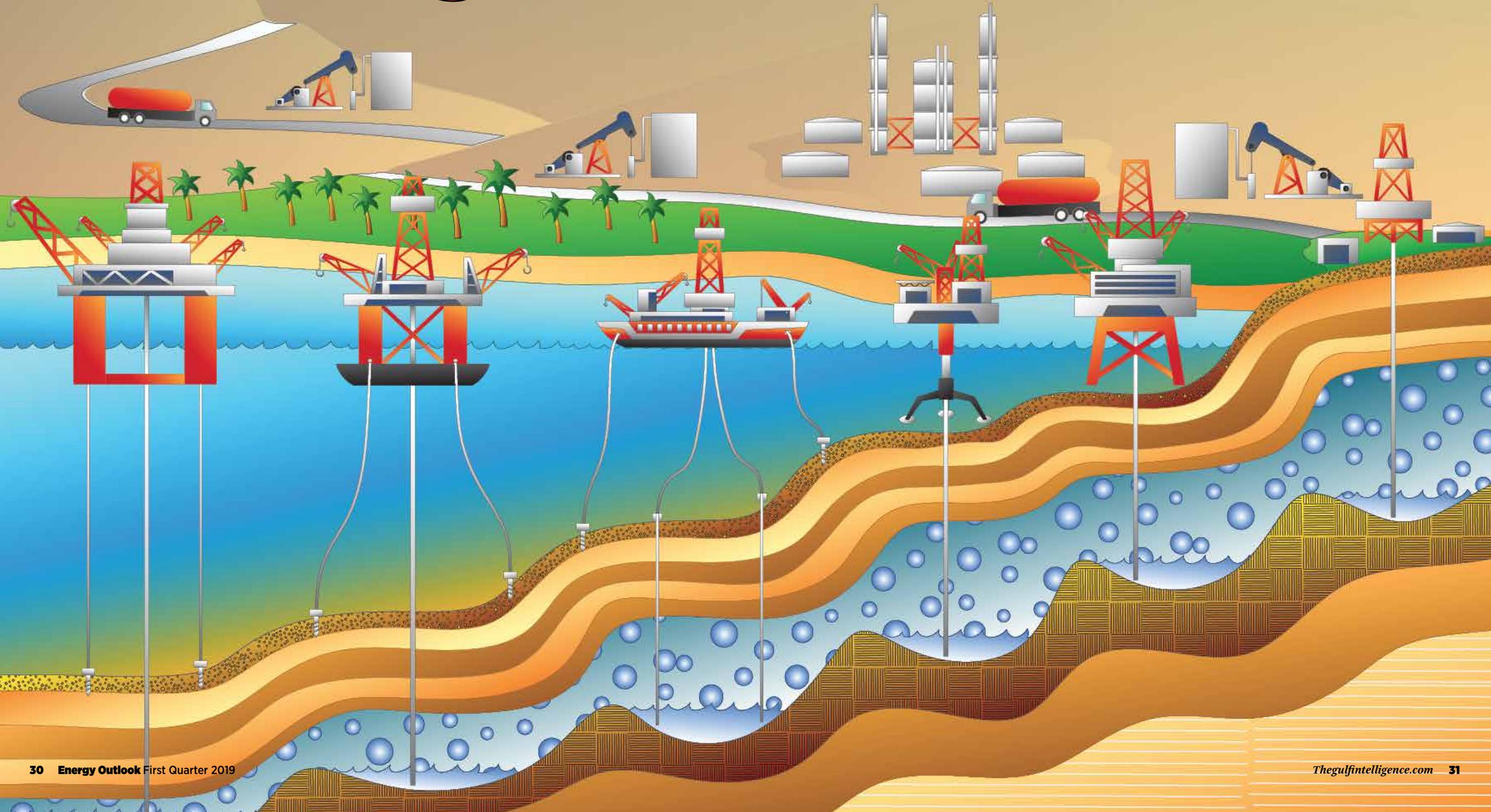
The use of predictive tools is most advanced in companies earning annual revenues of \$50 billion or more, as well as those with the highest market capitalization levels.

(R&D) to commercialize digital innovations. The latter is especially relevant to many Gulf nations’ Visions to become knowledge-based economies; the UAE included.

Primary players from energy companies, technology firms and government to academia and financial institutions (FI) must lower the brick walls that crimp the flow of knowledge sharing. This is not new territory for Middle Eastern oil stakeholders; their track record since the sharp decline in oil prices in 2014 for sharing knowledge and embracing digital disruption stands them in good stead.

Predictive analytics are essentially a highly intelligent heads up that enables proactive action to be taken affordably and efficiently, saving millions of dollars and potentially even lives. While Middle Eastern oil stakeholders’ digital tools have been shedding light on the dark corners of operational inefficiency for years, predictive analytics gives them a very powerful spotlight to see every detail. They must be patient and persevere; the 20/20 vision will be worth it. ■

# Advancing EOR in The Middle East



## GI RESEARCH: How to Create a Virtual Community of Enhanced Oil Recovery (EOR) Stakeholders Across the Middle East?

Seventy senior stakeholders in the region's energy industry, academia and government shared their expertise on how best to create a **Middle East Community of EOR Stakeholders (MECES)** at the Gulf EOR Workshop 2018 in Abu Dhabi on the 11th November. The six top recommendations detailed in this Whitepaper were captured via interactive discussions and voting sessions that focused on answering two key questions in this critical conversation (See Stream 1 & Stream 2).

### EXECUTIVE SUMMARY

**U**NITY EQUALS PROGRESS AS ENERGY STAKEHOLDERS EMBRACE THEIR MUCH-needed evolution from siloed efforts into collaborative synergies that make greater economic and environmental sense. Achieving this balance ultimately strengthens energy security; a holy grail for all.

Decades of trial and error means every Gulf country benefits from a strong foundation of knowledge, encompassing advanced expertise, technologies and policies. Now, this springboard for further innovation has extra bounce with the advent of the 4<sup>th</sup> Industrial Revolution. How can this unprecedented commercial array of digital tools streamline EOR operations?

A general sense of unity is already present amongst many national oil companies (NOCs), international oil companies (IOCs), academia, technology companies and financial institutions (FI). But a plethora of opportunities must still be leveraged to improve efficiency, cut costs and accelerate funding. As market pressures intensify, how best to knit Gulf countries' hard-won knowledge together to establish a world-leading MECES? ■

## EOR: A snapshot

**\$516.7bn**

The valuation of the global EOR market stood at \$38.1 billion in 2012 and could soar to \$516.7bn by 2023, according to Transparency Market Research. Clearly, potential abounds.

**75%**

Robust EOR methods can literally pay their way. Oil extracted via primary recovery accounts for 5% to 15% of the total reservoir while secondary recovery can extract about 20% to 60% of the total oil present in the reservoir, according to Future Market Insights. But installing EOR technology means 35% to 75% of oil can be extracted.

**34%**

Can better EOR methods help BP Outlook's forecast ring true? The energy major expects the Middle East to still be the largest oil producer by 2040, accounting for over 34% of global liquids production.

**2025**

Gulf countries' EOR goals are becoming increasingly ambitious and well-supported. Oman has long been a leader, both regionally and globally, in this area. For example, state-owned Petroleum Development Oman (PDO) aims for 25% of its oil production to be supported by EOR by 2025.

**15%**

The UAE has already made huge strides in improving EOR methods. Between 10-15% of state-owned ADNOC's oil is currently recovered with EOR technologies, primarily via miscible gas injection.

**40%**

Despite sitting atop approximately 40% of the world's natural gas reserves (the majority in Iran, Qatar), parts of the Middle East face chronic gas shortages. R&D to increase the efficiency of gas in EOR processes will help trim the region's rising bill for LNG imports.

**7.9%**

In 2014, the Middle East imported 5.9bn cubic metres of gas as LNG – just under 2% of the global total LNG imports, according to Platts Analytics' Eclipse Energy. By end-2016, LNG imports had moved to 28.6bn cubic metres a year – 7.9% of the global total. The IEA also expects the region's demand for natural gas to double from current levels by 2040.

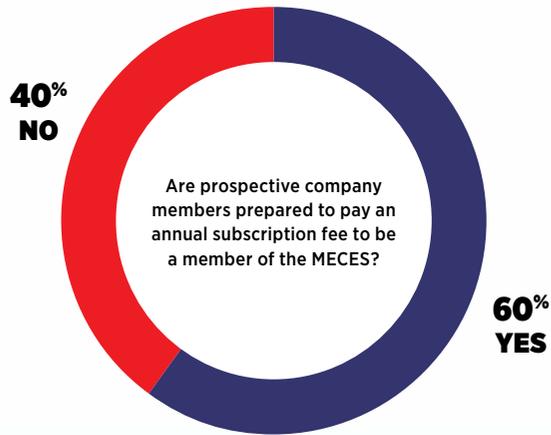
**25%**

In Kuwait, the natural gas needed to produce the steam for Ratqa's planned thermal EOR operations is equal to a quarter of the country's current gas production, according to GlassPoint. The incentives to reduce reliance on gas for EOR operations is clear.



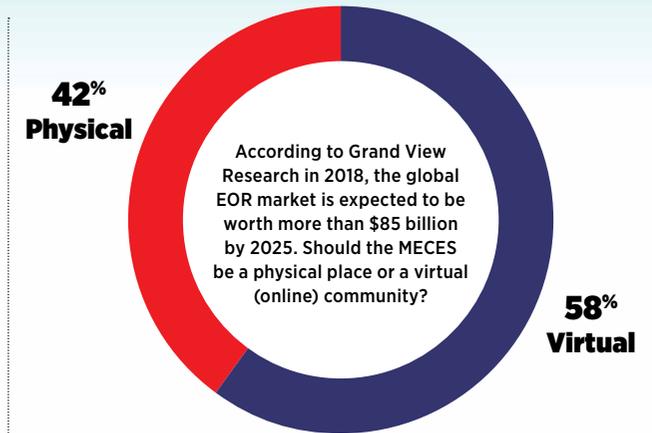
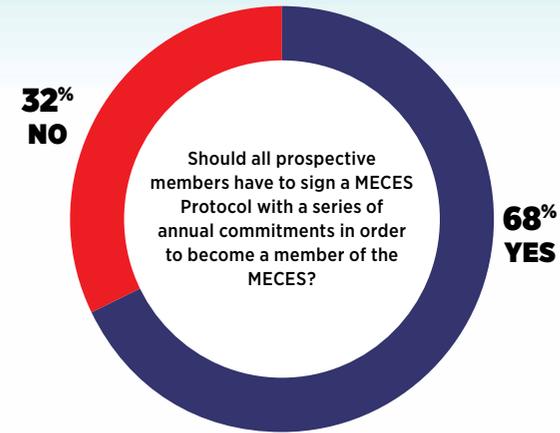
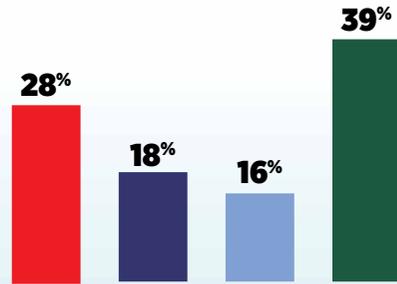
# EOR INDUSTRY SURVEY

## How to Create a Virtual MECES to Support the Arab Gulf's Oil Industry?

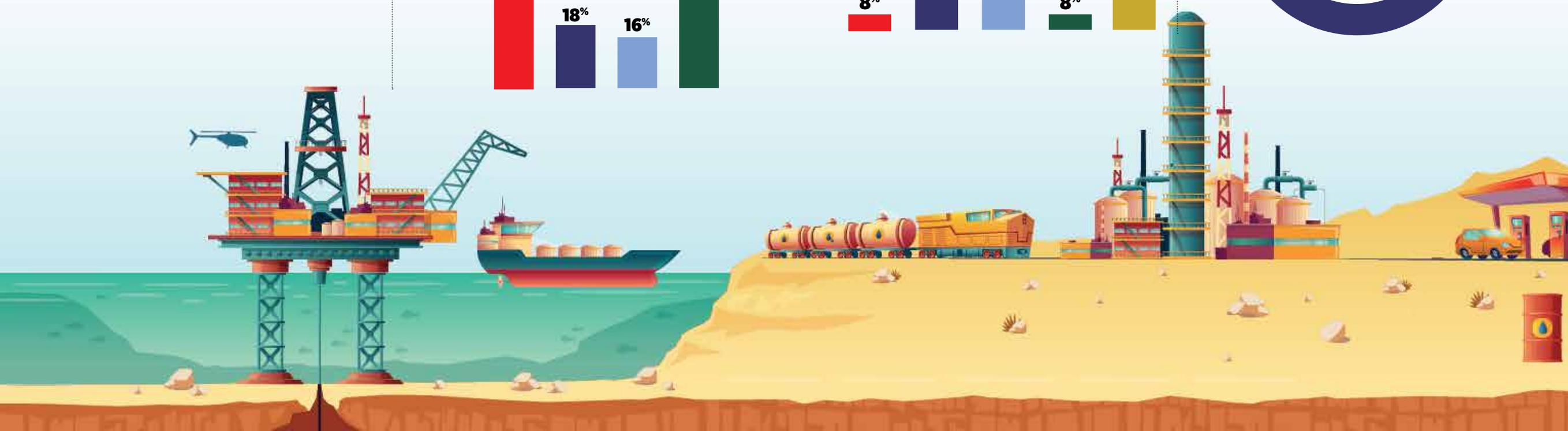
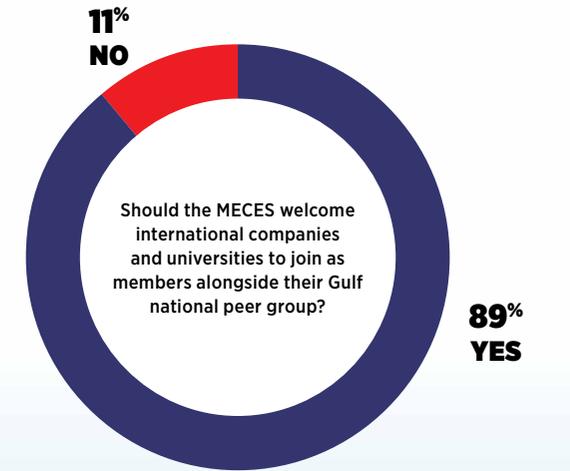
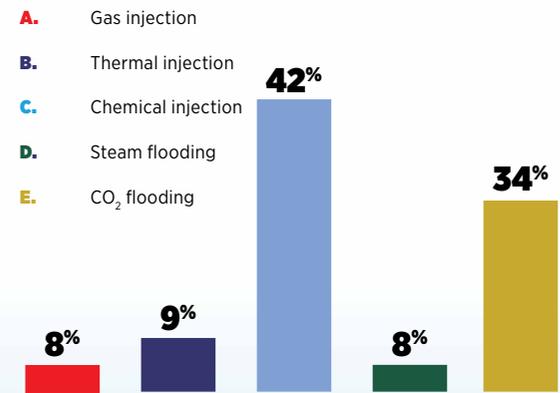


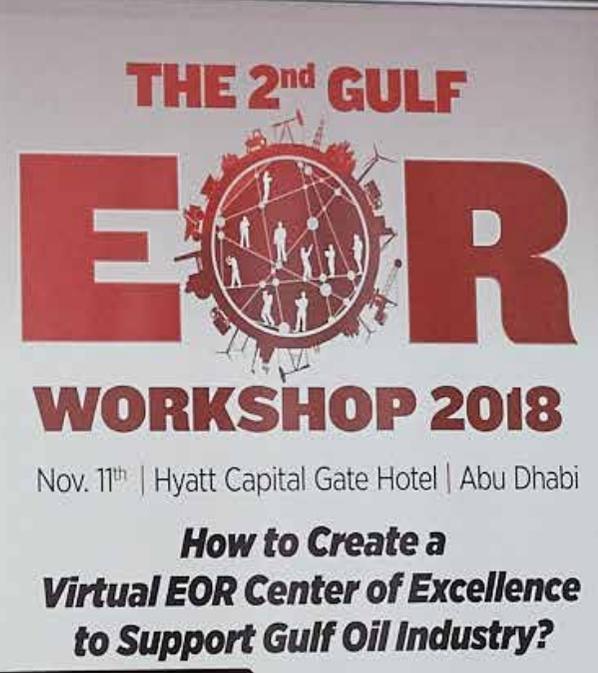
What would be the most important responsibility of a new MECES with regards to fostering relevant R&D?

- A.** To contribute positively in the development of research and innovation activities at the regional level.
- B.** To participate in organizing and actively engaging in seminars, conferences, workshops and training to build EOR research and innovation capacity.
- C.** To leverage the available financial resources in supporting research and innovation activities.
- D.** To participate in a membership-based virtual collaborative platform where industry, academia and government can interact and engage in research and innovation activities.



Which of the following EOR (tertiary recovery) techniques should the MECES seek to specialize in?





**“ADNOC’s oil production capacity has increased from 3 million barrels a day (b/d) to 4m b/d – a 33% climb in the last two years alone. And recently, the Supreme Petroleum Council approved a target capacity of 5m b/d by 2030.”**

# FOREWORD



**BY MOHAMMED AL MARZOUQI**  
Manager, Development Unit, Abu Dhabi National Oil Company (ADNOC)

**E**NHANCED OIL Recovery (EOR) is no longer a ‘nice to have’ research project. It is a key part of ADNOC’s strategic transformation plans, playing an integral role in the company’s aspiration to reach tertiary field recovery rates of 70% and above. It carries similar importance worldwide; more than 50% of oil companies invest in EOR.

The UAE’s journey in this space started more than 20 years ago in Abu Dhabi with immiscible gas injection. Today, we produce more than 150 million Btu. The future of EOR is a dynamic one. More and more energy companies are leveraging this tool, which has been used for more than a century, to relieve the pressure on their budgets while safely increasing production to meet rising demand. EOR is also an essential tool to sharpen the competitive edge of the oil industry in the UAE and wider Middle East. This is a main driver behind meeting both domestic needs (reducing import bills) and expanding the region’s presence in the global export market. Transparency Market Research expects the valuation of the global EOR market to soar from \$38.1 billion in 2012 to \$516.7 billion by 2023. The highest rate of growth is anticipated in the GCC, reaching \$140 billion by 2024.

**NEW DRIVERS**  
A recent step change emphasizes the importance of EOR; we are striving for gas self-sufficiency. Therefore, we must be smart about our production growth, especially as growing

**“If we start from scratch at every turn, we will all lose time and money. Many hands make light work.”**

demand must be balanced against meeting the national obligations made in support of the Paris Agreement. ADNOC’s oil production capacity has increased from 3 million barrels a day (b/d) to 4m b/d – a 33% climb in the last two years alone. And recently, the Supreme Petroleum Council approved a target capacity of 5m b/d by 2030.

As gas supplies need to be deployed elsewhere, we are embarking on more investments in unconventional activities. ADNOC’s comprehensive technology roadmap highlights how we are committed to spearheading the maturation of new EOR concepts, such as carbonate reservoirs, through a series of innovative and ambitious industry trials. These will be piloted over the coming years, including chemical-based hybrid EOR technology.

**ONE VOICE**  
Successful implementation of these technology trials will require strong collaborative efforts amongst ADNOC’s diverse set of stakeholders – siloes will not work. Our integrated strategy also focuses on linking efforts with wider industry and academia – cornerstones of an innovative and progressive energy market. We must leverage the wide experience of knowledge already at our fingertips so we can all put our strongest foot forward in conventional and unconventional exploration.

Establishing a MECES for the region would be a major step in the right direction to addressing the existing challenges on technology and policy. It would also set a realistic timeline for EOR deployment. Sharing costs and risks when piloting new technology supports often strained budgets and timetables; many hands make lighter work.

One example is the solar-thermal EOR being implemented at the Miraah project in Oman. Have the details of this success story been shared adequately? Perhaps not.

We should all embrace the advancements in technology that are being made by different partners in the region and we must all be quicker and more effective in identifying opportunities to develop these ideas. With a limited pool of subsurface talent, it is crucial to support regional R&D investments and align efforts across the Gulf. ADNOC cannot do this alone.

Critics may argue that this approach could lead to challenges in managing diverse solutions, but that is where ADNOC can be a facilitator. The goal in ADNOC’s upstream division is to identify and facilitate solutions by studying different assets while preserving the confidentiality of each technology for each partner. Essentially, we aim to enable sharing in a commercially safe environment. If we start from scratch at every turn, we will all lose time and money.

Together, we move faster. ■

## INSIGHTS

# Opportunities in a Virtual Industry-Academia Digital Marketplace?

**PANELISTS:**

- Mohammed Al Marzouqi, Manager, Development Unit, Abu Dhabi National Oil Company (ADNOC)
- Dr. Shahin Negahban, Director of TORP & Associate Professor, Department of Chemical & Petroleum Engineering, The University of Kansas
- Dr. Nasir Haji Darman, Chief Technology Officer of Group Research and Technology, Project Delivery & Technology Division, PETRONAS

**MODERATOR:**

Sean Evers, Managing Partner, Gulf Intelligence

*Sean Evers: Should the MECES reach out to international companies and universities to join as members alongside their Gulf national EOR group? Or would it be better served keeping it within national universities and national research centers?*

*Mohammed Al Marzouqi: EOR in the region itself has matured but it lacks the different aspects of some technologies and R&D. That's where international academia and shareholders are comparably active and would be advantageous.*

*Sean Evers: Which EOR technique should a new MECES seek to specialize in or prioritize its focus? For example, chemical or CO<sub>2</sub> injection? Solar thermal?*

*Mohammed Al Marzouqi: In the UAE, we are focused so far on chemical injection and CO<sub>2</sub> flooding, because that suits the condition of our reservoirs.*

*Sean Evers: Do you think that would be something that would be shared by your neighbors across the region?*

*Mohammed Al Marzouqi: Last week, ADNOC had a very good workshop with Aramco, not necessarily*

**“Where does the future of EOR lie? In integrating artificial intelligence for field management with the physics of reservoir engineering.”**

for EOR, but more for carbon capture and technologies. We also have agreements with Kuwait Oil Company (KOC) and Petroleum Development Oman (PDO), but we need to do more and to be more agile and quick.

*Sean Evers: Dr. Nasir, what are your thoughts on the best type of EOR to focus on from a global perspective? And where technology development is at?*

*Dr. Nasir Haji Darman: We need to remember that it is not so much the technology that we select but rather the issue that we are trying to solve. These can be very specific and unique to the country and reservoir. If the reservoir needs chemical or CO<sub>2</sub>, then the whole technology program needs to align with that. So, it's an asset question.*

*Sean Evers: Dr. Shahin, do you agree on this need to focus on analyzing the problem before deciding on what technology solution to research?*

*Dr. Shahin Negahban: You have to do a detailed study of reservoirs, screening what type of oil you have, depth and so on. Then you select the route. At ADNOC, chemical injection and CO<sub>2</sub>, or a hybrid of both, is ideal.*

*Sean Evers: What about other solutions? Look at the US when it continued to pursue research into shale; they have added 5m b/d to their production in the last decade.*

*Dr. Shahin Negahban: Shale technology has been key for production increases in the US but it also brings a lot of challenges.*

*Sean Evers: Dr. Nasir, PETRONAS is operating now all over the world, in Iraq, in Mexico and new concessions at home in Malaysia. Is it a challenge when you're dealing with so many geographies with EOR?*

*Dr. Nasir Haji Darman: We basically need to look at all technologies because every country requires a*



different solution. For example, thermal in Malaysia is useless because the nature of our oil is very light and it is offshore. But we still have to study thermal because we also operate in Sudan where the oil is very viscous and we can only inject gas.

*Sean Evers: Do you have to develop competence in house for all these different applications?*

*Dr. Nasir Haji Darman:* It's multi-pronged. If we look at Malaysia, we basically have a physical center where our service providers can come in and work with us. In international areas, we have several partners, such as CNPC in China. And we have other partners, such as Shell. We know their strengths and they know our strengths – then we share the results.

*Dr. Shahin Negahban:* EOR is not a new technology. The number one challenge in the Middle East is people. We have to develop the expertise. The second thing is you can look at all these processes but you will always end up doing a techno-economic analysis to come up with an optimum solution. CO<sub>2</sub> might be the best solution but if it costs you a lot of money to produce it, that's not a true solution. You need to make sure that the process you're using for the country benefits the most in terms of cost also.

*Sean Evers: Regarding the MECES, will companies becoming members of this potential center be willing to actually pay for annual subscription fees and secondly, what would be the most important responsibility of a new center? For example, to conduct relevant R&D or leveraging available financial resources in support of innovation? Being able to participate in a membership-based collaborative platform where industry, academia and*



**“ EOR has just begun... look at the US! They pursued their research into shale and have added 5m b/d to their production in the last decade.”**

*government can interact and engage in research and innovation activities? Or a digital platform where project details can be exchanged and project teams set up and so on?*

*Mohammed Al Marzouqi:* We need to leverage everything, be it by conducting workshops or the actual development of EOR activities.  
*Sean Evers: Dr. Shahin, you've participated and worked a lot in Abu Dhabi and you're now at the University of Kansas. How do you compare institutions here for research and fundraising and so on with the US? What advice would you have?*

*Dr. Shahin Negahban:* You have got to be smart in terms of profitability and efficiency and you don't want to reinvent the wheel. If you look at petroleum-related universities in the US, it's not a large number but they are very specific in what they do. If you want to do numerical work, you go to Stanford and the University of Texas, for example. We should consider universities based on what

they offer and try to align what they offer with ADNOC's vision. Focus on the most important strategies of the conflict in terms of how best you can bring in technology and implement it in the field.

*Sean Evers: Dr. Nasir, what are your thoughts and advice in terms of the challenge of creating a regional center of excellence, which essentially means cooperation and partnership?*

*Dr. Nasir Haji Darman:* Let's divide the issue into two. One is solving the problem of the asset and the second is solving the technological challenge. The idea of collaboration is not new. There are many joint industry project (JIPs) where multiple companies contribute along with 40 or 50 sponsors, which enables budgets to be quite big. PETRONAS is a true believer in that. We have many JIPs that we join in this nature and although they are not providing a solution on a particular asset, we can gain the knowledge and possibly use that technology elsewhere.



**“ CO<sub>2</sub> might be the best solution but if it costs you a lot of money to produce it, that's not a true solution. You need to make sure that the process you're using for the country benefits the most in terms of cost also.”**

*Sean Evers: How do you overcome the idea of intellectual property (IP) i.e. the inherent idea to protect while trying to collaborate and create new solutions?*

*Dr. Nasir Haji Darman:* At PETRONAS, we don't mind sharing the IP on early blue-sky research. If we develop one which is good, even if it fails, we can learn from it. However, when that technology becomes very specific to our competitive advantage, that is where we strengthen our position. So, our IP position is not static. It's very dynamic depending on the maturity of the project that we're going to do.

*Mohammed Al Marzouqi:* This is a very challenging aspect in our EOR activities. It's a blessing when you have more than a dozen shareholders, but that also means managing the different technologies coming from each one and where that can be applied, and in which

reservoir, etc. That is where ADNOC can come in as a facilitator. The smart thing is to build where people have finished. Our goal in ADNOC's upstream is to facilitate and work things out between the different assets, while appreciating the confidentiality of each technology for each partner.

*Dr. Shahin Negahban:* The IP issue could create a challenge within the MECES.

*Sean Evers: But in the context of the Gulf, we've got NOCs, such as KPC, Aramco, ADNOC and PDO who don't have any competitive issues to be concerned about. They obviously all want IP but they're not competing with each other in the way that Shell or Exxon or PETRONAS might be. And so perhaps there will be less sensitivity around IP? In terms of the commitments that countries or companies would need*

*to make a Protocol document as members of the MECES, what would those typically be? For example, assign a focal person to liaise with the virtual digital platform or a point person to lead the initiative? Another condition could be to provide a list of industrial research challenges and aspirations. Inevitably, if we're going to solve problems, we need to know what those problems are and companies need to be ready to be a bit transparent about their challenges and then active in supporting a particular R&D challenge and commit to it through to adoption.*

*Dr. Shahin Negahban:* EOR is a proven technology so the focus should now be on areas like the 4<sup>th</sup> Industrial Revolution and deep learning and application of methods, so that we can minimize the use of composition modelling, for example. It is also important to get to the 70% recovery factor and to do that, you have to focus on displacement efficiency at the core level. Integrating artificial intelligence for field management with the physics of reservoir engineering is where the future lies.

*Dr. Nasir Haji Darman:* EOR starts at the subsurface, goes up through to the surface and onto the fill point. There is not one company that can be good at everything in this whole value chain. Collaboration is the only way to go. We should all leverage the strength of our partners in solving our own interests. We can study a particular asset and then share that new knowledge.

*Mohammed Al Marzouqi:* Despite many memorandums of understandings (MoUs) signed between GCC countries, they are not moving forward enough on cooperation. There is a gap that must be plugged. ■  
*\*Edited transcript*



## WORKSHOP – STREAM 1

### What are the Top 3 Commitments an Institution Must Make to Become a Member of the Middle East Community of EOR Stakeholders (MECES)?

**A** MECES that brings all stakeholders together to share knowledge and solutions would be a huge benefit in an industry that often operates out of sync. The importance of sharing knowledge under one ‘roof’ – such as the MECES – will only intensify as the EOR market grows. The MECES must offer clear incentives and benefits to spark and sustain members’ loyalty. How to achieve this win-win outlook?

Developing a Protocol for NOCs, such as membership to the MECES, could accelerate much-needed innovative and groundbreaking R&D that can cut costs and boosts efficiency. Arguably, the more members there are, the less risk. For example, more than a third (37%) of respondents to a GIQ Industry Survey at the Gulf EOR Workshop 2017 said regional academia and industry should prioritize R&D for chemical EOR. CO<sub>2</sub> and solar projects took second and third place,

respectively. How can pooling efforts make aspirations from last year – and reaffirmed this year – a reality going forward?

Many workshop participants support the concept of a digital MECES platform, therefore enabling all members to contribute, monitor and feedback on changes in real-time. Not requiring a physical space or sign above the door can also help streamline cross-border progress, encouraging broader membership. The technology available under



**Knowledge-sharing, participation and innovation: these three key ingredients propel growth!”**

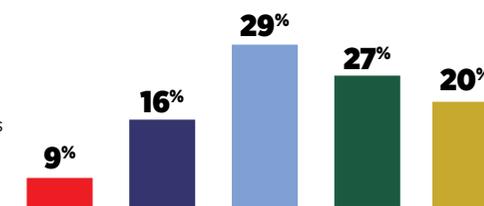


the umbrella of the 4th Industrial Revolution is already available to make this a reality; the Internet of Things (IOT), artificial intelligence (AI), blockchain, big data analytics and robotic technologies and many more are commercially available.

Ease is paramount. All those in the oil value chain already have multiple economic and environmental checklists. The aim of the MECES is not to add to this myriad of bureaucracy and paperwork, but to make progress easier. The tightrope is real. Efforts to meet the 54% growth that BP Outlook anticipates in the Middle East’s energy consumption by 2040 must abide by increasingly strict lower-carbon targets that support the Paris Agreement at a time when oil prices are hovering around \$60/bl. Hastening progress is also a driver to many Gulf countries’ National Visions to become competitive and knowledge-based economies, therefore climbing the global intellectual league table. What boxes must be ticked for companies to join the MECES? How to unite these EOR brothers in arms?

Which of the following membership criteria would be most important to include in the MECES Protocol?

- A.** Assign a focal person to liaise with the platform.
- B.** Provide a list of industrial research challenges and aspirations.
- C.** Support at least one R&D project initiative per year over the next three years. This will be on a project basis and subject to the Technical Committee agreement.
- D.** Reasonable endeavor in deploying and commercializing the output of R&D activities into their respective industry, through developing plans or endeavor to adopt some of the outcomes.
- E.** Provide possible industrial funding based on submitting research proposals tackling industrial research challenges or consultancy requests.



**54%** The growth in the Middle East’s energy consumption by 2040. A flourishing EOR market will play a major role in keeping pace with rising energy demands.

#### Points to consider

What would be the top aims of the MECES by 2025? What overall obligations would the Protocol tie signatories to? What expectations would the Protocol expect from its signatories? Would the market want upmost transparency on this platform? Would that be a prerequisite, or would there be concerns over sharing, i.e. safeguarding IP? What management structure should the MECES adopt? Should it host a committee? Should hosts be seconded representatives of members on a rotating basis? ■



## STREAM 1

### Top Three Recommendations

#### 1. Commit to sharing intangible resources

Every brick that goes towards building a knowledge bank requires deep-rooted collaboration. Research on reservoir data, technical reports, maintenance records, legalities, copyright, IP and many other areas fall under the banner of intangible resources. Such sharing not only helps those in the MECES strengthen the efficiency of established operations, but it also gives those with a zest for innovation more tools to redefine the status quo as quickly and as safely as possible. Pinning down members' goals is critical to ensure that resources – finances, talent, time – are directed towards resolving

specific challenges that offer the broadest benefits i.e. applied research. This is not a new idea. Nearly all (95%) of respondents to a GIQ Industry Survey at the Gulf EOR Workshop 2017 said Gulf countries should cooperate on identifying bespoke and regional EOR solutions. This sentiment has only strengthened in the last twelve months. Now, a merging of minds, funds and time must increasingly result in tangible progress. The route of applied research can be complemented by more exploratory research; investigations without a defined end goal. How resources are split between these two methods

will depend on where members' risk-reward barometer lies. Perhaps unsurprisingly, workshop participants in 2018 shared concerns over the confidentiality of data as one of the main deterrents to regional cooperation. Such concerns must be managed so that transparency is leveraged without dulling competitive edges. Taking a closer look at protection when sharing intangible resources is pertinent as cyberhackers, the world's largely invisible mafia, deepen their digital foothold. Cybercrime accounted for \$600 billion, or 0.8% of global GDP, last year, according to McAfee.

#### 2. Commit to a membership of 3-5 years with a rotating leadership

EOR can be complex. Golden solutions take time and are beyond the capability of one entity. Longevity is a cornerstone of building market confidence in the MECES, as is rotating leadership between experts in industry, academia and government. A longer-term membership requires more commitment; a public statement to resolve and thrive together. Membership that lasts several years enables companies to make significant progress on development programs under the MECES, including R&D and talent enhancement. Identifying local champions from member countries – some of whom may be the future



thought leaders in EOR – can reinforce the MECES' knowledge bank and credibility. A start-stop approach risks more paperwork and few solutions. In a busy world, simplicity is vital. How membership is categorized and managed must be clearly communicated to ensure all participants are on the same page.

For example, how to make the bar to entry high enough to reinforce the credibility of the MECES while ensuring it is not so high that it deters members? And amid the current energy transition, how best to categorize membership as companies' remits can evolve and shift over three to five years? Should membership be categorized by corporations' goals, existing projects, R&D expertise or structure i.e. state-owned, private, joint ventures (JV)? Or should there be no categories? How best to identify leadership and should it change on an annual or bi-annual basis? Plentiful questions illustrate progress; a market without questions is a stagnant one.

#### 3. Commit to diversify membership between industry, academia and technology developers

How to ensure all the voices in the market are heard? Promote a diversified membership. Equally, these voices must be managed so that they unite in a symphony rather than a clang. Some workshop participants suggested that the organizational model of the MECES' could consist of four parts; technical evaluation, troubleshooting, financial management and a steering committee. Within these pillars would be a fair representation of industry, academia, government and technology developers.

Financial institutions should also be engaged in the development of the MECES, as a sustainable pace of substantial funding is paramount. For example, if a company using EOR recovers 5% of a reservoir that has 10 billion barrels at \$50/bl, the revenue nears \$25 million.

If the company reinvests 2% of that earning into R&D under the MECES umbrella, it amounts to \$500,000. Still, this would only represent one step in the funding journey. The good news is that successful R&D can pay for itself many times over; the math justifies the effort.



#### Other Recommendations From Stream 1

**COMMIT TO:**

- ✓ Filling the academic gap in EOR studies
- ✓ Sharing the current status of EOR technologies
- ✓ Sharing IP for all participants (when appropriate)
- ✓ Contributing to research and/or application
- ✓ Crowd sourcing of ideas and solutions from the R&D community
- ✓ Hosting a group of EOR experts with a large funding source
- ✓ Joint financial investment to drive R&D funding
- ✓ Creating better value added to the technique and solution ■





## WORKSHOP – STREAM 2

### What are the Top 3 Priorities that the Middle East Community of EOR Stakeholders (MECES) Should Strive to Focus on?

**T**he current EOR lens is very broad; multiple R&D ideas to explore, applications to test and geographies to adapt to. But the majority of efforts happen in siloes with lessons learned in one project failing to migrate to another, even if both lie within the same border.

Organizing these factors into a cohesive system, such as under the umbrella of the MECES, will

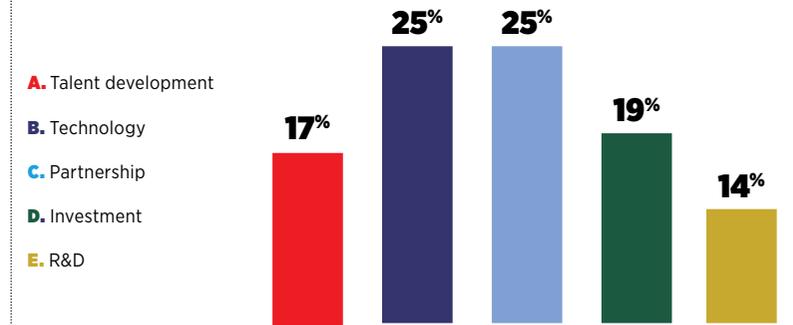
mean stakeholders do not waste time and money reinventing the wheel. Equally, the MECES cannot be a jack of all trades, at least not to start with. Attempting to cover all bases risks spreading resources too thin and alienating potential members.

Therefore, a clear focus with quantifiable goals is paramount to build the credibility of the MECES, encouraging membership and ultimately, strengthening the

overall ecosystem of knowledge and progress. EOR stakeholders all have a common goal; to affordably bolster oil production to meet domestic needs and sharpen the region's global competitive edge while hitting lower-carbon targets. Pinning down three key goals that have the widest applicability for members to collectively work towards in the MECES is a good starting point. What priorities top the list?



Which of the following is the most critical area to advance in order to make EOR operations more economically viable across the Gulf? This includes achieving recovery targets of 70% in the UAE, which is twice the world average.



**“With so much diversity and so many ideas, how best to identify a common voice with a streamlined focus?”**

#### Points to consider

The exploration and implementation of new EOR technologies in such a wide space – geographically, politically, economically – is very complex and costs could soar. How could MECES partners merge strategies to ensure shared success? What would be the risks for MECES members, if any? What are the strengths of each Gulf country in this process and how can they be leveraged? How important is unity? What are the main hurdles? How beneficial and realistic would it be to have joint EOR projects – collaborating from the laboratory to the field – in order to accelerate the knowledge sharing and application process? ■



## STREAM 2 Top Three Recommendations

### 1. Integrate an asset model of reservoir management across the whole value chain, which can also highlight examples of best practice

The noise of conflicting agendas can make it hard to hear the full worth of stakeholders' insights, adding unnecessary time and costs to already challenging projects. Identifying a common asset model of reservoir management under the umbrella of the MECES would provide a much-needed beacon of clarity; essentially a language everyone can look to and understand. Less opacity would support more sophisticated levels of reservoir characterization, reservoir management, reservoir modelling

**“The MECES cannot be a jack of all trades. Equally, it cannot alienate members and new ideas. Where does the balance lie?”**

and reservoir monitoring. Stronger integration between sub-surface and surface R&D and operations can also help improve the continuity, efficiency and ultimately the safety of operations. These improvements all help strengthen budget management; gold dust

to hedge against unpredictability i.e. oil prices, geopolitics, natural events. Highlighting best practices and success stories in an industry that often has its flaws, rather than qualities, in the headlines is essential to driving positive momentum.

### 2. Ensure R&D, service providers and E&P companies jointly coordinate on MECES projects

Any joint operations must earmark time to ensure all parties are singing from the same hymn sheet before the band starts playing i.e. clarify quantifiable goals and methods before parties start funnelling resources into a joint project. Collaborations need clarity. Opacity in joint projects bleeds into delayed timetables and increased costs; neither is attractive to members of the MECES, nor investors. One route suggested by workshop participants included focusing on the least complex technology that can have the widest applicability in the



region, therefore promoting holistic techno-economic development. Others said blue-sky thinking has equal value, but appreciated the high risk associated with such R&D means that it must complement, not dominate, the agenda. Workshop participants pointed to several key areas for collaboration, including

how cut the costs associated with CO<sub>2</sub> capture while hitting environmental targets and how to enhance expertise in the wider EOR ecosystem. For the latter, EOR and digital expertise must be 'programed' within human resources; it is not automatically known. That does not mean the MECES should become a training facility but it can be an 'intellectual home' of a cross-pollination of ideas. As long as the findings thread back into the MECES' ecosystem, the time taken on talent enhancement is a win-win.

### 3. Create an architecture for a basic standard of data definition

In alignment with Moore's Law, computer power has doubled every year since the 1970s and more data has been generated in the last two years than in all of previous recorded history. What does this mean? Proper data management (PDM) is vital across the energy industry, including in the MECES. Poor data handling risks leaving the EOR ecosystem as a lame duck as the wider energy industry actively enhances its digital acumen. The MECES must keep pace with the 4th Industrial Revolution to be viewed as a relevant and valuable marketplace of knowledge and ideas. NOCs and other Gulf energy companies have made bold moves in recent years to remove bricks from the walls safeguarding their data – much of which has more value in a collaborative environment. But these are just the first steps; more national and cross-border cohesion is required. Smart data

generation, harvesting and analysis in a central data bank could be a cornerstone of enabling affordable and lower-carbon scalability. Members contributing data to such a bank could pick and choose what information to share. But all contributors must ensure that they define and manage their data

in a 'common language' that is compatible with the broader data bank in the MECES. The benefits of creating and leveraging a central data bank are far reaching, from accelerating innovative R&D and commercialization to exploring application in new geographies in the Middle East. But remember: simplicity is crucial as complicated data storage systems will confuse a market already grappling with a myriad of uncertainties.

#### Other Recommendations From Stream 2

**COMMIT TO:**

- ✓ Cutting the cost of EOR implementation
- ✓ Managing the voluntary versus paid discussions and give collaborations credibility
- ✓ Defining the trends of underlying building blocks for EOR
- ✓ Focusing on talent development and critical thinking, as well as linking the world's top universities to improve efficiency practices
- ✓ Collaborative incentives, such as crowd funding
- ✓ Continuity and fit-for-purpose EOR to enable sustainable progress
- ✓ Improving efficiency, collaboration and integration between surface and sub-surface efforts
- ✓ Coordinated data solutions ■



# **IMO 2020** **Seeking Beacons in the Mist**

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## EXECUTIVE SUMMARY...

INSIGHTS FROM A ROUNDTABLE HELD IN ABU DHABI IN LATE-2018 UNDER THE CHATHAM HOUSE RULE

W

## WHAT DO WE KNOW? THAT

the International Maritime Organization (IMO) will not push back the start date of 1 January 2020 for the 0.5% sulfur limit on bunker fuel, down from 3.5% today. And that vessels found carrying bunker fuel over 0.5% sulfur without appropriate permits will have their insurance voided. We know that the four main post-2020 bunkering options are low sulfur fuel oil (LSFO), scrubbers,

2025

The IMO was considering a later start date of 2025; much preferred by the majority of the market. But immediate improvements in maritime-based pollution are critical.

liquefied natural gas (LNG) and non-compliance (not necessarily an option, but one that some stakeholders quietly say they are considering.) We also know that every part of the value chain needs to adjust, that no one is immune to major change; refiners, shippers, storage companies, port authorities, national oil companies, international oil companies, traders, end users and others. The ripple effect goes on.

## SEA OF GUESSWORK

The other details? They are still floating in the ethereal of ambiguity, knocking between one game of finger-pointing to another. The main question marks circle over how compliance will be enforced, whether there will be a grace period as the industry adapts and the supply-demand balance of new fuel blends, scrubbers and LNG.

With 12 months to go, the black hole of confusion is just as black as it was last year, just now the rays of hope that clarity will prevail have been largely doused. This does not bode well for a regulatory decision that Wood Mackenzie estimates could increase global bunker fuel costs by \$60 billion a year from 2020 in a full compliance scenario.

This guessing game also derails confidence around how the market will react to other inevitable changes as momentum behind the Paris Agreement's targets builds. How the risk-reward equation stacks up for IMO 2020 is just a prelude to the next round of regulations that will likely pop up in the 2020s as environmental concerns intensify. The market is frustrated, investors are hesitant and the IMO is under a critical spotlight. What's next?

## 0.1%

Ensuring the exact composition of new fuel blends between ports around the globe is a major sticking point.

A cargo carrying fuel with a 0.1% discrepancy will be deemed non-compliant, even if it is an honest mistake. Shipowners want – and need – assurance. Pinning down one defined specification is complicated by different fuel blends, different vessel types (bunkers, barges, cruise ships, for example), while some ports have little or no access to blending facilities. Some blenders will look to fuel oil-based products, others to distillate-based products. Consequently, port authorities supplying fuels must have up to six types of blends in order to guarantee compliant fuel. This is a major undertaking, both logistically and economically. And even then, contamination could be a huge problem. Comparatively, HSFO was a standard fuel composition worldwide.

1st

Who will make the first move, who will spearhead change? For now, the floor remains quiet. The idea of a first mover advantage has been replaced with one of frustration; one part of the value chain cannot make critical decisions without knowing what supply-demand balances lie higher up and vice versa. A stalemate ensues.

70%

High sulfur fuel oil (HSFO) was used for approximately 70% of the world's bunker fuel in 2016, so the adjustment to 0.5% sulfur requires a dramatic shift in the balance of fuels – and fast.

\$3m

Installing scrubbers on ships is being seen as the most viable short-term solution for IMO 2020, but it comes with a hefty price tag - \$3 million. Still, this is much cheaper than installing a new coker at a refinery for \$5 million to \$10 million.

TICK TOCK, TICK TOCK: LESS THAN 12 MONTHS UNTIL IMO 2020 STARTS! WHO IS GOING TO CALL QUITS ON THE GAME OF FINGER-POINTING AND LEAD THE CHARGE TOWARDS CLARITY?"

## GEOGRAPHIC PUZZLE

No country is immune from IMO 2020, but some are faring better than others. Some stakeholders suggest that compliance in the Middle East may be more challenging due to a lack of refineries with the required facilities to quickly and affordably produce enough LSFO. Solutions could include importing light and sweet crudes from the US and West and East Africa. Or to blend 10% HSFO with 90% gasoil, giving a 0.5% specification, for example. The UAE's Port of Fujairah, the world's second largest bunkering hub with 18 million barrels of product in storage, could be well-placed to facilitate this. The port would need to invest in expanding storage facilities and enhancing its crude blending options. Progress is also underway in the world's other major bunkering hubs of Singapore and Rotterdam. Singapore has extended the mandatory use of mass-flow-meters to bunker barges that fuel large ships in a bid to enhance transparency as per IMO 2020. In Rotterdam, Gunvor are considering adding a fuel upgrading unit to help meet LSFO compliance, for example.

## GLOBAL POLICE FORCE?

Many feel enforcement of IMO 2020 should be in the hands of the flag states, while others argue there are too many loopholes once ships leave port. Major ports are expected to be absolute in imposing compliance, with a global carriage ban on HSFO bunkers coming into force in March 2020, for example. Some ports are especially proactive. Singapore, the world's largest bunkering hub, and Rotterdam will not pass ships unless they have scrubbers installed. The reality is that 80% of demand for bunkers comes from major players like Exxon and Shell – companies that won't risk their reputation with non-compliance. But all these options still do not answer the key question: who is responsible, where does the buck stop, who makes the ultimate decision? ■

3.5%

0.5%!!

MEANWHILE...

HUH?

# THE TRANSITION TO IMO 2020

...

# & THE IMPACT ON PORT OF FUJAIRAH

WHA?



IMO

2020

CHECKLIST

HOSTED BY: JOHN STEWART, PRINCIPAL ANALYST, WOODMACKENZIE

*Host:* The Wood Mackenzie view is that come 2020, we don't see the world being fully compliant with the IMO 2020 regulations. We will see 80% compliance on the 0.5% sulfur emissions target. Places like South America, parts of Southeast Asia and the Middle East to a certain extent, will have limitations to comply due to infrastructure on the supply side.

There are three tangible options to comply with the new specification. Either install scrubbing technology on vessels to take the exhaust gas emissions down to 0.5%; switch to a lower sulfur fuel or distillate marine gas oil; or switch to LNG which has large growth potential. A fourth and final option of course is to do nothing. In parts of the world, that might actually happen despite the reputational damage that might follow.

We think there will be around 1,000 scrubbers on vessels worldwide by 2020 – that is out of a global vessel market of 55,000 so not a large penetration rate. Those 1,000 scrubbers will represent around 5% of global marine fuel demand globally. Come 2025, we are likely to see this number at 5,000

vessels and that's just based on the type of vessels that are going to be installing scrubbers with economic paybacks i.e. those that have long distances to cover and will therefore be burning lots of fuel.

There are resistance factors to installing scrubbers, such as whether there will be time to get all the scrubbers installed by January 2020. What happens if you have a receipt that says you bought a scrubber but it's not installed yet? Do you get leasing on the fuel that you burned because you have a scrubber coming six months down the road? There is a lot of uncertainty about how that enforcement transpires.

*Delegate:* You mentioned that the Middle East has not got the necessary infrastructure. If we have an overhang of high sulfur supply, there's going to be a market clearing price.

*Host:* The refining system has certain limitations on its flexibility and how much it can shift one way or another. It can't go overnight from 30% gasoline to 30% diesel. As HSFO pricing starts to

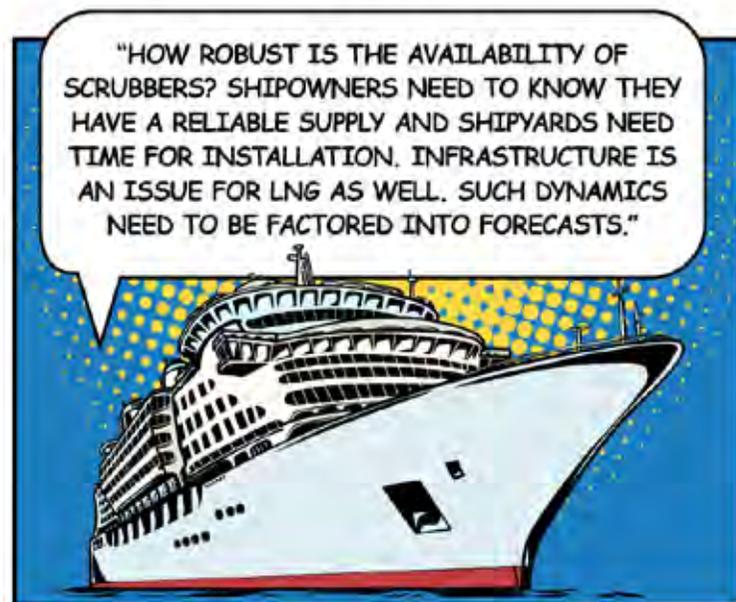
fall, the scrubber penetration rate picks up through to 2025. There are many factors on the economics of refineries in the region. HSFO can either go into the power sector if it gets cheap enough or you can look for outlets in other refining systems to take it into their upgrading units. Globally, we think there is enough upgrading capacity to take those barrels. The best thing refiners can do is look at their internal streams and how to blend the fuels to make other specifications. If that option has been exhausted and a refiner has produced as much compliant fuel as possible from lower value streams, then look for an outlet to export those barrels somewhere else that has the upgrading capacity, such as in North America and China.

On LNG, the potential growth rate is very high. We see 70% growth through to 2020, but on a volume basis that will only be 40,000 barrels or so of the overall mix. That is very low, so we don't see it having a material impact in our base case. Certainly, there is scope for more growth in LNG with the right investment.

We see full compliance coming in 2025 – only six years away. Most of the switch will be made from an initial shift in the refining system to produce distillate to the levels that it can. And then beyond that, it will really come down to the scrubber penetration rate.

**Delegate:** When you invest in a scrubber, it's based on certain assumptions of price and how much LSFO will be available. So, how is a shipping company going to look at this with regards to the size of vessels? If the size of the ship is bigger, the economics are easily justifiable.

**Host:** Yes, a scrubber makes more sense for larger vessels burning greater amounts of fuel. Some of the smaller product size tankers actually did quite well on a LNG versus scrubbers



basis. Many factors feed into the equation. It depends on the route you are taking, the size of the ship, the payback schedule, fuel availability and who is financing the project, for example. As a refiner of HSFO, you could talk to a shipping company and say, we'll give you the fuel oil and help fund some of the capital expenditure for the scrubber if you come to us every time you go into the UAE's Port of Fujairah. Ideally, port authorities, storage companies and refiners need to talk more as a group instead of working independently, about what the options may be and how to solve these questions in a collaborative fashion. There's opportunity that hasn't fully realized. We're quickly running out of time.

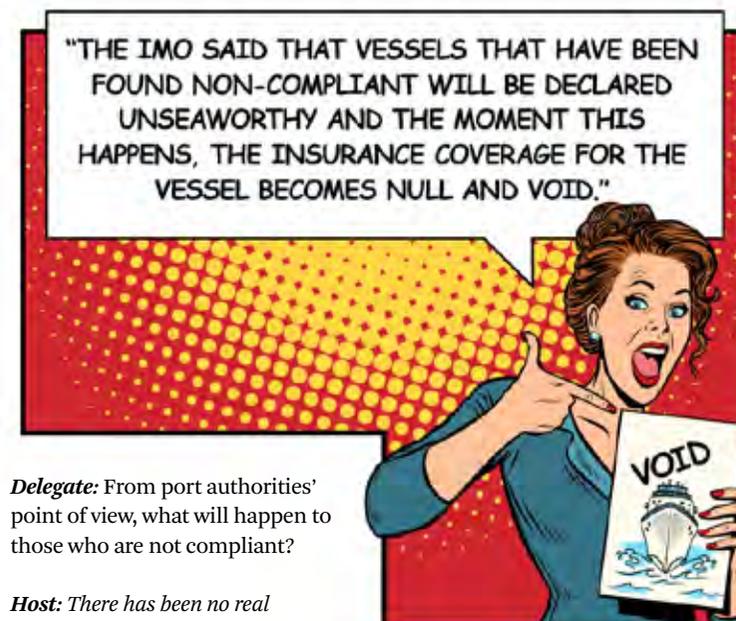
**Delegate:** How robust is the availability of scrubbers? Shipowners need to know they have a reliable supply and shipyards need time for installation. Infrastructure is an issue for LNG as well. Such dynamics need to be factored into forecasts.

**Host:** The numbers that I referred

to i.e. 1,000 scrubbers by 2020 and 5,000 scrubbers by 2025, are probably optimistic. Those numbers were compiled at the end of May 2018. I can see those numbers being pulled down in our next update.

**Delegate:** If the scrubbers aren't available, how does that impact the whole market for HSFO?

**Host:** The Middle East region still relies on the net back price from Singapore for the pricing of fuels. So, they are going to need to know how the HSFO market is doing regionally and also what's happening on the distillers' side. There's not really the liquidity on the fuel oil side in the region compared to perhaps some of the other ports. There is liquidity here on the distillate portion of the barrel though and I think we've got 2m b/d of additional refining capacity coming over the next five years. So, there will be additional availability of lower sulfur distillate volumes, which is an opportunity for Fujairah to get a little bit more of a foothold in the global market and to establish itself with a benchmark.



**Delegate:** From port authorities' point of view, what will happen to those who are not compliant?

**Host:** There has been no real transparency on that. Who enforces compliance? Does it fall with individual states or each port authority? Does it go back to the original supplier? Can you chase a refiner because they sold HSFO to a ship or does that get lost in the whole trading cycle? How much is the fine? The framework to implement fines is very difficult to understand. I don't see how that will play out.

**Delegate:** We all know there is going to be an increase in price for the compliant fuel that's going to be in use. Irrespective of who bears the cost, the final price of the commodity in itself is going to have a huge impact especially for developing countries who may not be ready to absorb this additional cost.

**Host:** If it's an international shipping organization, then maybe they have the ability to absorb that cost. But some countries don't, so then how does the discussion transpire on that basis?

**Delegate:** The IMO said that vessels found non-compliant will be declared unseaworthy and the moment this happens, the insurance coverage for the vessel becomes

null and void. How is that going to be a factor in terms of ensuring compliance?

**Host:** You will lose money on a daily basis if your ship can't move from A to B due to insurance coverage. But again, it goes back to the fact that the framework is just not there yet on who is responsible.

**Delegate:** What will the impact be on supply in the Fujairah market?

**Host:** We have looked into the Fujairah market on the supply side and we don't see there being sufficient very low sulfur fuel oil (VLSFO) availability. So, the question becomes do you start to pull out barrels from other middle distillate grades to comply with the 0.5% legislation? Areas where 0.1% sulfur limits are already in place will do okay, as will other parts of the world that have more sophisticated refining infrastructure.

**Delegate:** Fujairah is a big bunker supplier. So, when you say the region will struggle to have the compliant

supply, what does that mean for bunker supply companies? Does it mean that their customers might be bunkering somewhere else or will they have to do something else like import the required supply?

**Host:** Yes, they may need to do that in order to not lose customers. Also, if you are a refining company that has shipping, you probably want to supply your own ships when you can with compliant fuel. Certainly, the risk of loss of market share is there compared to regions like Amsterdam, North West Europe, Singapore and even places like China, which has quite a sophisticated refining system.

**Delegate:** The supply after 2020 will all depend on what kind of spread there is between HSFO and LSFO. If it's high, then the ship owners and the suppliers will have to find different ways to take advantage of that spread. But it's very hard to define right now. Will the spread be \$50 per ton or \$200 per ton? Do you think blending would be an option for Fujairah to overcome the shortfall in refining capacity, given the massive infrastructure and the flexibility available to blend?

**Host:** I've yet to see a consistent LSFO spec that everyone can or has to comply to. Picking up a variable sulfur fuel oil in Singapore might not be the same as the one you pick up in China or Fujairah and compatibility might be an issue with blending. There are existing players and infrastructure in Fujairah and that is a platform for growth. The blending site is a good opportunity. But again, it goes back to the point of transparent communication between suppliers, consumers and storage companies. We are not where we need to be on that basis. ■

\*Edited transcript

# FUJAIRAH BEYOND 2020?

**IMO 2020 COULD PROPEL THE WORLD'S 2ND LARGEST BUNKERING HUB'S REPUTATION AS A GLOBE-LEADING ENERGY CROSSROADS. BUT THERE ARE JUST 12 MONTHS LEFT TO PREPARE. READY, STEADY...GO!**

**Moderator:** Will the Port of Fujairah leverage IMO 2020 as another step in the ladder to greater influence on the global energy stage? Or will it stand by while others strengthen their grip? Which stakeholders should take the lead in setting the compliance and enforcement roadmap for IMO 2020: ports, refiners, shippers, insurance companies?

**Delegate:** When it comes to enforcing compliance, the ports will have to do this. But how? We can only build on the documentation regarding where the product comes from, what the specifications are, quality certificates and so on.

**Moderator:** I suppose the expectation would be that you are the representation of the government. Is that realistic?

**Delegate:** The UAE is a signatory

to IMO. We sit on the IMO table. We have representatives there. The federal government will 100% follow what the IMO says.

**Delegate:** It should not only be the responsibility of ports. This regulation came because of environmental factors, so it's a joint responsibility for all.

**Delegate:** Non-compliance is not a question here. We'll have to comply, then what will the next steps of compliance be? The next regulation? If I use LNG and I fix my machinery accordingly, what other regulations might come up afterwards? How much am I going to spend on scrubbers or on new customized refineries? Will bunkers be available? Eventually of course, the cost of any of this will move to the customer or end user.



**Moderator:** Of course, the end user pays for every regulation eventually. Are shippers accepting a sense of responsibility?

**Delegate:** The shipping industry tends to have a culture of 'let's wait and see' what happens.

**Delegate:** I concur. I conducted a survey and reached out to 626 ship owners on their next steps and 52% of them came back and said they were not yet in a position to answer.

**Delegate:** We also don't know how much the penalty will be for non-compliance. How will I find low sulfur? If I want to fit a scrubber, are there enough dry docks? How much will it cost? I'd be more than happy to fit the scrubber if a company as big as Vitol, for example, would close a contract with me for five years and give me the capital to do so.

**Delegate:** The bottom line is that LSFO is not available in high quantities everywhere. It is available in certain places, such as the US coastline and certain places around Europe. But it's not generally available globally. Even if some refineries announce that they will invest in cracking to produce LSFO, it will cost and the residual value will be problematic in certain areas. So, we are then left with installing scrubbers, yet most ports don't have a reception facility for this, including the UAE.

**Moderator:** Will destination ports change because of the possibility of the sporadic availability of marine gas oil (MGO)?

**Delegate:** We have to look at all the pieces of the puzzle: supply of LSFO, MGO, shippers, terminals and ports. With terminals, we can look at what infrastructure is suitable enough to store these kinds of 'future' fuels. I think the Port of Fujairah in particular has done enough to have the suitable infrastructure in place. The biggest hurdle in the whole situation is fuel supply. Ultimately, you can only enforce implementation if you have the right fuels available, so I think the major part that has to be played is by the refiners to make sure LSFO or MGO is available. Otherwise, shippers will pay the brunt of the cost. A scrubber has an investment of around \$3 million and it will

**9**

It could take until September 2020 for compliance efforts to bear fruit – nine months after the start date. Thereafter, processes should be smoother.

**30%**  
Transparency is the greatest leverage in enabling IMO 2020 to help create a Fujairah/regional independent oil products benchmark, according to nearly a third of respondents to a GIQ Industry Survey last year.

**56%**  
More than half of the GIQ Industry Survey respondents said port authorities should take the lead in creating a IMO 2020 roadmap. Shippers (28%) and refiners (16%) took second and third place in the hierarchy of responsibility.

**80%**  
A large majority of demand for bunkering fuel comes from major players, such as Exxon and Shell. Such companies will not risk their reputation with non-compliance.

take a year before you can get one installed. In the US, many refineries have actually upgraded their systems for hydro cracking in order to have the low sulfur available. And in this region, I understand Kuwait's Al-Zour refinery (615,000 b/d when it is expected to come online this year) is going to produce a lot of LSFO. Still, there won't be a dearth of supply here. The key is the availability of the right fuels while the other pieces of the puzzle still all play their part.

**Moderator:** Would you consider asking every storage company in your ecosystem to deliver a IMO 2020 preparation plan on what they intend to do?

**Delegate:** The main challenges will happen during the first six to nine months of 2020. After that, things should settle down. Nobody wants to make major investments that could be redundant nine months down the road. Having information on how ship owners and customers are going to manage their business is important as it means the port can act accordingly.

**Delegate:** We have already started to fit scrubbers. We did a huge volume of research on the best possible option. We also reinvented the wheel so that we would not have to cut the ship to install the scrubber, which otherwise can be complicated. On the point made about the Port of Fujairah requesting a preparation plan for IMO 2020, I don't think this needs to come from its stakeholders.

**Moderator:** What does the Port of Fujairah need to do in order to seize the opportunity to go on the front foot rather than wait to see?

**Delegate:** IMO 2020 is more of an opportunity than a risk for Fujairah. For example, we have the capacity for blending. But again, the more information we can gather upfront, the better we can set out to meet the demands of 2020. The most important thing from our stakeholders is clarity. A lot of people are talking about MGO as the new fuel of choice, but is it going to be available?

**Moderator:** Will LNG become a bunker fuel sooner than expected as a result of IMO 2020?

THE MAIN CHALLENGES WILL HAPPEN DURING THE FIRST SIX TO NINE MONTHS OF 2020. AFTER THAT, THINGS SHOULD SETTLE DOWN. NOBODY WANTS TO MAKE MAJOR INVESTMENTS THAT COULD BE REDUNDANT NINE MONTHS DOWN THE ROAD."



**Delegate:** It will take a while for LNG, at least more than five years. First of all, LNG takes a lot of bunker space. Where and how can it be stored? Do we have the right crew to take care of this substance as it can be quite hazardous? Ship owners currently do not have the facilities or liquidity. We don't even know who's going to be inspecting and implementing rules and regulations. As a vessel, I might pick up fuel with 0.5% sulfur in one port but another port may not have it. So, I'll then need two products in my tanks and have to invest more in purifiers, for example. There has been no preparation for this whole process by any of the parties. An extension to the IMO 2020 start date is required, because nothing is clear. No one knows who, where or how to start.

**Delegate:** There are two stakeholders across the globe. One is the user (shipping companies) and the other is the supplier (refiners). But business models for refiners differ across countries, so it's a bit of a 'chicken and egg' scenario. One doesn't want to invest without knowing what the other is going to do. In this kind of situation, who is the central authority to take charge, give incentives and charge penalties across the globe? Do you actually go and consult each and every refiner and each and every shipper?

**1,000**  
Approximately 1,000 vessels worldwide will have scrubbers installed by 2020, estimates Wood Mackenzie. This is out of a global vessel market of 55,000.

**4,450**  
As to be expected, forecasts for scrubber installations vary. Goldman Sachs said the bullish associated economics could see 3,125 scrubbers installed by 2020 and 4,450 scrubbers by 2022.

**Moderator:** You can wait or you can set the compass. Singapore has, for example, made it a requirement that every stakeholder company that operates in their space must submit their plan and preparation for IMO 2020 by the end of this year.

**Delegate:** In the short run, scrubbers will be faster and cost less than changing the refinery slate, which can take up to four years and cost several million US dollars. Fujairah doesn't have sufficient refineries, so it will depend on how efficiently it will be able to source LSFO. This will be one of the port's main challenges when it comes to competing with the other markets, such as Singapore where there are certainly sufficient refineries. But Fujairah's location linking the Middle East to the Far East will also give players an advantage to capitalize on. Long-term, they can look to establish a refinery with a strategic investor as a buyer.

**Moderator:** The UAE is a signatory of the IMO. Is there anybody coordinating with the Port of Fujairah? It is after all one of many ports in the UAE. Are you part of a commission that gets together every month to plan for IMO? Is there a collective that gets together to discuss these issues?

**Delegate:** Yes, we are part of a collective committee and we meet. And yes, there's a representative for the UAE who presents the country at the IMO.

**Moderator:** Is the guidance from the Department of Transport at the federal level that the ports should not be a policeman of this rule?

**Delegate:** There is no policing required. Under the IMO regulation, as soon as it is implemented, all ships have to clarify whether they are going to have scrubbers or comply with the fuel. On that set date, there will be no fuel allowed to a ship that has a 3.5% sulfur content. If so, it has to prove it has a scrubber and IMO will be notified by the society of charter ships. The Port of Fujairah is going to be critical and it will continue to grow. The main questions are whether all the LSFO supply from the region's refining can bunker in Fujairah and whether the port will be able to expand its facilities to cope with the demand. Will port guidelines within the federal UAE

become more fluid to undertake this new change? Change in management is huge. You need a think-tank process to make sure all parties concerned are on the same page. Fujairah is on the right track.

**Delegate:** We should also look at how much producers like ADNOC and others across the GCC can supplement the amount of LSFO that is required in Fujairah. Plus, if you actually want to facilitate LNG bunkering, it does not necessarily need to be in Fujairah. It could be in a location like Jebel Ali, where there is already a floating storage and regasification unit (FSRU) for LNG. Perhaps they are well placed to start LNG bunkering, even if in small quantities? Instead of saying that the Port of Fujairah should account for much of the required initiative, we must ask how requirements can be met as a country, as a region. Coordinating roles are needed rather than over-stretched watchdogs.

**Delegate:** It seems that there are a lot of indirect players that haven't been mentioned here, such as insurance companies. Unlike other regulations, these guys actually end up putting a lot of pressure on the game. They say that if you don't comply, we're not going to insure or fund you.

**Moderator:** It's unlikely that ships will be insured if they're not compliant to the 0.5% sulfur limit this time next year. I imagine that it would be quite a straightforward view. Looking at another angle, the IMO rule was essentially brought in for coastal communities and environments, yet ships are mostly burning fuel on the high seas. When it comes to enforcing compliance, is there a risk of double play as ships traverse between coastal seas and high seas?

**Delegate:** The shipping industry is a chain and the weakest point is the ship – the middleman. A vessel can take clean bunker fuel from Fujairah and she then goes to a port that has no bunker fuel. She can sit there for 20 to 25 days and then have to take off-spec bunker fuel. Then, she obviously risks her machinery and also might be fined because she doesn't have a scrubber. Equally, when she's on the high seas, how do we know she's

**"ANYBODY CHOOSING NOT TO COMPLY IS MAKING A BAD DECISION – INSURANCE AND CORPORATE RISKS ARE HIGH."**

**95%**

Compliance is unlikely to reach 100% in 2020, according to Goldman Sachs. The company's 80% base case of compliance in 2020 will gradually rise to 95% globally by 2024.

**0.1%**

Sulfur content limits in some coastal waters - Northwest Europe, US, Canada and some Caribbean islands - were reduced from 1.5% to 1% in July 2010, Goldman Sachs detailed. The limits were reduced again to 0.1% in January 2015. IMO 2020 aims to unite these reductions in sulfur, and others, under one global umbrella with the 2020 ruling.

**2m b/d**

The approximate growth in the Middle East's refining volume up to 2025; good timing with efforts to boost LSFO supplies to support IMO compliance.

really burning LSFO? There are still so many questions. What exactly do we want from IMO 2020? What's the benefit?

**Delegate:** IMO has declared the regulation, but without guidance on who should go first, who should take the lead. There are no milestones.

**Moderator:** Would you charter a ship that isn't complying with IMO 2020?

**Delegate:** We are investing in testing scrubbers on some ships to see how they run. We're fortunate enough to know where we're shipping to, so we have to look at that and make sure that they pick up the right product enroute. Anybody choosing not to comply is making a bad decision – insurance and corporate risks are high. Everybody should take some responsibility for compliance but the buck has to stop with someone. If a ship doesn't have a scrubber on it, who's going to make sure that it's not loading? Someone's got to make the ultimate choice. I haven't seen any clarity on that.

**Delegate:** One of the things we're out to establish is the change in the supply chain and who's changing with it. The industry as a whole needs to get together and start thinking about that. Everybody's waiting for someone to make the first move and the first decision. I welcome ports to start bringing in a broader audience. This needs massive coordination. I welcome the opportunity to sit down with the Port of Fujairah and the Port of Singapore and elsewhere to talk about the change in process and how we can make it as smooth and transparent as possible.

**Delegate:** There is definitely a 'wait and see' attitude. As a trader, we would primarily be responsible for getting the supplies. We will source LSFO on the market if it's available, but if you then start to talk about spreads between HSFO and MGO, it could be \$300, for example. So, I'm telling vessel owners they have to

pay that just to be compliant. It's not ideal. Scrubbers are the best solution, but you also have the cost of that. Whether that investment pays off when newer regulations inevitably come forward is a different question.

**Delegate:** I am more positive. The energy majors and main container owners are going to be compliant. The industry as a whole is. The question is more focused on what route will they choose. The uptake for scrubbers won't be substantial up to 2025, as a maximum 25% of fuel will be consumed by ships with scrubbers and 32% will use LNG by 2025. Some innovative solutions have been created on how to store very large volumes of LNG and new vessels are being built to ensure the right type of ship is available if a strategy does include LNG bunkering. The question here? How fast this will happen.

MGO and LSFO will be very expensive, yet 90% of ship owners must tread this route for compliance. There will be a big battle on who pays that bill. The same applies to what the ship owners have to absorb and don't have to absorb. For a port to be in a position to handle all these scenarios is fantastic. Lessons can

**"THERE HAS BEEN NO PREPARATION BY ANY OF THE PARTIES. AN EXTENSION TO THE IMO 2020 START DATE IS REQUIRED, BECAUSE NOTHING IS CLEAR. NO ONE KNOWS WHO, WHERE OR HOW TO START."**



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Perhaps the market's surprise at the IMO 2020 ruling is the biggest surprise? The journey to reduce sulfur in fuels started fourteen years ago in 2005, with the IMO tightening the sulfur cap to today's 3.5% limit in 2008. Plans to lower the sulfur limits have since been on the table and arguably, the writing was reaffirmed on the wall when the Paris Agreement was borne in the French capital in 2015.

be learned from the Port of Rotterdam, which will have seven bunker vessels loading LNG and handling of LSFO and HSFO. They have the whole nexus planned out. Jacksonville, Florida, is another one to watch. It had virtually no bunkering up until this year with respect to LNG and very little traditional bunkering. But in the space of four years, it will have three liquefaction plants, albeit on a small scale. That's fast work! They will have a bunker barge in place and they're delivering bunkers not only to container vessels for Puerto Rican trade, but the cruise vessels will also begin using these. Carnival, the leader of cruise companies, has chosen to use LNG on their new builds sailing into the Caribbean market. You need to look at your own market, your own demand, your own ship types and also look at the combination of ports in this region to find the best solution.

**Delegate:** If IMO is really considering the environment, then the organization must extend the start date to 2025 to ensure there are enough docks, scrubbers, LSFO supplies and so on to reach compliance. But if the intention is to push vessels out of the market in a bid to rebalance supply-demand, then the ticking clock for the 1 January 2020 will work.

**Delegate:** If you look at the oil majors and big companies, they will produce IMO compliance fuels. Of course there will be 20% that probably will take a while before they get to that stage and cost will be a major factor. But this will eventually be passed onto the customer.

**Delegate:** IMO 2020 is a bump in the road that we will all get over. There are a lot of opportunities for Fujairah to expand its bunkering market and we should embrace 2020. Going forward, the industry will be self-regulated; it's not going to be one particular regulator overseeing everything. And the LSFO fuel will ultimately become available. If IMO comes forward and gives more guidelines as to how this should all be managed, then a lot of this fear would dissipate. ■

\*Edited transcript of a roundtable held under the Chatham House Rule.



**TEASER**  
**Oman's Energy  
Transition:  
What's Next?**

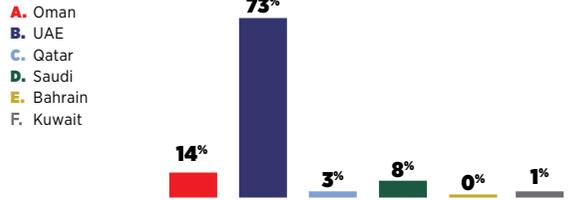


# INDUSTRY SURVEY

## OMAN ENERGY MASTER PLAN 2040

### Powering Oman's Energy Transition for the Future?

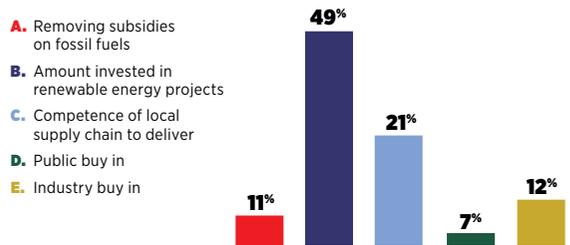
Saudi Arabia has promised to invest over \$100 billion to develop 41 gigawatts of solar electricity by 2032, while most other Gulf states have announced similar ambitious transition projects of their own. *When it comes to implementation, which GCC country do you think is currently leading the energy transition?*



Oman's total domestic use of natural gas tripled in the 10 years since 2008 to 1.5 billion standard cubic feet in 2017. *Will it be possible to meet this soaring demand growth without a centralized single authority overseeing all elements of the value chain i.e. Ministry of Energy?*



Contributions that each individual country should make to achieve the worldwide goal of the Paris Agreement on climate change are determined by all countries' nationally determined contributions (NDCs). *Which of the following is the most appropriate indicator to measure a Gulf country's progress in implementing an energy transition strategy?*



Oman and the GCC states need to go beyond their current focus on the power sector in embracing renewable energy and energy efficiency initiatives. *Consideration should also be given to the replication of these initiatives in water desalination, industrial and transportation sectors.*



The existence of a competent and integrated localized supply chain in Oman is critical for the country to be able to accelerate its energy transition!

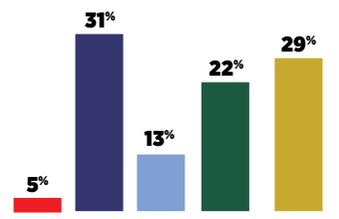


The diverse range of new energy sources within the energy transition will need complete infrastructure right through the value chain - from production and capture to processing, storage and transportation. *Is Oman's legacy energy value chain an opportunity or a barrier to the energy transition?*



The energy transition must move towards secure, efficient, and low-carbon energy systems that all encompass components related to production, conversion, delivery, and end use of energy. *Which of the following should be the most important next step for Gulf countries?*

- A. Define the need for alternative energy sources
- B. Identify alternative (sustainable) energy options
- C. Define energy consumption per sector
- D. Define sectoral and intersectoral transition strategies
- E. All of the above



Peak power demand in Oman is expected to grow at around 9% per year, from 5,122 MW in 2014 to 9,530 MW in 2021. *The sultanate will be able to meet this demand through its Vision 2040 blueprint!*



The Miraah solar thermal facility in Oman is expected to deliver 6,000 tons of steam a day for EOR operations at the Amal oil field, while six new solar and wind powered projects in the sultanate aim to deliver around 2,650 MW of renewable power by 2024. *Oman will achieve its goal to generate 10% of its power from renewables by 2025!*



Policies that provide secure payments to refinance renewable energy investments and help liberalize the power sector would be significantly beneficial in attracting more investments in energy transition projects. *Does Oman have the right financial vehicles in place to encourage the investments required to achieve more sustainable forms of energy?*



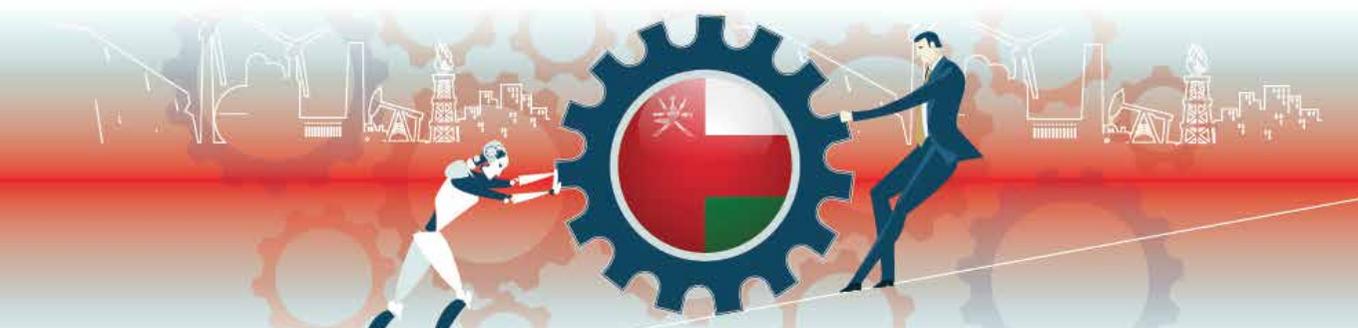
The World Economic Forum's (WEF) Global Future Council on Energy declared earlier this year that the global energy transition is still not moving fast enough. Therefore, the WEF said the ball is back in policymakers' court to accelerate the shift towards the clean energy solutions of the future.



In June, the EU agreed a 32% EU renewable energy target for 2030, and Spain became the first EU state to create a Ministry for Ecological Transition from merging the former Ministries for Environment and for Energy. *Is it possible to get left behind in the great energy transition and miss out on its economic rewards, now estimated at \$1 trillion per year?*



There is a two-part solution to this energy transition challenge. First, reducing emissions stemming from energy supply by increasing the share of zero-carbon energy in the supply mix. And secondly, moderating growth in demand for energy by radically increasing energy productivity (the economic output generated from each unit of energy used). *Oman and Gulf countries should prioritize:*



Full report released  
on February 20  
WATCH THIS SPACE!



# Spurring Oman's GREEN SPIRIT

BY IBRAHIM AL-WAILI

Head of Business Planning, Gas Directorate, Petroleum Development Oman (PDO)

**A** RAINBOW OF CHOICE WILL characterize Oman's energy sector in the 21<sup>st</sup> century. Diversification is the only sustainable path, as per the National Vision. The sultanate is actively moving away from an overreliance on a narrow range of resources, such as using gas for 97%

of national power generation. New lower-carbon targets include using renewable energy resources for between 10%-11% of power generation by 2023 – a very short four years away. Oman has made a good head start on a journey that is gaining traction worldwide; the seeds of its positive disruption are bearing fruit.

**Oman could answer globally-pressing questions i.e. how to achieve affordable battery storage for renewables so that supply is guaranteed when the clouds hide the sun or the winds calm?"**

Greater agility will be pivotal to guaranteeing Oman's long-term energy security, especially amid volatile oil prices, rising energy demand and lower-carbon targets. In the last quarter of 2018 alone, oil prices went from \$84/bl to \$60/bl – a 28% decline in a matter of weeks. Such peaks and troughs used to occur over many months, so the increasingly rapid shifts wreak havoc for financial planners who have an overreliance on fossil fuels. Energy diversification should give oft-nervous accountants steadier goalposts to work around, therefore freeing the flow of much-needed capital for both renewable and fossil fuel projects.

## TICK TOCK

Is there a short cut to creating a diversified energy market? No, but masses of potential boil down into a handful of key drivers for success. Generally, these include diversifying the renewables market, embracing digitalization and technological innovations, putting national talent in the spotlight, managing consumers' expectations and strengthening international alliances. Each requires clear and fast-acting government policies, an aware and adventurous financial market and communication campaigns. Research and development (R&D) and commercialization within these primary categories can help Oman answer globally-pressing questions i.e. how to achieve affordable battery storage for renewables so that supply is guaranteed when the clouds hide the sun or the winds calm?

Oman is not a novice when it comes to pushing lower-carbon boundaries, as most recently illustrated with the Miraah project. Once completed, it will arguably be one of the

**28%**  
The decline of oil prices in a matter of weeks in the last quarter of 2018, from \$84/bl to \$60/bl. No wonder eagle-eyed accountants are nervous.

**97%**  
Volatile commodity prices serve to reinforce the need for a diversified energy basket. Using gas for 97% of Oman's power generation creates vulnerabilities in the matrix of energy security.

**4**  
Oman aims to use renewable energy resources for between 10%-11% of power generation by 2023 – a very short four years away.

**69<sup>th</sup>**  
Oman's ranking out of 126 countries on the Global Innovation Index 2018, which accounts for 96.3% of the world's GDP. Impressive for a country with a population of under 5 million.

largest solar projects in the world producing some 1,021 megawatt (MW) of peak thermal energy. Miraah will capture and concentrate the sunlight to generate around 6,000 tons of solar steam each day. The steam will feed directly into our existing thermal enhanced oil recovery (EOR) operations, providing a substantial portion of the steam required at the Amal oil field in Southern Oman. At the same time, Miraah will save around 5.6 trillion British thermal units (BTUs) of natural gas each year, freeing up gas that would otherwise be burnt to produce the steam.

## HEARTS AND MINDS

Oman is in a quandary, albeit a privileged one. The country benefits from a long queue of creative people lining up to share their ideas on various energy solutions, from policies on how to trim energy consumption to flagging emerging technologies. Yet, many companies do not know how to identify and pursue the best ideas, and so many are unutilized and Omanis' eagerness dampened. To break this cycle of wasted potential, we must all actively manage every bead of intellectual sweat in the existing queue to its full value while encouraging others to join.

Nationals' appetite to think 'out of the box' must translate into tangible and profitable projects that support energy diversification. The sultanate's zest for novel thinking is clear. Approximately 150 projects were submitted to PDO's inaugural Renewable Energy Awards (REAs) this year, which were launched in co-operation with the Ministry of Education. Home to just 4.6 million people, the sultanate ranks 69<sup>th</sup> out of 126 countries on the Global Innovation Index 2018, which accounts for 96.3% of the world's GDP. Imagine how quickly Oman could climb the rankings if every idea was explored and, if viable, commercialized. There is no such thing as overshooting investments in national talent.

Amid such significant change, every part of the energy value chain requires attention, no matter how seemingly small. The pressure points are very real, as are Oman's obligations under the Paris Agreement. Every color in Oman's rainbow of diversification must beam with profitability and sustainability in the 2020s and beyond. ■

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# CALENDAR 2019

## **The Gulf Intelligence UAE Energy Forum 2019**

Under the Patronage of  
His Excellency Eng. Suhail Mohamed Al Mazrouei  
UAE Minister of Energy & Industry

*Jan. 9<sup>th</sup>, 2019*

## **Oman Energy Leadership Summit**

*Muscat, Feb. 7<sup>th</sup> 2019*

## **The Gulf Intelligence IPWeek Middle East Energy Summit**

Hosted by the Energy Institute - IPWEEK

*London, Feb. 28<sup>th</sup> 2019*

## **The Middle East LNG Workshop**

*Abu Dhabi, Mar. 19<sup>th</sup> 2019*

## **The Gulf Intelligence Saudi Arabia Energy Forum**

*Riyadh, Apr. 8<sup>th</sup> 2019*

## **The Middle East Oil Markets Workshop**

*Dubai, Apr. 22<sup>nd</sup> 2019*

## **The Gulf Intelligence Middle East UK Summer Retreat**

*UK, July 12<sup>th</sup> 2019*

## **The Gulf Intelligence Energy Markets Forum**

Under the Patronage of  
His Highness Sheikh Hamad Bin Mohammed Al-Sharqi  
The Ruler of Fujairah, UAE

*Fujairah, Sept. 23<sup>rd</sup> - 24<sup>th</sup> 2019*

## **The Gulf EOR Workshop**

*Abu Dhabi, Nov. 10<sup>th</sup> 2019*

## **The Gulf Intelligence Abu Dhabi Knowledge Series**

*Abu Dhabi, Nov. 11<sup>th</sup> - 14<sup>th</sup> 2019*

## **The Gulf Intelligence Oman Energy Forum**

*Muscat, Nov. 26<sup>th</sup> 2019*

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