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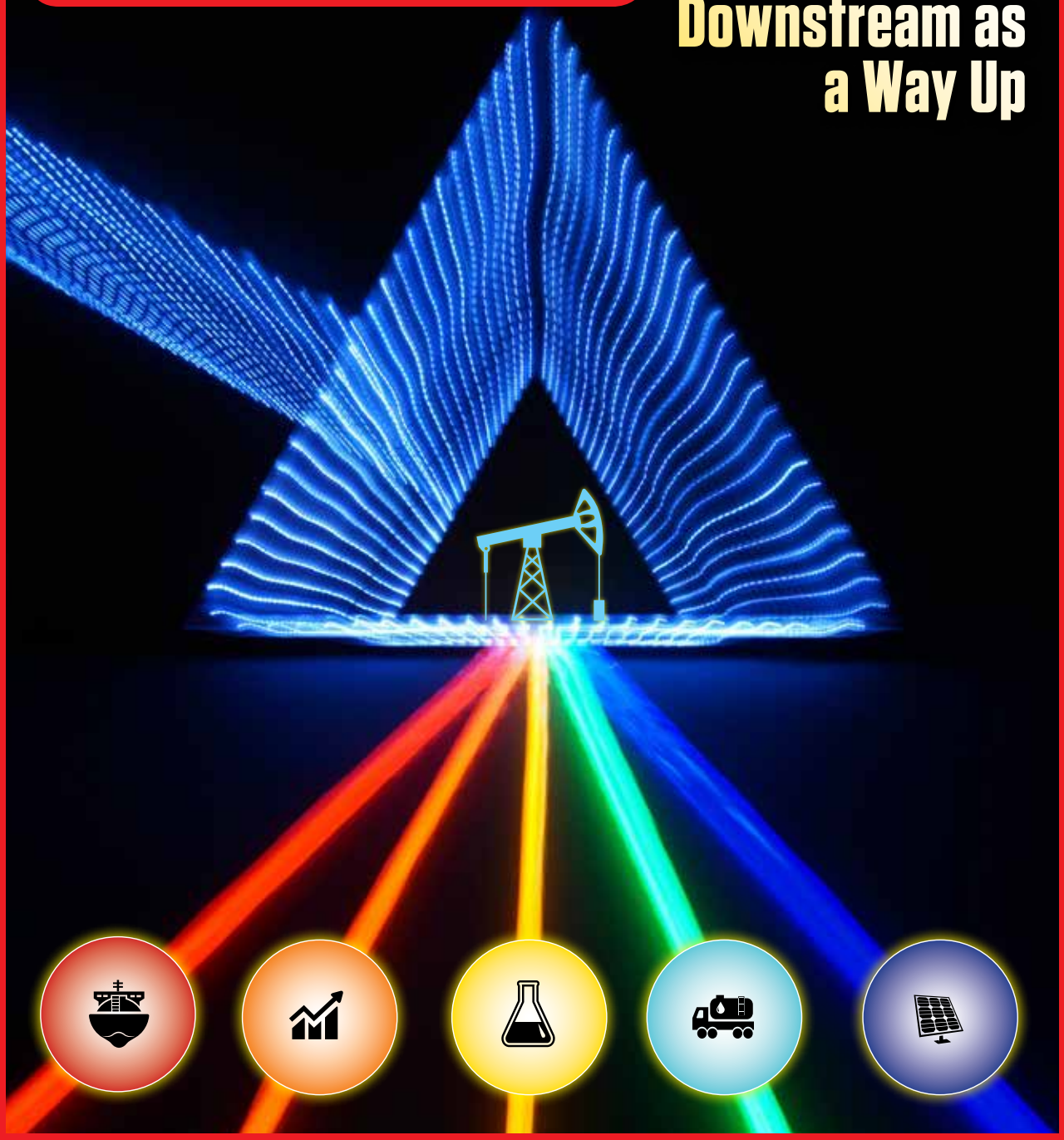
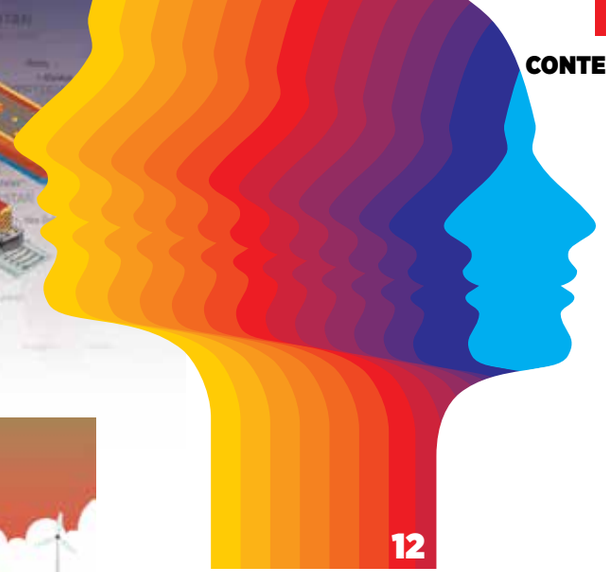
Energy Outlook

SECOND QUARTER 2018

STRENGTH IN DIVERSITY...

NOCs Turning to Downstream as a Way Up





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Sean Evers

Managing Editor
Annette Bontke

Design Manager
Carl Bergman

Editor & Senior Content Analyst
Michelle Meineke

Editorial Associate
Mahin Siddiqui

Contact
info@gulfintelligence.com

Trailblazers of Diversity in 2018 – Are You In?

BY SEAN EVERS
Managing Partner, Gulf Intelligence

Flexing without financially wincing to price and geopolitical volatility is gold dust. The secret to success? "Winners are those who are well integrated along their value chain. This is what the national oil companies (NOCs) are working on," Nizar Al-Adsani, CEO and Deputy Chairman of the Board of Directors of Kuwait Petroleum Corporation (KPC), told Gulf Intelligence (GI). An ability to seamlessly integrate and collaborate along the value chain means energy stakeholders in the Middle East, including international oil companies (IOCs), can ride the wave of change in 2018. Failing to act results in getting wet and urgently seeking a life raft; at worst, drowning.

The spotlight is especially bright on one link in the chain; downstream. Egypt has set its sights on becoming a new energy hub, potentially *the* nexus in the Eastern Mediterranean (p6), and Kuwait will add more cash to the $50 billion it has already spent on domestic refineries (p8). Big ticket investments in refineries and port infrastructure are luring foreign investors in at a time when 'lower for longer' oil prices mean energy companies are eagerly scanning the lending horizon for affordable injections of cash. Keep in mind that the loosening of investors' purse strings – i.e. how ambitious a project they are willing to back – will be heavily influenced by the success or failure of the initial public offering (IPO) of 5% of Saudi Aramco in late-2018. Have no doubt; ripples from the IPO will spread far and wide.

There is also an unnerving change on the regulatory horizon; downstream will feel the greatest impact, but no part of the value chain is immune. The International Maritime Organization's (IMO) ruling to limit sulphur in bunker fuel to 0.5% from 3.5% from 1 January, 2020 is giving energy stakeholders a new set of wrinkles. The clock is ticking loudly – and uncomfortably – for refineries, port operators, storage providers, trading and marketing, ship operators and more as they try to figure out their new status quo.

There is some good news; the average price for Brent crude in the first half of 2018 will be in the $60s/bl, according to 76% of respondents to a GIQ Industry Survey. How the price plays out largely rests on whether the unprecedented holding of hands between OPEC and non-OPEC countries continues (p12). While the price forecast offers a tentative and rudimentary platform of stability, don't forget that uncertainty is the only certainty. Hedge your bets; diversify.

TAKING BACK THE CROWN

Will the Middle East Reassert its Global Energy Leadership in 2018?

Egypt Poised to Become East Med Energy Hub

By H.E. Tarek El Molla
Minister of Petroleum & Mineral Resources, Egypt

Egypt aims to transform itself into an Eastern Mediterranean center for energy trade; an import-export hub for oil and gas. The move is a key stepping stone in the country's bid for sustainable development, as per its Vision 2030. Ambitious plans to enhance domestic oil, gas and refining production are already under way and leveraged by Egypt's strategic location on the Mediterranean and Red Sea, connected by the Suez Canal. With new partnerships with neighbors and companies like ENI and BP, the country is ideally positioned as a nexus and arbitrage point for the transit, storage, blending and trading of Asian and Middle Eastern crude and products flowing to and from Europe.

Oil and gas extraction and refining currently accounts for just 11% of Egypt's GDP, so much potential remains to be tapped. The country pioneered the exploitation of natural gas in the Eastern Mediterranean in the 1980s and with recent major gas discoveries and a vast infrastructure upgrade planned for its crude oil conversion system, Egypt currently has the natural lead in the region.

In addition, it has the advantage of established natural gas pipelines from the Red Sea to the Mediterranean and two liquefication plants for the potential re-export of natural gas, at Damietta and Idku on the Mediterranean coast. It is also expected that once storage and blending facilities for crude oil, refined products and petrochemicals are complete, neighboring players in the supply chain will seek to optimize their own positions by trading in and out of Egypt.

In February, an Egyptian private consortium reached a $15 billion agreement with Israeli companies Tamar and Leviathan for the supply of 64 billion cubic meters (bcm) of natural gas for 10 years from 2020. The deal will enable Egypt to once again become an LNG exporter and also increase its output of petrochemicals and refined products. The industrialization and modernization of the country's petrochemicals sector is very much a parallel target to developing its upstream assets.

In December of last year, the country's giant Al Zohr gas field, discovered by ENI in 2015, came onstream producing an initial 10 million cm (mcm) per day with the figure expected to reach 28 mcm by the end of phase one in June. Stage two is due to be finalized by the end of 2019, with production reaching 76 mcm. And with the recent discoveries of 1.5 trillion cubic feet (tcf) and 2 tcf of gas at its Atoll and Noroos fields respectively, Egypt should be self-sufficient and in a position to re-secure its status as an exporter of surplus gas by 2019.

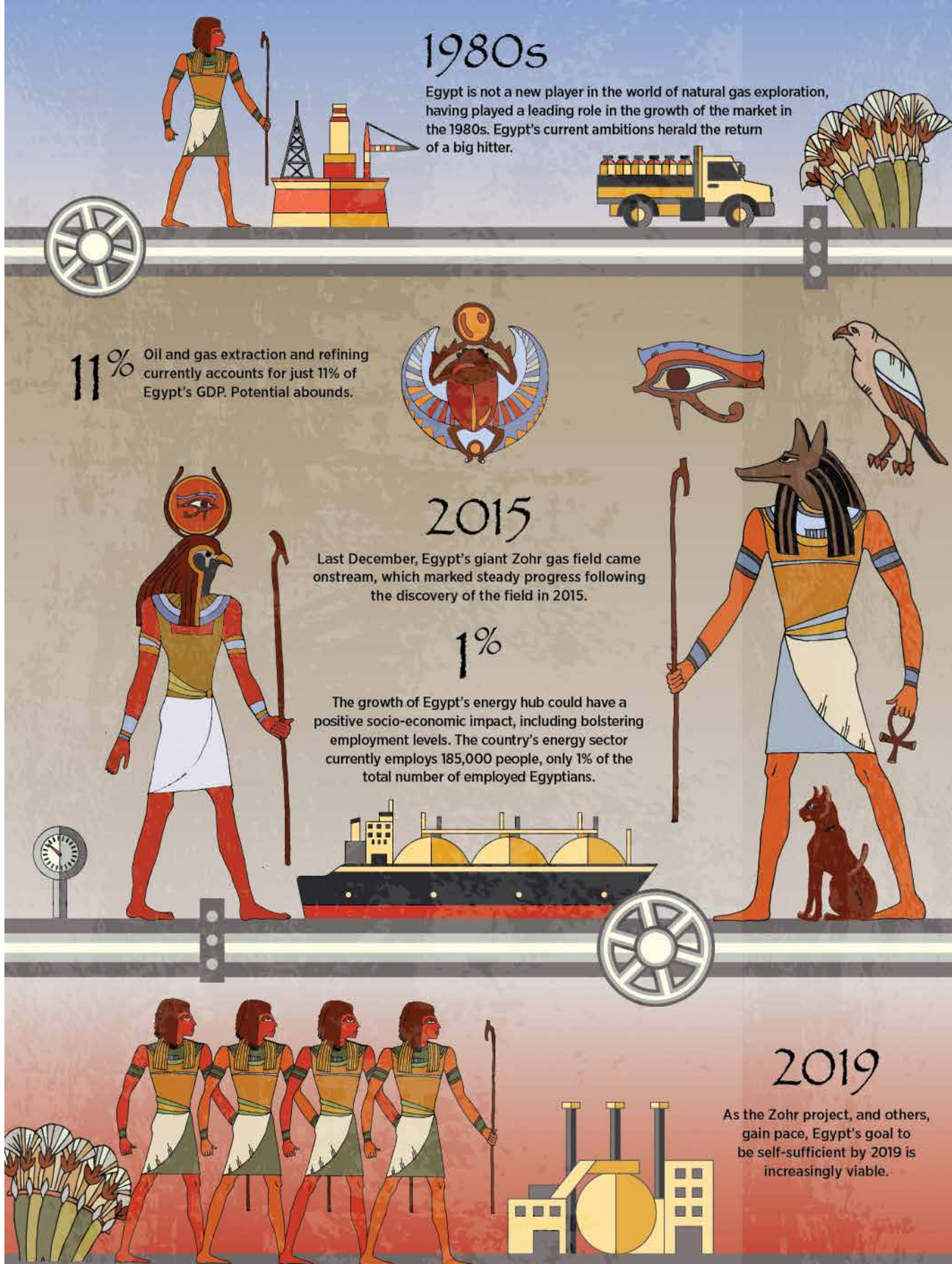
Middle Eastern imports of LNG have almost quadrupled in the last three years to around 29 bcm with countries such as Egypt, the UAE and Kuwait – traditionally gas exporters – transitioning into importers.

Egypt has also made significant progress when it comes to legislative reforms. The country recently established an independent gas regulator and opened up opportunities to the private sector. It has also formed an inter-governmental committee represented by different ministries and entities to discuss the challenges that the sector plans to tackle. And feasibility studies continue on the development of future infrastructure projects, such as marine platforms and storage facilities, as well as upgrading and extending current ones.

Such growth is expected to stimulate much-needed employment in the country. The energy sector currently employs 185,000 people, only 1% of the country's total employment. Around 80% work in refining and 20% in the extractive industries.

Egypt also intends to align itself with the European Union's energy strategy, with plans to sign an updated memorandum of understanding (MoU) with the continent – the main consumer of energy transported and traded through the country – this year. An initial arrangement has been signed with Cyprus for gas cooperation and pipeline plans from Cyprus to Egypt in line with the maritime jurisdiction of the two countries. To the east, pen has hit paper with a MOU with Jordan and Iraq to cooperate on transporting oil and gas from Iraq via Jordan to Egypt. ■

**This Op Ed was harvested from a live speech during IP Week in London, February 2018.*



KUWAIT ONWARDS & UPWARDS IN THE ENERGY MIX

INTERVIEW:
Nizar Al-Adsani, Deputy Chairman & CEO, Kuwait Petroleum Corporation (KPC)

Dyala Sabbagh (GI Partner): *How is Kuwait strategizing for the new dynamic in global oil and gas trade flows that we have witnessed in recent years?*
Nizar Al-Adsani: Trading continues to be dynamic for our part of the world. We've seen Venezuelan crude coming to India's Gujarat refinery, we've seen West African crude migrate from the US to Asia and Iraqi crude production grow to almost 5m b/d and penetrate the Asian market. We may eventually also see South American crude enter the arena from offshore Brazil. I see all these dynamics continuing.

On the products side, the US has been quite aggressive into Europe. But eventually you will see [the impact of the] new Gulf refineries coming onstream; Saudi Arabia's Jizan refinery at 400,000 b/d, the UAE's Ruwais refinery, Oman's Duqm oil refinery, Kuwait's Al-Zour and the Bapco refinery in Bahrain. There will be an enormous amount of middle distillates coming from the Gulf and moving into Europe and Asia.

2040
Half a trillion US dollars will be invested in oil and gas projects in the next 25 years as part of Kuwait's 2040 Energy Strategy.

Dyala Sabbagh: *Is the advent of US crude exports to Asia a threat to Kuwait's market share? Is there enough demand to absorb all of today's suppliers?*
Nizar Al-Adsani: There is enough demand. Kuwait has long held alliances with the likes of SK of Korea, and we also have a refinery in Vietnam that's being commissioned for 200,000 b/d. Kuwaiti crude will go to the refinery. We are thinking about another refinery in Vietnam and expanding that by the end of this year to 200,000 b/d, therefore creating another opportunity. We are also in a long-term relationship with Unipec and Sinopec. We will continue as long as the margins are healthy; we are a low-cost producer and we are aggressive enough to penetrate the Asian markets. It's a competition at the end of the day between us, the US, other producers in the Gulf, as well as other regions, such as West Africa or even South America.

$100bn
The amount Kuwait will spend in the next two years, with an additional $300 billion in the next 10 to 15 years.

Dyala Sabbagh: *You mention Kuwait's investment in downstream assets abroad, such as in Vietnam, which is one avenue to securing*

"We see great appetite from the financial community to work with us on our many ambitious projects. There is competition – but we're getting good margins."

Asian customers. Looking at the bigger picture, Kuwait is planning to invest half a trillion US dollars on oil and gas projects in the next 25 years as part of its 2040 Energy Strategy. How do you plan to finance this? We are seeing a lot of foreign investment going into Asian oil and gas infrastructure. Are you facing any challenges when it comes to competing for funding? After all, Kuwait is planning to spend $100 billion in the next two years and another $300 billion in the next 10 to 15 years. And Kuwait, like other Gulf economies, is running budget deficits compared to the steady years of surplus before 2014.

Nizar Al-Adsani: In terms of the $100 billion expenditure, 76% of that will be spent domestically on upstream. We plan to increase our production to 4m b/d by 2020 and to 4.7m b/d by 2040. We already have 150 rigs drilling in Kuwait and we will have 180 before the end of this year. We also plan to tap Kuwait's offshore potential next year.

We have already secured financing for our refining projects. We have spent $50 billion in the last five years upgrading our refineries in Kuwait and building 600,000 b/d of capacity. We have just finished the Vietnam refinery with PetroVietnam and our Japanese partners and have initiated the 200,000 b/d Duqm refinery in a 50-50 joint venture with Oman Oil.

76%
Just over three-quarters of the $100 billion expenditure will be spent domestically on upstream.

4.7m b/d
Kuwait aims to increase production to 4m b/d by 2020 and then 4.7 million b/d by 2040.

20%
Approximately 150 rigs are already drilling in Kuwait, with this figure rising by 20% to 180 rigs before 2019. The country also plans to tap its offshore potential next year. This will be relatively new territory for KPC, which has historically focused its domestic efforts on onshore assets.

#5
Kuwait has a feasibility study on a new 300,000 b/d refinery, which would mark the country's 5th such project. Kuwait's plans for another refinery by 2040 would bring domestic refining capabilities to 2m b/d.

All these refineries are integrated with petrochemical projects.

We have secured $19.5 billion in financing from commercial banks, local banks, export credit agencies (ECA), sukuks and bonds. We have another $6.5 billion that we will tap in the coming two months, which will help the LNG import facility that we're building in Kuwait and the $1.2 billion Dibdibah Solar Power Plant.

We also currently have a feasibility study on a new refinery in Kuwait of 300,000 b/d (which would be the country's 5th refinery), which will take us up to 1.7m b/d of capacity by 2025. Another refinery is planned by 2040, which will take us to 2m b/d of domestic refinery capabilities.

We see great appetite from the financial community to work with us on our many ambitious projects. There is competition – but we're getting good margins.

Dyala Sabbagh: *Do you feel that there is perhaps too much new refinery capacity in the region? Is there a risk of over supply?*

Nizar Al-Adsani: The winners of the energy scene are those who are well integrated – in upstream, downstream, petrochemicals, retail and transport – across the whole value chain. I don't see this new supply as a threat. I see it as an added value for all the countries and this is what the national oil companies (NOCs) are working on. Once you secure that value chain, you will mitigate any volatility in prices. We are dependent on oil and gas and we need to maintain a steady stream of revenue for the state.

Dyala Sabbagh: *To diversify portfolios and maximize revenues, what are KPC's plans to set up a fully-fledged trading arm along the lines of Saudi Aramco Trading or Oman's OTI, for example? Has Kuwait been considering joint ventures with various trading houses and majors?*

Nizar Al-Adsani: We have the approvals to start a trading arm. On the physical front, we have been working in trading for a long time. In Europe, we have a huge retail network of 5,000 gas stations and we also supply around 70 airports from Sydney to Heathrow with jet fuel. We consume 400,000 barrels of products in Europe between jet fuel, gasoline and diesel. All of this is done through trading hubs that we have in London and elsewhere and we will try to replicate that in the future.

Dyala Sabbagh: *How challenging is the situation of power shortages in the region? We've seen Saudi Arabia signal it wants to invest in gas assets as far away as Russia and the US to secure supplies. Does Kuwait have any aspirations to go after more assets abroad on this front?*

Nizar Al-Adsani: We have been active in exploration and production (E&P) outside Kuwait since 1981 in places such as Egypt, Tunisia, the Norwegian part of the North Sea and Alberta, Canada. We also have our investment in Wheatstone Australia and exported our first liquefied natural gas (LNG) cargo from there last October. Train 2 will start this year, so we will have more LNG exports, which will go to Asian markets. We can always swap cargoes if they are needed domestically in Kuwait. We have also issued a tender and signed a 15-year contract with Shell for LNG supplies to Kuwait and we will sign another tranche next month with a second supplier of LNG. We are also working with Petronas on various LNG opportunities in Malaysia.

Dyala Sabbagh: *The agreement by the group of 24 OPEC and non-OPEC producers to trim oil output has been successful in regards to compliance and supporting the oil price. How do you think 2018 will play out?*

Nizar Al-Adsani: Kuwait is committed to the OPEC accord but even with the production quotas that we have, we will continue to increase our capacities in Kuwait. Future demand requires it. We also have to make up for the drop in global E&P investments in 2015 and 2016. We will be there to make sure that the markets are balanced and that we meet our customers' needs with reliable sources of energy. ■

**Edited transcript*

"We will continue as long as the margins are healthy; we are a low-cost producer and aggressive enough to penetrate the Asian markets. It's a competition at the end of the day between us, the US, producers in the Gulf and other regions."

$26bn
Kuwait has secured $19.5 billion in financing from commercial banks, local banks, export credit agencies (ECA), sukuks and bonds and has another $6.5 billion it can tap into. The total financing of $26 billion will help develop the country's LNG import facility and Dibdibah Solar Power Plant.

$50bn
The amount Kuwait has spent in the last five years upgrading its refineries.

5,000
Kuwait's reach spreads far and wide. The country has a significant retail network of 5,000 gas stations in Europe and supplies approximately 70 airports from Sydney to Heathrow with jet fuel.

THE NEW FACE OF OPEC?

INTERVIEW:
H.E. Suhail Mohamed Al Mazrouei
UAE Minister of Energy & Industry and President of OPEC Conference 2018
MODERATOR:
Stephen Sedgwick, Presenter, CNBC

Stephen Sedgwick: *The deal to cut oil production between OPEC and non-OPEC has worked and is still working. But how do you see it going forward beyond 2018? How is it going to transform into this longer-term charter, which you have recently mentioned as an ideal goal?*

OPEC President: We are living in an age of transparency and cooperation and not one where OPEC alone is responsible for the market. As you say, the output agreement is working and beyond expectations. When we started last year, everyone was skeptical about whether it would work and whether producers would adhere, but average compliance in 2017 was 107%. If you look at the last few months, we have continued to over-deliver, even when prices were at $60/bl and above. The level of understanding and trust within the group also increased gradually throughout 2017 if you look at conformity levels. As the President of OPEC, together with the Secretary General, that gives me hope that we can keep this group together for longer.

We are keen on putting a charter proposal to the Ministers, but whether we do it in June at the next OPEC meeting or before the end of this year is not clear. This new structure of cooperation that we have today in terms of sharing data and even working with US shale producers as far as understanding their predictions of what is going to come to market ensures we are better informed as a group.

> **"Who would have expected at the end of 2016 that we would then have 3.7% growth in global GDP? This was directly linked to the success of OPEC."**

Stephen Sedgwick: *How do you reconcile the need for this discipline on production to remain while at the same time encouraging investment in new output and while producers compete for market share in Asia?*

OPEC President: The task of this year is cooperation and to remove the excess overhang and over storage in the sector. We have removed more than 260 million barrels so far, which was a worry for us as an industry. The mission is not yet complete. But once it is, tomorrow's task will be to provide and to assure the world that we will have adequate supply.

We have seen many countries face a significant decline in production due to a lack of investment. There was $1 trillion of investment that was supposed to happen in the past three years if we had been in a perfect world, but it didn't because of the supply glut and because of low prices. Now we are going to see the effect of that under-spending. In the medium and long-term, we must ensure that we have enough CAPEX coming into E&P.

Stephen Sedgwick: *Will OPEC fail without a longer-term charter with the likes of Russia? Will it lose its potency without this?*

OPEC President: That's a very short-sighted point of view. OPEC was crucial to maintaining the new stability in the market and it was OPEC that enabled US shale producers to come back. The production cut agreement has benefitted all oil producers and the world economy. Who would have expected at the end of 2016 that we would then have 3.7% growth in global GDP? This was directly linked to the success of OPEC. This commodity is so important to the world and we cannot underestimate what we have done for both producers and consumers. We are not after a price; we are after a future where the supply of oil is ensured.

Stephen Sedgwick: *Why doesn't Russia just join OPEC?*

OPEC President: Every country has a right to join. Without Russia and the group it has brought with them, I don't think we could have

107%

Average compliance to the OPEC and non-OPEC production cut exceeded 100% in 2017. Such success hushed naysayers and spurred momentum for more cooperation within the group in 2018.

260m

The deal to cut production has removed a total of 260 million barrels from the market so far. This relieves what was a significant worry for the industry.

> **"This new structure of cooperation that we have today – sharing data, working with US shale producers and so on – better informs us as a group."**

been successful. Saudi Arabia, as the biggest oil producer of OPEC, and Russia, are the critical cornerstones of this deal. The potential is there for this group and Russia to look at forms of cooperation for the future. There are already talks of significant investments amongst oil producers in the Gulf and Russia and all because we have started working with each other and started to align for the benefit of the whole world economy, while restoring order to the oil markets. A precedent has been set by this group of 24 countries working together. That is the realization of today and that is why this deal has gone into a second year.

24
The number of countries within the group – OPEC and non-OPEC – with no sign of any departees in 2018.

Stephen Sedgwick: *Geopolitics has contributed to some OPEC members not being able to comply to the deal. For example Venezuela, which has had huge internal strife. For you as the OPEC President, what problems are you most concerned about for your members in terms of overriding geopolitics or making sure everybody is on board?*
OPEC President: What is important is to look at the compliance rate of each country and that is the job of the monitoring committee, which is led by the very capable Excellencies Al Falih and Novak of Saudi Arabia and Russia, respectively. We are always looking at structured ways for the group to help countries experiencing difficulties, such as Venezuela. At the same time, what is happening within a country is also the country's business.

We are also monitoring the level of investment that each country is making. We will need to replace around 400-500 million barrels every year – that is half of Saudi Arabia's production – to ensure we have adequate hydrocarbon resources for the future. This incentivizes the thinking within OPEC that those who have investment arms can help restore production and every country that joins this group will have the ability to talk to investors from Saudi Arabia, the UAE, Kuwait and others who can afford to invest in upstream.

Stephen Sedgwick: *Do you see the UAE's imports of condensate from the US continuing?*
OPEC President: The UAE is an open market and whether it is condensate or LNG, we are not restricting imports. We have an open market system for products, which we liberated from subsidies in 2015. So, it's a balanced approach and the government is not going to interfere as a regulator because we have balanced selling points. I also see the imports of condensate from the US as an opportunity; the US is an important ally and what is happening with gas in the country is an exciting story for the world. The balance of where condensate comes from into the Middle East is a matter of market balance.

It's also important to look at the bigger picture in terms of trade amongst producers. The true market concern is to ensure that the additional 12-15m b/d of demand that is expected by 2040 will be supplied from where we have adequate resources. Can we manage the decline of reservoirs in older fields? This is the sort of question that we need to discuss and our job in OPEC is to ensure that there is a plan. We are working with everyone to ensure there is a balanced supply and demand market.

> **"The price will be right when we see an adequate amount of investment. Are we there yet? No."**

$1trn
The amount that energy analysts expected to be invested over the last three years. But a supply glut, and subsequent low oil prices, means purse strings have been much tighter than anticipated. Concerns that this pull-back will trigger a supply squeeze in the next few years are intensifying.

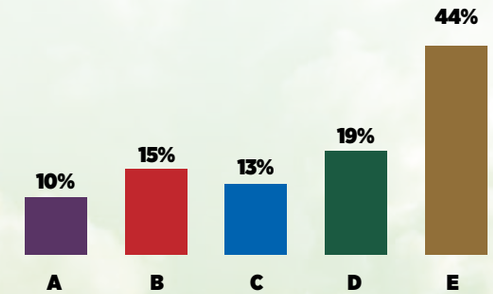
Stephen Sedgwick: *Is $60-$65/bl a sweet spot for you?*
OPEC President: I will never give you a price for a very simple reason: we are not targeting a price. We are targeting a balance and the market will decide what is a good price. We have experienced $40/bl and $50/bl and we have realized that it just doesn't work and not necessarily for us as low-cost producers, but for the cost of production worldwide. The price will be right when we see an adequate amount of investment. Are we there yet? No. ■

SURVEY RESULTS

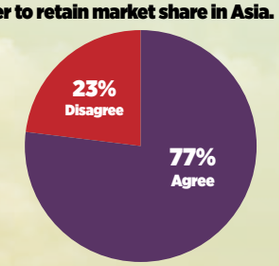
MIDDLE EAST LNG 2018: *Liquid, Flexible & Transparent?*

What is the most important 'next step' to establish a liquid, flexible and transparent Middle East LNG market by 2025?

A. Build LNG storage hubs in the region
B. Establish a Middle East LNG benchmark price contract
C. Regional domestic demand to outpace pipeline supply
D. Remove all subsidies that fix natural gas prices at low levels
E. All of the above in no particular order

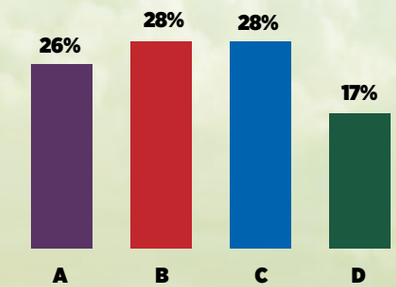


Destination restriction clauses prohibit the buyer in a LNG sale and purchase agreement from redirecting or reselling the LNG in any cargo. Middle East LNG sellers will have to drop destination restriction clauses in future contracts in order to retain market share in Asia.

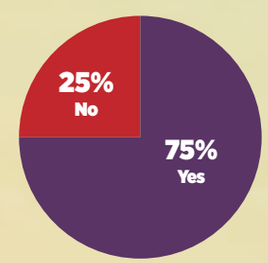


Global LNG demand is predicted to grow from 250 million tons per annum (mtpa) in 2015 to 400 mtpa in 2025 – a 60% increase. How much of this 400 mtpa will be 'homeless' and available to the spot market in 2025?

A. 50 mtpa
B. 75 mtpa
C. 100 mtpa
D. 100 mtpa+

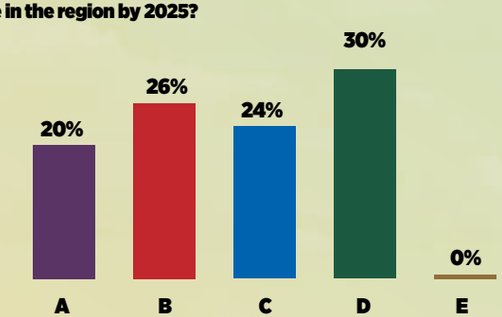


Between 2016 and 2020, the US is expected to account for half of the 20 billion cubic feet per day of new LNG export capacity worldwide. Should this market revolution compel the Middle East to accelerate its transformation into a more liquid, flexible and transparent LNG market?



The Middle East, traditionally associated with large-scale LNG exports, has become one of the fastest growing demand centers for the commodity. This has mostly been facilitated by a significant increase in the number of floating storage and regasification units (FSRUs) operating across the region, from Egypt to Pakistan. How many more FSRUs will arrive in the region by 2025?

A. 2
B. 4
C. 6
D. 6+
E. None



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Source: ME LNG Institute Research; Q2 2018

SHIFTING SANDS

The Era of Transition and Transition of an Era?

Evolving Energy Sector
RETHINKING THE NORMS

BY PROF. PAUL STEVENS
Distinguished Fellow, Energy, Environment and Resources, Chatham House

Energy transition is when an economy switches from one main source of energy to another. Historically, these have tended to occur at the national level and occasionally at the regional level. In the US for example, between 1865 and 1900, the energy mix switched from 80% wood-20% coal to the exact inverse. The trigger was dwindling supplies of commercial wood. There are also reinforcing factors in energy transitions usually associated with changes and advances in technology. This current energy transition is global and can be defined as a moving away from hydrocarbon molecules to electrons. The trigger is environmental concern; mainly climate change and the Paris Agreement, as well as urban air pollution. A reinforcing factor is the falling cost of renewables. The cost of solar and wind electricity generation has plummeted, as have battery costs.

Another reinforcing factor to today's transition is the rise in electric vehicle (EV) usage. With the declining price of lithium ion batteries, it might be cheaper to buy an EV than an internal combustion engine by 2025. It may also be cheaper to run it.

A third reinforcer is 'OECD disease'. In the early 1980s, the Organization for Economic Co-operation and Development (OECD) governments sought a way to raise revenue by imposing high sales taxes on oil products. This took advantage of a large tax base, very inelastic demand and a low collection cost. This caught on and now we see a lot of non-OECD governments beginning to catch the disease in China, India and other parts of Asia, particularly where demand growth for oil is expected to continue. One implication is that the price of crude oil will become increasingly irrelevant. What is going to matter is the price of the final product, which is going to rise irrespective of what happens to oil prices.

> **"A crucial date to watch this year will be May 12 when the US administration announces whether it will renew the lifting of sanctions on Iran. If not, then in effect the US will have unilaterally abrogated the nuclear agreement."**

The energy establishment is generally understating this transition. The International Energy Agency (IEA), the OPEC Secretariat, the US Energy Information Administration (EIA) and some oil companies (at least publicly) are downplaying what is going on.

So, what are the implications for the Middle East? A key issue here is when peak oil demand is likely to happen. But the question to ask is not whether or when we reach peak demand. What matters is what happens after the peak. Is it going to be a slow gentle plateau of decline or is it going to fall off the edge of the cliff?

Today's energy transition has two crucial implications for the Middle East. First, if oil demand falls quickly, there is an ever-greater need for economic diversification, albeit 45 years too late. To diversify properly, the Middle East needs to develop an effective private sector. However, the current ruling elites in the region tend to behave in a way that threatens property rights. Without secure and guaranteed property rights, the private sector will not be willing to commit on a grand scale to invest domestically and create the much-needed jobs for Middle Eastern nationals.

The increasing competition for energy market share in Asia is also going to have significant implications for the region. Competition for markets will be aggravated by geopolitical instability in the region, coupled with the continuous uncertainty over how US President Trump behaves (or misbehaves) in the region. A crucial date to watch this year will be May 12 when the US administration announces whether it will renew the lifting of sanctions on Iran. If not, then in effect the US will have unilaterally abrogated the nuclear agreement – the Joint Comprehensive Plan of Action (JCPOA). It will be very interesting to see how Iran will respond to this considering it has the capability to cause serious mischief in the region. ■

2025
As the price of lithium ion batteries slides, it might be cheaper to buy an electric vehicle than an internal combustion engine within the decade.

35
Energy transitions are not new. In just over three decades between 1865 and 1900, the US' energy portfolio of 80% wood-20% wood switched to the exact inverse.

Period of Record High Oil Inventory Ends! NOW WHAT?

Navigating Persistent Backwardation in 2018 to Avoid a Price War

DAVE ERNSBERGER, GLOBAL HEAD OF ENERGY PRICING AND CO-HEAD OF CONTENT, S&P GLOBAL PLATTS
CHRIS BAKE, MEMBER OF THE EXECUTIVE COMMITTEE, VITOL

CHAIR: SEAN EVERS, MANAGING PARTNER, GULF INTELLIGENCE

Sean Evers: *Are we likely to see the backwardation in the market continuing throughout 2018 and if so, how should market players tackle this?*
Chris Bake: What we are seeing today is a result of a series of events that first triggered an unprecedented rise in oil stocks and then last year, a lowering in oil stocks. The emergence of US shale oil in 2009-2010 surprised us all. Since then, year-on-year and with the help of capital markets, US production has incrementally produced 1m b/d of oil.

The surprise triggered OPEC to respond with its market share strategy in 2014. The taps were opened, refining margins remained robust and crude and products ballooned at an exponential level – a bonanza for incremental oil storage. The geopolitics in the Middle East also encourage a natural imbalance, with the eastern flow of oil from Iran to other locations having to be stored instead of going to market, for example.

Which leads us to 2016 when OPEC decided to cut production to support the market, which was coupled with strong demand during 2016-2017. Demand estimates were revised, and they continue to be so with 2018 also looking strong. Within that context, OPEC has remained disciplined on its output agreement and the consequences have been a visible drawdown in oil inventories. About half a billion barrels of oil has been drawn down in a short period of time, which has led to the backwardated structure that we see today. The incentive to carry oil is not there and there has been a dramatic impact on the use of tankage – the velocity of the barrel is going to increase.

Sean Evers: *Did the industry miscalculate how much new storage capacity to build during the period you just outlined?*
Chris Bake: The market reacts to immediate indicators. So, as long as there are short-term reasons, it will always be justifiable to build capacity. There has also been a change in trading patterns and specifications, which have influenced the reasons behind tankage being built.

Sean Evers: *Dave, what's your outlook for the structure of the market in the year ahead?*
Dave Ernsberger: The view on backwardation depends on where you are in the barrel – fuel bunkering or middle distillates or gasoline – which means it looks a little different in coming months for different players. If you look at publicly reported inventories, they are not down as much as one might think. We are getting back to 5-year averages on inventories, but we are not at the bottom of the tank. Storage is there for purposes other than managing the structure of the forward market curve and taking advantage of profits.

There is a lot of demand that will change significantly in the coming two years on the blending side of the market. This will raise two core questions for storage. Firstly, should tank farms be optimized for crude or products and how will this be influenced by new trade flows in the market, such as new crudes coming to Asia, for example?

The second and more challenging question is whether operators should build clean or dirty tanks. The answer depends on your point of view regarding where fuel oil is going to go when the International Maritime

"If you look at publicly reported inventories, they are not down as much as one might think. We are getting back to 5-year averages, but we are not at the bottom of the tank."

Organization's 2020 ruling that all sulphur limits in bunker fuel must be 0.5%, instead of 3.5% comes into play. Are fuel oil inventories going to balloon due to insufficient coking capacity and will fuel oil have a role in the bunker pool? We could have a situation where we have a contango in fuel, but backwardation in middle distillates and a spread between fuel and gasoil. Whether there will be a fuel build or middles build will impact where to position in the next 18 months.

We also need to remember to look at the data. In Fujairah in the UAE, for example, today light distillates are 60% of inventories and fuel is 40%. But in December, it was the other way around. So, that dynamic impacts the tactical decisions that are being made.

Sean Evers: *Chris, should the different hubs – Rotterdam, Fujairah, Singapore – have the same strategies in the current cycle?*
Chris Bake: The overall impact has hit all major markets in terms of the incremental barrel of oil not making its way into the tank today. But each region also has geographic differences driven by certain conditions. For example, Singapore's recent dramatic change to tax legislation and import legislation impacts components that used to go from Southeast Asia to China for gasoline blending and conversion. Another example would be the incremental outward flows of crude oil from the US Gulf coast, which has rendered it both an importing and exporting hub. Each region has its own idiosyncrasies.

Sean Evers: *Dave, some forecasters argue that inventories will remain stable now after falling so dramatically in the last year.*
Dave Ernsberger: We forecast that stock inventories will continue to fall, but maybe not at the same pace as the last 14 months. Commercial inventory drivers are still competitive in the short-term on the products side. On the crude side, there is a growing consensus that US shale producers are being held to higher standards on their business models and return on investments in this second wave of production – and the exuberance in the run up to 2014 – may be tempered this time around.

Audience: *With supply chains and inventories moving as they are, what is the capacity utilization in the storage area now and what's it likely to be in the commercial space and by region? And how is all this impacting the shipping market, which seems oversupplied?*
Chris Bake: The percentage of utilization is very terminal specific, and it is really a fact of investment as to what tanks terminals can hold. There are also different specifications of tanks and they are not purely interchangeable for crude or gasoline blending. Tankage usage is down approximately 20% year-on-year, so there is bigger availability of tankage today. We don't see any change in the short term.

The real elephant in the room is how will the world handle the new IMO 2020 sulphur regulation? And how will marine gasoil and heavy fuel oil fare? For example, answering this question is crucial: what will be done with the surplus heavy fuel oil as more developing economies go into gas? If the IMO regulations are effective in the bunker market, then we will need an alternative to high sulphur fuel oil – and that will be gasoil. In this scenario, marine gasoil will have to rise to help meet latent 2020 demand and fuel oil will also rise due to lack of natural demand from the market. There will be an inflection point and the storage requirement will have to change as a result. This will play out over the next six months.

Shipping-wise, there are currently big dislocations in pricing and an over exuberance on trying to build superefficient or dual-purpose ships, which are not always necessarily required.

Audience: *Are floating storage units (FSU) going to disappear in this backwardated market?*
Dave Ernsberger: We can probably assume that FSUs will be removed first for scrapping. If you happen to have a flexible contract agreement with the owner, it's possible you could give back the ship. But if not, it would go to scrap.

"Focus on long-term relationships and on being a service provider that is operating storage as a commercial proposition. Safe harbor is what people are looking for."

"The ability to manipulate a barrel quickly – to blend it, upgrade it, convert it – is paramount during this backwardation period."

Chris Bake: We have seen floating storage of 28 million barrels sitting off the coast of Iran incrementally disappear, as well as Singapore fuel storage.

Sean Evers: *What advice would you give to storage hubs to prepare for the next opportunity and manage their way through this backwardation?*
Chris Bake: Responsiveness and flexibility are key to any operator. The ability to to manipulate a barrel quickly – to blend it, upgrade it, convert it – is paramount during this backwardation period. Terminal and port operators must show a huge degree of flexibility to incentivize that barrel to come onshore and enable that incremental refining margin to be achieved. They must realize that their assets will be challenged more in this environment than when the market is in a natural contango.

Audience: *How will the IMO regulation impact shipping, terminal operators and charters?*
Dave Ernsberger: Every party thinks the other is taking care of it, but the reality is there has been no agreement around the table yet. There is a lack of clarity on how to respond. One thing is clear though: tolerance for not abiding by the IMO's ruling will be very low by the likes of the United Nations', International Convention for the Prevention of Pollution from Ships (MARPOL) and other authorities. The turnaround for IMO has become acute in the last two months with talk of drones and satellite enforcement. Fines for non-compliance may not be very high, but reputational damage will be.
Chris Bake: The market needs certainty. We missed the wave of investing in putting scrubbers on ships. Now it comes down to refiners, port authorities and blenders to give clarity on enforcement and the requirements in different areas. Some players are already providing alternatives to destroying high sulphur fuel oil and to changing refinery slates as soon as everything is defined clearly. The industry can react when the conditions are there, but the message must be coherent on how to, for example, extract waivers, equal standards between ports and so on.

Audience: *Where do you see the demand and supply balance at the end of 2018?*
Chris Bake: The drawdown in inventories will stabilize in the second quarter with refinery turnarounds, assuming economic conditions stay as they are and demand and investments stay strong. But going into 2019, it will be a combination of price and economic cycles and as we are currently at the peak of this cycle, there will be vulnerabilities in market.
Dave Ernsberger: We can look at demand and supply, but we also need to factor in geopolitics. For example, if the Saudi Aramco IPO is successful, it could alter decision-making within OPEC regarding production cuts. Forecasting changes beyond 2018 is hard to do.

Sean Evers: *What would be your final piece of advice to energy hubs in 2018?*
Dave Ernsberger: Remember that storage use is not just for the short-term and to stay above the fray of tensions in the market. Focus on long-term relationships and on being a service provider that is operating storage as a commercial proposition. Safe harbor is what people are looking for.
Chris Bake: Flexibility and certainty to the extent that it is possible. IMO 2020 is going to drive the dynamics of the market for the next 18 – 24 months, so being able to cater to that is going to be paramount. ■

**Edited transcript*

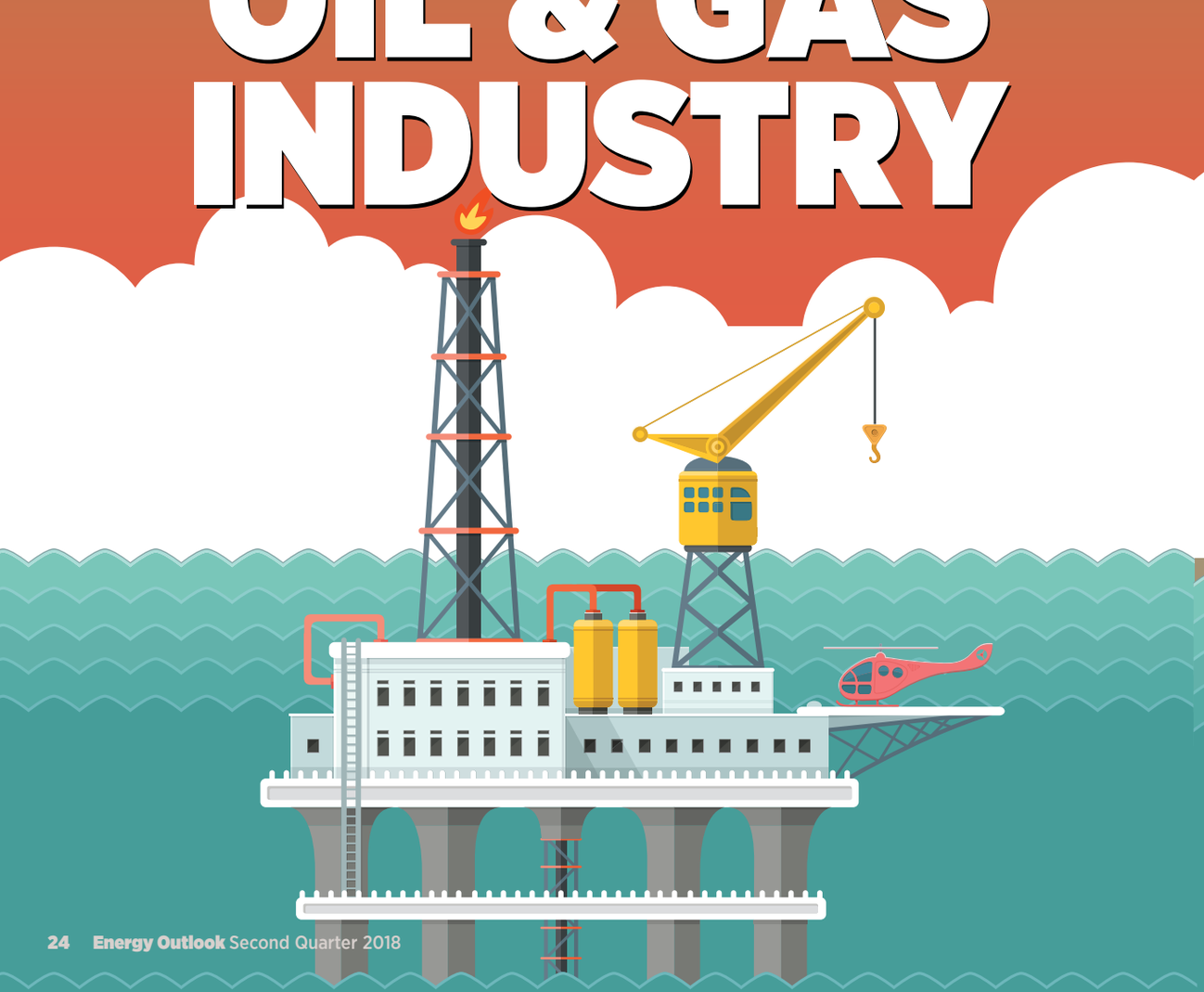
OMAN SPECIAL REPORT

A TECHNOLOGICAL REVOLUTION:

THE OIL & GAS INDUSTRY

BY DR. CAROLE NAKHLE
CEO, Crystol Energy

In the global landscape of oil and gas markets, Oman is dwarfed by its Middle Eastern neighbours. This is hardly surprising given that its proven oil and gas reserves are a tiny fraction of those of its peers. However, the country's long-standing investment-friendly policy means it has been able to deploy the latest technologies and not only reverse its oil production decline, but also reach record high production levels. Oman has also been able to tap its unconventional resources, which are trapped in some of the most complex and deepest geological formations known in the global industry.



Adverse Geology

Oman has thrived, despite lacking the geological fortune of its Gulf neighbors.

40
It took almost four decades to strike oil in the sultanate.

1956
The first exploration license was granted in the early 1920s, but oil was not discovered until 1956.

22nd
Oman's proven oil reserves rank 22nd in the world, which is the equivalent to 2% of Saudi Arabia's reserves.

26th
Oman's proven gas reserves rank 26th worldwide, which is equivalent to 3% of Qatar's reserves.

ENHANCED OIL RECOVERY

Oman has recovered its oil production trajectory to exceed all expectations in recent years – an impressive turnaround. The government's welcoming attitude to both domestic and foreign investors has encouraged the application of the latest technologies, especially when it comes to squeezing more oil out of older fields.

Subsequently, Oman has been a global leader in the application of enhanced oil recovery (EOR) technologies. Typically, production from a conventional oil field first increases rapidly but then, as the natural pressure inside the reservoir gradually drops, less and less oil can be extracted. In the end, a significant fraction of the original oil is left in place. Although the figures vary from one region to another, the average recovery factor is between 20-40%. This means that between 60-80% of the oil in a reservoir is left stranded.

To delay and decelerate the imminent production decline and squeeze more oil out of a reservoir, companies invest in EOR. This can improve the recovery factor by up to 60%, i.e., in some cases, 60% of oil can be recovered. This significantly boosts overall production. EOR involves different techniques, including the use of gas, chemicals and steam to improve the flow of oil in a reservoir and facilitate extraction.

Petroleum Development Oman (PDO), a joint venture majority-owned by the government of Oman (60%), the Shell Group (34%), Total (4%), and Partex (2%), is the only enterprise in the region that is simultaneously carrying out full-field projects using each of the three EOR methods. PDO accounts for around 70% of the country's crude oil production and nearly all its natural gas supply. By 2025, EOR is expected to account for approximately 25% of PDO's oil production.

One of PDO's oil fields, the Qarn Alam, is the world's first full-field steam injection EOR project and the largest of its kind. According to the engineering firm Mott Macdonald, after almost 40 years in operation, only 4% of oil in the Qarn Alam field had been recovered using conventional methods. The application of the steam injection technique is expected to increase its oil production 25-fold over the next 30 years.

40%
The average recovery factor from an oil reservoir is a maximum of 40%. Therefore, most of the oil (60%-80%) is not used.

60%
EOR can improve the recovery factor by up to 60%, i.e. 60% of oil can be recovered in some cases.

2025
EOR is expected to account for approximately 25% of PDO's oil production within the decade.

1st
One of PDO's oil fields, the Qarn Alam, is the world's first full-field steam injection EOR project and the largest of its kind.

X25
Engineering firm Mott Macdonald said that, after almost 40 years in operation, only 4% of oil in the Qarn Alam field has been recovered using conventional methods. Using steam injections could boost its oil production by 25x over the next 30 years.

2015
PDO partnered with US firm GlassPoint in 2015 to build Miraah, a 1,021 megawatt (MW) solar thermal energy facility at the Amal field. Miraah is the Middle East's first solar EOR and the world's largest solar project in terms of peak energy production.

GAS AND OIL PRODUCTION

According to the US Energy Information Administration (EIA), Oman's oil production increased each year from approximately 716,000 b/d in 2007 to reach a new peak in 2016 of 1.01m b/d. This 36% increase made the sultanate the 20th largest oil producer in the world. Production could have been sustained at this level, but Oman, currently the largest non-OPEC producer in the Middle East, pledged to cut its oil output by 45,000 b/d as part of the OPEC+ deal in December 2016. The deal brought together the biggest alliance of OPEC and non-OPEC producers in the history of the oil market.

Gas production has also been on the rise, particularly since the early 2000s. Oman is now the world's 24th largest natural gas producer and the 10th largest LNG exporter, with 88% of its gas exports going to the Asia Pacific region.

Natural gas is Oman's main source of primary energy, providing 63% of final consumption. The remaining 37% of consumption comes from oil. Domestic gas demand has been growing rapidly. Between 2000 and 2015, it increased by a staggering 213%. Oman is a net exporter of gas, but it imports around 2.1 bcm yearly through its only international gas pipeline – the Dolphin – which runs from Qatar to Oman via the UAE. This supply may not suffice for future needs.

In 2000, Oman joined the club of LNG exporters. Fifteen years later, Oman Liquefied Natural Gas (Oman LNG), owned by a consortium including the government, Shell and Total, which operates all LNG facilities in the country, announced that it would end exports and divert its entire output to domestic consumption by 2024. Since oil and gas are the backbone of the Omani economy, as in other Gulf states, such a scenario would have serious implications for the local economy if no alternative revenue sources are developed.

If Oman is to maintain its gas exports, it must curb local demand and increase supply. Applying alternative EOR techniques, such as solar, will help. Another promising potential source of supply is the country's unconventional gas resources.

213%
Oman's domestic gas demand has soared; it climbed by a staggering 213% between 2000 and 2015.

36%
Oman's oil production increased each year from approximately 716,000 b/d in 2007 to a record high of 1.01m b/d in 2016. This 36% increase made the sultanate the 20th largest oil producer in the world.

45,000 b/d
Oman, the largest non-OPEC producer in the Middle East, pledged to cut its oil output by 45,000 b/d as part of the deal between OPEC and non-OPEC members in December 2016. The deal marked the biggest such alliance in the history of the oil market.

1st
Oman is the first Middle Eastern country to join the very small club of unconventional oil and gas producers, currently led by the US. Production started at Oman's $16 billion Khazzan tight gas field last September and involved the largest-scale use of US-style fracking technology seen to date in the Middle East.

SOLAR FACTOR

Although renewable energy has yet to make its way into Oman's primary energy consumption, it is being used in EOR. In 2015, PDO partnered with US firm GlassPoint to build Miraah, a 1,021 megawatt (MW) solar thermal energy facility at the Amal field. Miraah is the Middle East's first solar EOR and the world's largest solar project in terms of peak energy production. The project harnesses solar rays to produce steam, which in turn is used to improve the recovery factor from the Amal field. According to PDO, this landmark project points to the existence of a massive market for deploying solar in the oil and gas industry. The technology offers an alternative to burning natural gas for EOR, which currently accounts for nearly 20% of Oman's total gas use. By switching to solar, Oman can find a more lucrative use for its gas, such as meeting its rapidly growing local demand or/and expanding its liquefied natural gas (LNG) trade. Once complete, the Miraah project is expected to save 0.16 billion cubic meters (bcm) of natural gas each year – the amount of gas that could be used to provide electricity to nearly 5% of the sultanate's population.

US IMPACT

Oman recently became the first Middle Eastern country to join the very small club of unconventional oil and gas producers, currently led by the US.

In September 2017, production started at its $16 billion Khazzan tight gas field, involving the largest-scale use of US-style fracking technology seen to date in the Middle East. Like shale, tight gas is difficult to access due to the nature of the rock, making hydraulic fracking and horizontal drilling necessary to extract it. A combination of these ushered in the shale revolution in North America.

The Khazzan reservoir in Block 61 represents one of the Middle East's largest unconventional tight gas accumulations. According to BP, which operates it as a holder of 60% interest (the rest belongs to Oman Oil Company Exploration and Production), plateau production is expected to reach 42 mcm/d. This is the equivalent of a third of Oman's total domestic gas production.

But the Khazzan project is not for the fainthearted. BP notes that the reservoir's gas deposits lie at depths of up to five kilometers in narrow bands of extremely hard, dense rock. Specialized drilling equipment is necessary to access it. The company conducted the world's largest onshore seismic survey, covering the 2,800-square-kilometre block area, to understand where the gas is.

PDO is also investing in its first tight gas project – the Khulud field. It is one of the deepest tight gas accumulations in the world and requires capital-intensive, innovative and complex techniques to exploit. More unconventional projects should come on stream as Omanis master the technology.

THE RIGHT ATTITUDE

As the US shale experience demonstrates, a friendly regulatory environment is needed to encourage investment in unconventional technology. Although Oman could benefit from further reductions in red tape, compared with the rest of the region, the sultanate has honored a tradition of welcoming and supporting international investment.

According to the EIA, contract terms for international oil companies in Oman are more favorable than in other countries in the region; some allow significant equity stakes in the projects, for example. In 2013, the government amended the Khazzan contract to make the investment proposition more attractive for the foreign partner. The revised contract included a higher gas price and a reduction in the government's share of profit gas from 70% to 55%. Such an attitude has helped Oman compensate for its smaller oil and gas reserves, complex geology and higher exploitation costs. This highlights the importance of above-ground factors in hydrocarbon investments.

> **"Although Oman could benefit from further reductions in red tape, compared with the rest of the region, the sultanate has honored a tradition of welcoming and supporting international investment."**

**A version of this article appeared in Geopolitical Intelligence Services on Nov. 15, 2017.*

Oman Factbox

- *Since July 23, 1970, Oman has been ruled by Sultan Qaboos bin Said al Said.*
- *The state-owned Oman Oil Company (OOC) is responsible for energy investments both inside and outside Oman.*
- *Petroleum Development Oman (PDO) holds drilling rights to around 40% of the country's land area and produces over 75% of Oman's hydrocarbons from over 100 fields.*
- *In 2016, oil revenues accounted for 27% of Oman's GDP. The country's Vision 2020 development plan calls for reducing that share to 9% of GDP by the end of this decade.*

Energy Innovation Must Be Second Nature

BY STEVEN MOERMAN
Project Manager Energy Transition, Shell Development Oman

An unprecedented transition is underway; the world is shifting from an energy portfolio underpinned by oil, gas and coal to one based on a lower-carbon energy mix. Innovation is driving this shift, including novel technological, regulatory and social tools and thinking.

According to the Abu Dhabi-based International Renewable Energy Agency (IRENA), growth in renewable energy could deliver 24.4 million jobs worldwide between now and 2030. Both private and public organizations need to implement incentives and demonstrate a clear direction of purpose to foster an innovative energy transition culture. This will be vital to securing a pipeline of workers with the right skills; those who will form the backbone of this energy revolution.

24.4m

Growth in renewable energy could deliver 24.4 million jobs worldwide between now and 2030.

The traditional oil and gas sector is reputed to have a relatively fixed mindset and low risk appetite when it comes to disruptive change, but that is changing. Both international oil companies (IOCs) and national oil companies (NOCs) need to keep nurturing in-house cultures that embrace a low-carbon development model. This may bring real near-term costs higher, incurred by intensive training or the acquisition of newly skilled personnel, for example. But it is crucial to maintain a long-term view of the tangible benefits. Some companies have already started to rebrand themselves to attract and acquire this new generation of talent.

In the GCC, energy efficiency among the public could be encouraged by devising financial incentives, such as discounted fees for energy efficient households and for those who use electric vehicles (EV). The level of awareness can be further supported by education – starting small in schools and moving into college education – by teaching youth to become resourceful and to embrace clean energy and efficiency. Deploying messages via social media is a very effective tool to reach generations Y and Z.

Governments need to direct policies and regulations to be more supportive of the private sector. They could set up a dedicated authority to encourage investment, or designate brand ambassadors and 'champions' to promote awareness programs and work on behalf of the energy ministry with corporates. Easing bureaucracy and regulations on financing, particularly for small and medium-sized enterprises (SMEs) that are promoting clean energy or efficiency would be beneficial to economic growth.

Today's regulatory procedures are often cumbersome and an impediment to change, preventing incentives from materializing. Alignment among governments' institutional bodies on the main goals to achieve energy efficiency is generally lagging in the region. Government departments and businesses need to embrace a 'change culture', which encompasses making procedures and processes more flexible. This will allow the energy transition to transpire more easily.

When we talk about energy transition, most people think about the power sector, particularly renewable energy and solar energy. Other sectors, such as transport and heavy industry, are much harder to decarbonize fully. Therefore, full energy transition will take decades and will require continued collaboration and innovation among policy makers, business leaders, non-governmental organizations (NGOs) and consumers. ■

> **"Opportunity lies in using the energy transition to create new employment opportunities, reduce the physical impact of the energy system and maximize the contribution to the diversification of the economy."**

2016

Energy innovation is integral to enabling producers to both satisfy rising demand and meet the commitments their governments made when the Paris Agreement, the world's most comprehensive climate-related deal, was established in 2016.

Oman's Outlook

Energy transition presents a challenge as well as an opportunity for Oman. The challenge is to keep meeting the increased energy demand from a growing population and economy while living up to the commitments of the Paris Agreement. The opportunity lies in using the energy transition to create new employment opportunities, reduce the physical impact of the energy system and maximize the contribution to the diversification of the economy.

There are two dominant themes for energy transition in Oman. The first one is around the adoption of renewable power in the energy mix. Sun and wind are two of the country's major resources; both have been largely untapped until today. Several initiatives are gaining ground. Shell has initiated a program that includes an investment in solar PV panels for 22 schools and the company educates the children on the importance of renewable energy. Efforts extend to training and contracting local SMEs to do insulation works. The Oman Power and Water Procurement Company (OPWP) and Petroleum Development Oman (PDO) have also announced tenders for large scale solar farms.

Energy efficiency is the other key element of energy transition in Oman. Proven technology is available to significantly reduce energy demand while maintaining or even improving living standards. Yet little progress seems to have been made on a national scale. Using significantly fewer resources to keep the population and the economy energized is within reach and would make gas available for the government to monetize in a different way. Plus, it would reduce the fiscal impact of subsidies and represents a significant opportunity for the employment of local talent.

Oil Worker of the Future: *A NEW TYPE OF CV?*

BY JAMAL AL HABSI
Omanization and In-Country Value (ICV) Team Leader, Occidental Oman

Industry and Academia in Oman need to become better aligned to enhance vocational education and meet future labor market requirements. Currently, vocational education is viewed as an alternative educational pathway. Instead, it should be viewed as a complementary style of learning that can work hand-in-hand with traditional education. Rebranding the image of vocational education and enhancing the current mindset around its reputation in Oman needs improvement. Society needs to move away from the commonly held view that vocational education is not up to par or not as prestigious as a university degree. Industry, Academia, and Government need to work together to encourage the younger generation with incentives. Improving accreditation and standards for vocational education through new legislation in Oman would be a pathway to further credibility. Young professionals need to be assured that their training is transferable and fully accredited. It is crucial that individuals are recognized both in-country and internationally.

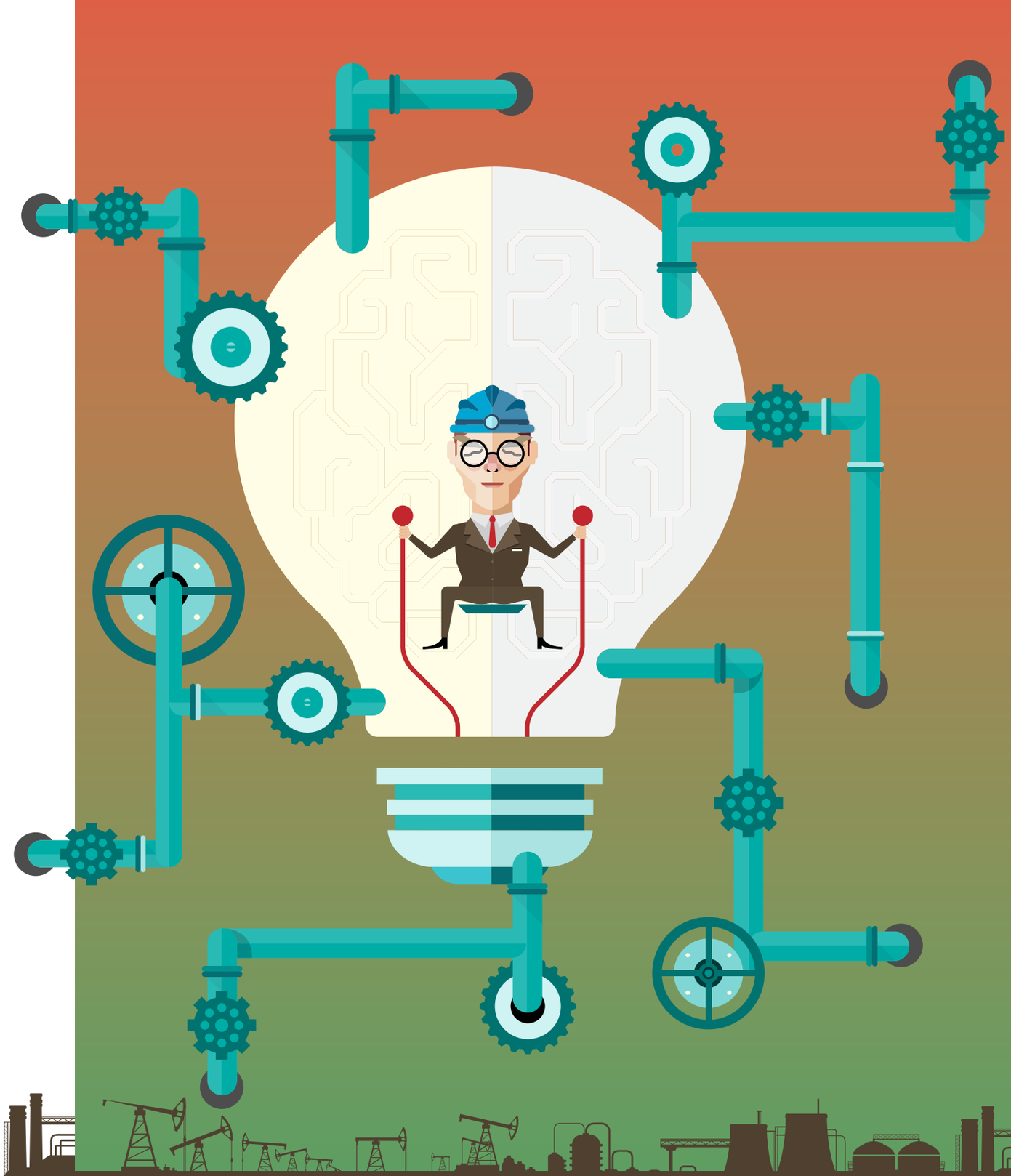
One of the top recommendations harvested from the 2017 Oman Energy Forum was that Industry should work with Academia throughout the entire period of a student's university career to develop vocational qualifications. Having a structured framework and learning process to guide students as they go from university or college into the workplace will resolve at least some of the challenges in meeting Oman's future labor requirements. Vocational qualifications can be established from entry university level through to PhD level. An example of a vocational PhD would be a medical doctor who gains hands on experience while completing a theoretical degree.

Internships and apprenticeships are the bedrock of skills training. They encompass all three stages of learning: watching, participating and doing. The culture and environment surrounding apprenticeships or internships in Oman needs to be greatly enhanced.

Applied skills in technology and real-world learning will be particularly crucial in today's 4th Industrial Revolution and would allow for diverse skills and knowledge and provide the required tool kit for future success. The new world of technology is a key pillar in creating entrepreneurs, self-employment and contributes to the growth of the small and medium-sized enterprises (SMEs). This is a critical factor in the growth trajectory of developing economies.

Given the rapidly changing environment brought on by digital disruption, energy stakeholders should strive to work with technology companies to ensure that standards and accreditation in technical education are always improving and up to date. By establishing this closer collaboration, they can learn better and faster about how technological infrastructure is developing and introduce that into current and future vocational standards and frameworks.

The rapid rate of technological advancement renders what we learn today obsolete in a very short period of time. So, learning and re-learning continuously has to become an important skill that is cemented into society. Popular estimates show that 65% of children entering school today will graduate to work in jobs that do not yet exist. The education system can only go so far and energy stakeholders have to understand this. Organizations need to actively direct their staff on how to transfer knowledge and teach their employees to be efficient learners. ■



CASE STUDY

The Occidental Oman STUDENT AWARDS for the Advancement of Post-Graduate Education

Occidental of Oman Inc.
أوكسيدنتال عمان انكربوريتد

VISION AND IMPACT

The vision of the Occidental Oman Student Awards for the advancement of post-graduate education is to enhance the prestige and attitudes toward research-focused education as a major component to building knowledge capacity and talent. Both are required to deliver an innovative R&D ecosystem in Oman.

The Occidental Oman Student Awards recognize and celebrate the country's future industry and academic leaders who will contribute to building the sultanate's R&D hub. This Pioneering Award recognizes role models and establishes the award winners as ambassadors for the Advancement of Post-Graduate Education in Oman.

As the project gains visibility and legitimacy, so does the significant role of post-graduate education in the development of a knowledge economy.

CASE STUDY

CAMPAIGN OVERVIEW

The Student Awards for the Advancement of Post-Graduate Education recognize, celebrate and strategically position future industry and academic leaders. They will contribute to Oman's national R&D ecosystem and transition to role models for the next generation of innovators.

IMPACT

A Holistic Approach

1 UNDERGRADUATE STUDENTS

Provide undergraduate students with a better understanding of available educational programs, career options, and guidance on continuing education.

2 STUDENT SEMINARS

Student Seminars enhance the dialogue between students, academic institutions and industry to ensure students have a better understanding of pursuing post-graduate studies and what career opportunities are available following a post-graduate degree.

3 STUDENT AWARDS

The Occidental Oman Student Awards Ceremony takes place in front of 200+ high level government, academia, and industry executives.

4 THOUGHT LEADERS

Ahmed Al Hatrooshi, PhD Student, University of Newcastle and Winner of the 2017 OXY Oman Student Awards

Will deliver a TEDx – Next Generation speech on *The Future of Work and the Work of the Future by Someone Who Will be There* at the Oman Energy Forum 2018.

5 INDUSTRY, ACADEMIA, GOVERNMENT LEADERS

Dr. Omar Said Al -Abri, Winner of the 2016 OXY Oman Student Awards

On behalf of The Research Council, he is leading the development of the sultanate's ePlatform, which will host the resources and objectives of the Oman Energy Industry-Academia R&D Protocol.

6 INFLUENCERS & ROLE MODELS FOR NEXT GENERATION

Dr. Lamya Adnan Al-Haj, Winner of the 2016 OXY Oman Student Awards

International Public Speaker & Lecturer at Sultan Qaboos University (SQU) on Female Empowerment through research.

CASE STUDY

The Occidental Oman STUDENT AWARDS

for the Advancement of Post-Graduate Education

Occidental Oman and Gulf Intelligence have teamed up to award Omani and Oman-based postgraduates who have demonstrated outstanding achievements in the field of energy. Award nominations are evaluated by a proficient Selection Committee that selects 4 winners – 2 Masters and 2 PhD postgraduates. The primary aim of the Awards is to recognize extraordinary individuals and future thought leaders who are instrumental to achieving the sultanate's goal to create an innovative research and development (R&D) ecosystem, as per the National Vision 2020.

Awards Criteria

Criteria for Nominees for the PhD Award:

- Omani National, or Oman-based and Oman-educated for a period of 10 consecutive years.
- Near completion of PhD, or a recent PhD graduate in an energy-related field. Degree must have been completed within the last two years.
- Demonstrates potential to be a future thought leader in the energy industry in Oman.
- PhD dissertation should be relevant to Oman.
- Extra weight given to PHD studies that directly impact the advancement of local industry.
- Demonstrates the intention of working in Oman.

Criteria for Nominees for the Masters Award:

- Omani National, or Oman-based and Oman-educated for a period of 10 consecutive years.
- Near completion of Masters, or a recent Masters graduate in an energy-related field. Degree must have been completed within the last two years.
- Demonstrates potential to be a future thought leader in the energy industry in Oman.
- Current, or planned involvement in energy-related research in Oman.
- Demonstrates the intention of working in Oman.
- Extra weight will be given to those with intent to pursue a PhD.
- Exemplary Undergraduate and Graduate grades.

Occidental of Oman Inc.
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About the Selection Committee

A Selection Committee of international standing with distinguished individuals from Government, Academia and Industry determine the nomination criteria, requirements, and score the nominee profiles.

Selection Review Committee 2017

Mohammed Al Asimi
Subsurface Development Manager
Occidental of Oman

Dr. Nader Mosavat
Program Director
Engineering and Technology
Muscat University

Dr.Ing. Najah Al Mhanna
Head of the Department of Engineering
GUTech

Professor Martin Blunt
Chair of Petroleum Engineering
Imperial College London

Saif Al-Bahry
Director Oil and Gas Research Center
Sultan Qaboos University

Selection Review Committee 2016

Dr. Rahma Al-Mahrouqi
Deputy Vice-Chancellor
of Postgraduate Studies and Research
Sultan Qaboos University

Dr. Michael Georg Modigell
Rector
GUTech

Dr. Abdullah Al-Abri
Technical Lead
Petroleum Development Oman

Dr. Khalil Al Riyami
Vice President of Exploration
Occidental of Oman

Award Winners and Future Ambassadors of Post-Graduate Education

PhD – 2017


Dr. Khalid Al-Hinai


Ahmed Al Hatrooshi

Masters – 2017


Hajir Al Farsi


Abdullah Salim Al-Shereiqi

PhD – 2016


Omar Said Al-Abri


Lamya Adnan Al-Haj

Masters – 2016


Mahir Mansour Al-Wahaibi


Mohammed Salim Al-Shuaili

Student Seminars

The Occidental Oman Student Seminars aim to promote post-graduate education with Omani undergraduates. The topics addressed will include: the advantages of pursuing post-graduate education and how to close the gap between Industry and Academia on R&D.

Winners Transition to Thought Leaders Through High Level Engagements

Digital Field Services: A NEW DAWN

Digitalization is enabling new business models that will drastically change how traditional services are delivered in the oil and gas industry over the next five to 10 years.

In a not so distant future, analytics, machine learning and unique algorithms will be connected to intrinsically safe sensors, mobility devices, wearables, autonomous vehicles and field equipment. This will enable equipment manufacturers and system integrators to provide a managed service rather than selling individual point solutions. The Oil Field Service (OFS) industry will greatly benefit as they will increase revenues but will be able to provide operational solutions at a lower cost through economies of scale. This means multiple clients can be served at lower operating costs, while achieving greater agility.

One example of a new oil field service offering is Diamond Offshore Drilling's announcement in February 2016 of a 10-year agreement for US$210 million to transfer full accountability for blowout preventor performance to GE Oil & Gas. Under the contract, GE Oil & Gas will provide on-rig personnel, management of parts, overhaul and repair, continuous certification, data monitoring, and management of change. This arrangement leverages the scale of GE data, predictive analytics, insights and continuous certification. It positions GE as a long-term partner, while simplifying operations for Diamond Offshore.

In one scenario, an oilfield service company could become an operator and position themselves to operate fields similar to what integrated oil companies (IOCs) are doing. National oil companies (NOCs) should prepare themselves for this and look to harvest and harness their knowledge, so that their digital brains put them at the forefront. This will enable them to leverage new offerings coming to market.

To leverage this, companies will need to update their organizations with appropriate IT architectures that can support remote operational services by third parties. The architecture for remote operations has traditionally been designed to support functional work silos that are performed on-site. However, as digitalization in the industry progresses, digital field services will become more and more extensive and complete. New designs will be constructed around real time centers that will evolve and act as the "brain" of the asset organization. This will enable remote support of offshore or remote field operations. This often involves real-time integration with joint venture partners, oil field service companies. The same architecture designs can be leveraged to include digital oilfield services.

Another area in need of a strong strategic IT underpinning is field work, along with reservoir and production monitoring and management. Until recently, responsibility for monitoring, coordinating and controlling the plethora of digital field instruments, equipment and applications that acquire and display data (such as pressure, temperature, flow rate, water cut) was typically scattered across multiple organizations. Currently, there is no comprehensive governance model for addressing all aspects of reservoir and production monitoring and management systems. As more-comprehensive digital field services evolve, solutions are coming into reach. But organizations will need to develop architecture and governance strategies to ensure their smooth integration into wider, coordinated oil field service providers.

When outsourcing digital field services, oil companies as end users will leave it to the supplier to deliver an agreed-upon output. How it is done is up to the supplier, leaving the oil company to concentrate on its own agenda. Nonetheless, it will be essential to any successful relationship that there is a clearly defined agreement as to the desired outcomes at the outset and that both companies have a clear understanding of the roles of each party.

As third parties take over management of equipment, it is anticipated that their services may even extend into production monitoring and management to include outsourcing the monitoring and/or management of equipment and production processes. Part of that process will include the development of algorithms that provide the "intelligence" to get the most out of the connections and interplay between people, things, processes and information. As such, algorithmic business transformation begin to emerge and algorithms become more essential to the business than the data alone.

For example, drilling services company Ensign Energy Services, working with a major oil company, has converted an idle drilling platform into an experimental drilling testbed to develop advanced technologies. This includes algorithms, which could potentially lead to totally automated drilling stations. Once the algorithm is proven effective and reliable, the company can outsource autonomous drilling services or the algorithms themselves to other companies. Clearly, such algorithms can be extraordinarily valuable.

With its applications gaining a foothold in the industry, oil and gas companies will generate and provide vast amounts of rich data to service providers, who will do the analytics. What companies do with that data — and how they turn it into proprietary algorithms — will determine how well they maximize the opportunity presented by digital business. ●

DIGITAL ENERGY STRATEGIC SERVICES

TWO ENERGY WORLDS

The energy landscape has shifted. Changing customer behavior, new technology, and increasingly global markets are creating two distinct energy worlds.

The classic energy world has the indispensable task of ensuring supply security. Alongside it is emerging the new world of distributed energy solutions. Uniper's portfolio will combine large-scale power generation and the effective management of global and regional energy supply chains. E.ON will focus on the new energy world with renewables, distribution networks, and customer solutions. Both worlds require distinctive business models and capabilities. Both worlds present challenges and opportunities. Both worlds are needed to meet the world's energy needs in the decades ahead.

A strong energy company

Uniper has the right assets, knowledge, and skills to succeed in the classic energy world. We have a deep understanding of global and regional energy markets, regulatory regimes, and market designs. We have a wide range of capabilities in the construction, management, and operation of large-scale energy assets as well as the optimization and risk management of assets and contracts. And we have long-standing relationships with industrial customers, municipal utilities, system operators, and our suppliers. These strengths and networks reinforce one another.

Why Uniper?

We're well positioned to play a key role in ensuring supply security. We have:

- a broad geographic footprint with positions in Europe's main generation markets and in Russia
- comprehensive capabilities in the operation and management of individual generation assets and optimization of generation fleets
- profound technical knowledge gained in the development and use of energy technologies
- the market access of a proven trading and optimization platform at Europe's key trading points and on global markets along with a significant position in the midstream gas business
- a detailed picture of the interrelationships between market participants, technologies, and energy systems
- deep expertise in regulatory regimes and market designs

There are three main areas in which we deploy our strengths:

• We help ensure security of supply in Europe as it transitions to a low-carbon future

The growth of intermittent renewable generation increases the need for flexible power plants that can meet fluctuating demand at short notice; our generation portfolio is well suited to this task. In addition, our midstream gas business helps ensure supply security through a diverse portfolio of long-term gas contracts along with gas storage, transport, and regasification capacity.

• Our trading activities connect global commodity markets

Global trading in commodities like natural gas and coal is bringing energy markets from America to Asia closer together. As markets become more interconnected and dynamic, they create more opportunities for companies that can build bridges between regional markets, respond swiftly to changes in supply and demand, and use their knowledge of supply chains to better manage commodity risk. Uniper has a flexible portfolio of long-term gas import contracts, coal, and LNG. This portfolio not only enables us to meet our own fuel needs but also to provide our customers with bespoke products and services.

• We support the development of power markets outside Europe with our own generation activities and our services for third parties

Uniper has a significant platform of technologically advanced generation assets across Europe and in Russia. As the demand for dispatchable generation capacities is growing in a number of markets, we're well positioned to market our capabilities in building and operating assets and in supplying fuel to third parties.

From gas fields and power stations to customers: Uniper helps keep energy reliable

We offer a broad range of energy products, services, and solutions. Our business portfolio encompasses most of the stages of the energy value chain. We have a stake in a gas production business in Russia and procure climate-friendly natural gas under long-term supply contracts and at trading venues. With LNG becoming a more prevalent source of gas, we're active in sourcing, transport, and regasification. In addition, our hydro, coal and gas power stations play an important role on the upstream end of the electricity value chain.

John Roper, Managing Director, Head of Middle East Uniper Global Commodities SE
E: John.Roper@uniper.energy