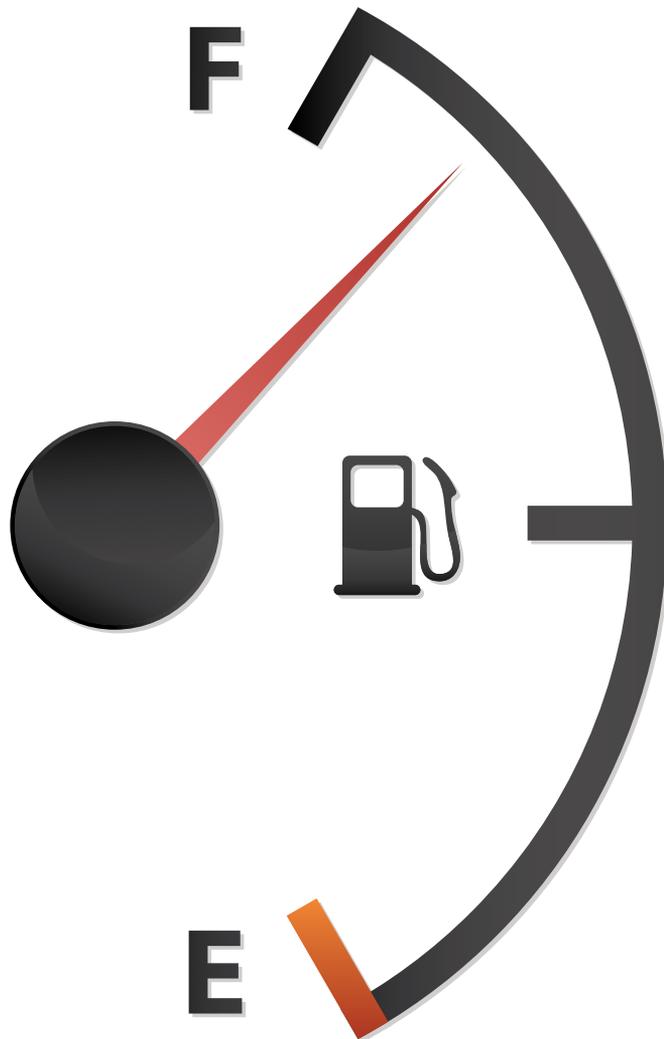


Second Quarter 2015

Energy Outlook



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Time of Market Volatility, Time for Strategic Decisions

FROM steep decline to partial rebound, global oil market volatility remains at a multi-year high amid a mixed outlook for crude supplies and demand. On the supply side, there are those analysts who think the market will remain oversupplied through at least the first half of 2015 despite today's fragile geopolitical environment, while falling global rig counts and reduced exploration budgets at oil firms suggest to others that the glut may be overcome faster.

On the demand side, the picture remains equally mixed. China is slowing down, Russia heading for recession, Japan heading nowhere, and the eurozone continuing to display signs of severe weakness. The picture is somewhat brightened by growth prospects in the U.S., whose economy is now due to grow faster than previously expected at 3.6 percent this year, according to the International Monetary Fund. But even with the sharp oil price decline, which represents a net positive for global growth, the world's economic outlook remains subdued.

It is at times like this that strategic decisions are being made. Gulf OPEC producers have done so by slashing oil prices to Asia and boosting export volumes at the same time in a bid to defend critical market share. It

is probably a wise move. For, as we all know, the global energy system's centre of gravity continues to shift towards Asia even as economic growth in parts of the region is slowing and world oil markets face a supply glut due to rising shale output in the U.S. Today, Asia is the only major oil consuming region in which Gulf states dominate supplies – Gulf OPEC producers don't want to risk giving this up at a time of intensifying competition.

Strategic decisions will also have to be made on an operational level. With oil prices in the \$50s-a-barrel space, there is an ever-greater need to enhance efficiencies and optimize operations. Rapid advancements in and widespread application of new technologies such as big data and analytics means companies are starting to capture these opportunities on an increasing scale, also in the Middle East. But with the increased interconnectedness of oil and gas infrastructure also come concerns over cyber security, which has become a clear and imminent danger, and threatens critical energy infrastructure all over the world. Strategic decisions and investments will have to be made on all these fronts.

Sean Evers
Managing Partner, Gulf Intelligence



Q&A: UAE Energy Industry Outlook 2020

**His Excellency Suhail Mohammed Al Mazrouei,
Minister of Energy, UAE**

Moderator: Dyala Sabbagh, Partner, Gulf Intelligence

DYALA SABBAGH (DS): It's my delight and pleasure to welcome His Excellency Suhail Mazrouei, the Minister of Energy of the UAE and Chairman of Mubadala, to join me for the forum feature interview. Thank you very much, Your Excellency.

I suppose a good place to start would be the oil price. And I'd like to put the question to you as to what the next steps for the UAE or OPEC would be on this. We certainly witnessed a rather relaxed reaction to the oil price decline in a sense that OPEC didn't act in November to cut production. Recent comments have indicated that it's quite comfortable to see it drop a little further. What would you say to that?

HE SUHAIL MOHAMMED AL MAZROUEI:

I don't think it's the fact that we are happy about the price or the fact that we don't want to do anything about it. It's just we are not alone in this market. OPEC has other partners producing oil. OPEC tried to be realistic about its goals and we left enough room for others to bring capacity. But we cannot continue protecting a certain price. That is not the only aim of OPEC. OPEC countries are sensible producers [but] I'm not the OPEC spokesman. I would like to talk about the United Arab Emirates. We are concerned about the balance of the market but we cannot under any circumstances be the only party that is responsible to balance the market. We have seen the oversupply coming from primarily shale oil and that needed to be corrected. I think if you ask any economist, anyone who is sensible, he'll tell you that the decision is strategic and it's rational for OPEC.

DS: Do you see this action that OPEC has taken so far continue as a strategy and have an impact beyond this year?

HE SUHAIL MOHAMMED AL MAZROUEI:

The strategy will not change in my view. What's going to happen by not panicking and readjusting or cutting the output from the OPEC countries, we are telling the market—and the other producers—that they need to be rational; they need to be like OPEC. They need to look at the growth in the international oil market and they need to cater for their additional production for that growth. It applies to any market. Unless that's there, the market isn't going to be balanced. Even if someone cuts production, it will happen again. And if the decision had been to cut output – cut it to what extent? By a million [barrels a day], a million and a half? We all know that in a few months

production is going to be produced from shale oil and we would have the problem again. What are we going to do? Are we going to cut again and again? It cannot be done and it cannot be viewed as fair either.

DS: Do you share the view that we may see a period of sustained volatility as opposed to high prices or low prices in the coming two to five-year period?

HE SUHAIL MOHAMMED AL MAZROUEI:

I think we are passing through a very interesting time. And history tells us that whenever we try to predict what's gonna happen, we will get it wrong. So what I would say is that it's unlikely that we will see a sudden rise. It will take some time. Is it going to be a year or is it going to be a couple of years? I think that will all depend on what we see in this quarter and the next quarter. The first half of 2015 will give us more data to predict what's going to happen in 2016. I think the current prices are not sustainable, not for us, but for the other producers. Shale oil from the U.S. alone is at almost 4 million [b/d] and the hope is to grow this by another 4 million by 2020. That cannot be sustained, produced or invested in at current oil prices.

DS: How is investment in production in the UAE being impacted at this particular oil price range, if we assume it's going to remain under \$50? Your plans are going to continue regardless of the oil price?

HE SUHAIL MOHAMMED AL MAZROUEI:

Yes, because most of these projects are already committed and they are already under construction. Some of them have been completed or will be completed soon; and some

“What's going to happen by not panicking and readjusting or cutting the output from the OPEC countries, we are telling the market—and the other producers—that they need to be rational; they need to be like OPEC.”



of them are in the pipeline. We cannot, as a responsible oil producer and a reliable supplier in the market, just stop our plans every time there is volatility in the market. This is not wise and it is not the plan. For us in the UAE, we aspire to keep our role as a reliable supplier. We will continue investing. We passed through more difficult times.

DS: If I could just take your point about the UAE's long-term plans to continue to increase capacity, some of the fields that the UAE is trying to enhance, older fields that have almost reached optimum capacity, you're trying to enhance and get more out of. Is there any concern within the industry here that there's any risk to asset integrity while you're trying to enhance some of these very challenging oil fields and trying to increase capacity there?

HE SUHAIL MOHAMMED AL MAZROUEI:

No. Asset integrity is one of the top priorities for us. The safety of the people and the safety of the environment are taken very seriously in our industry. We are not going to act irrationally because of the drop in the oil prices. We still have one of the lowest production cost per barrel and we have a very high level of efficiency. What's going to happen, and we will need the service companies and the contractors to understand the cycle, I think is that it's an opportunity to optimize and reduce cost in EPC [engineering, production and construction] and for projects to come. This will happen not only in the UAE but I think it will happen across. That doesn't mean necessarily cutting on maintenance or cutting on the integrity of the plants.

DS: The region as a whole must become better at controlling consumption, at becoming more efficient. Where do you think the country stands now with a view to taking further steps on, for example, reducing energy subsidies so as to achieve this ultimate aim of becoming more efficient and wasting less?

HE SUHAIL MOHAMMED AL MAZROUEI:

First of all, we are working very hard on improving the efficiency of the [power] plants, distribution and trying to switch off any single-cycle power generation – trying to be more efficient in using the energy we have. Demand side management initiatives include talking to the customers and now we start going to houses, changing or retrofitting. Of course, we cannot do it for all, but we are trying to give examples and help people to become efficient by installing and changing a few things inside their houses. The regulations are also improving and are getting more stringent, year after year, through the implementation of new building standards and strict rules on importing devices that are not or do not achieve certain limits of energy efficiency.

DS: Do you think that it's necessary to have regional cooperation on this particular topic? The UAE is taking very serious action on this, is that going to work if its neighbors aren't doing the same?

HE SUHAIL MOHAMMED AL MAZROUEI:

We are trying also to work on laws. You are talking about primarily gasoline, right?

DS: Yes, for example.

HE SUHAIL MOHAMMED AL MAZROUEI: I think we have a model to be followed on diesel. We freed diesel in the market and it went very well. Others are envying us of achieving this and they are now trying to do the same. We have seen initiatives in Kuwait. I know Saudi Arabia is working on something, and others. I think it's just a matter of time. People have to do it. It drives irrational consumption levels. And the ministry is working on a law on preventing the smuggling of diesel or other petroleum products. I think Saudi Arabia is working on a similar law. Because any of those neighbors who have subsidized or cheaper petroleum products, they don't want those to be sent across the borders and abused by smugglers. This will be fixed. We're talking together across the GCC and we are trying to find measures and laws how to prevent the abuse.

DS: Given the drop in demand in China and in Europe, and if we look at the demand/growth situation again: Russia, for example, is now trying to secure new markets for itself, looking to Asia to take more of its energy as it seems to be a little bit under pressure. Is that impacting at all the thinking of OPEC or the UAE in terms of where it seeks to sell its oil or gas? Does it still feel that China is a secure demand market for its product?

HE SUHAIL MOHAMMED AL MAZROUEI: We're not in the business of selling more gas than the existing contracts we have with Japan. So keeping that aside, the UAE is in the business of selling oil. Is it going to change the demand on our crude? I don't see that. I see a higher demand on our crude. I think what's going to happen, with us opening up the refinery—we are in the commissioning phase of the Ruwais refinery—is that it will take the amount of crude meant for export as crude versus products; that will shift. When Ruwais is fully commissioned and at top capacity, we will be refining around a million barrel inside the UAE. Before, it was 500,000 [barrels a day]. So the amount of crude available for export is going to be a bit less because of that. And we will be selling products to customers. The fact that we have storage in Korea and in Japan will make us closer and more reliable as suppliers. The fact is that we are seeing today more demand on our crude, because of the nature of the UAE crude, Murban and Das. Yes, competition will be there, but we don't see it a threat or something that we need to be worrying about.



DS: We are seeing a lot more Chinese investments into here and it's beginning to possibly displace the traditional partners of the last 30 to 40 years – is that part and parcel of securing demand as well?

HE SUHAIL MOHAMMED AL MAZROUEI: It's part of a strategic partnership with certain customers. And I think it's not just done like that; it's a plan. We look at the market and we are trying to strike a true partnership with those customers. We're not interested only in selling them oil for some time and that's it. No, we're trying to create value by using that partnership, giving them opportunity here, seeking opportunities there and even working in third countries together. This kind of thinking, partnership model, doesn't only apply to the customers. It also applies to the IOCs who are working here. This is what we aspire to build. True partnership is the only way in our view that can distinguish us from the others.

DS: I'd like to give the opportunity to the floor now to put a few questions to His Excellency and I'd like to invite the Managing Director of Maersk Oil Middle East, Richard Doidge, to put the first question to the Minister.

RICHARD DOIDGE: Your Excellency. With Abu Dhabi's strong cash reserves and relatively low cost of production and forward-thinking approach, do you see it adopting a kind of countercyclical or contrarian approach to the current low oil price environment? I'm thinking,

for instance, internationally through Mubadala or potentially TAQA becoming opportunistic, looking at distressed assets and companies, shifts of capital allocation and focusing on different markets?

HE SUHAIL MOHAMMED AL MAZROUEI: Yes, definitely. All of those investments—I would say, oil and gas, because Mubadala Petroleum is not purely investment; it also has some capabilities or aspiration to produce—all of them will be looking at targets because this is an opportunity, if you believe that things will improve upward. And we believe, as I mentioned, things will not stay for long at these oil prices. So yes, we are going to encourage those companies to look at targets. And we have seen in the past that the periods of low production creates the best values for those who buy at that time. So that's, I think, the hope. But we will leave it to the boards of those companies to make those decisions. I don't think the government is going to push anyone.

DS: There's definitely a trend of national oil companies, not just from the UAE, becoming more international and venturing into new partnerships abroad and other asset development opportunities, when they don't necessarily have to, when they have everything on their doorstep. So there is an impetus to go further than they were?

HE SUHAIL MOHAMMED AL MAZROUEI: I don't agree that they don't have to. I think they should. The reason, this is the business that we know very well and if we don't use this know-how, the technologies that we developed here, and we go and invest and do it outside and take opportunities, then we will be losing an opportunity. We have a vested interest from many companies here and we aspire to go and work together with them outside. And we have done and we have seen the benefits of such investments. But for those investments, you need not to have the mindset of a short-term investor – you need to have the mindset of a long-term investor. You need to take the risk of the oil prices going down and going up, and not to panic if the oil price drops and then go and sell everything you have. That is not how IOCs are in this business.

SEANEVERS: Your Excellency, the outlook for the oil price having on countries or NOCs that are looking to offer concessions in the coming years, Mexico and others, Iran possibly, but also the UAE is in a concession renewal phase

“When Ruwais is fully commissioned and at top capacity, we will be refining around a million barrel inside the UAE. Before, it was 500,000 [barrels a day]. So the amount of crude available for export is going to be a bit less because of that.”

over the coming years: I'm wondering what the impact of this new price cycle may have or not on that and what the outlook for that is.

HE SUHAIL MOHAMMED AL MAZROUEI: I think it depends on how you look at the horizon. All of those who are bidding on a long-term relationship that is going to last for 30 years or more, they are having a view on that as a long-term investment. They are not going to change their mind every time we have a blip or a glut in the market. Most of them, and those who are bidding on ADCO are all mature oil and gas companies, understand what they are bidding on, they understand the value. I don't think it is going to impact it directly in any shape or form because this is not just a one-year or two-year arrangement – this is a long-term arrangement. I think for other countries that do not have a system yet, they need to build trust and that risk profile needs to be taken differently. Because it depends from country to country, the fiscal regime, stability of the fiscal regime and the kind of contract or the nature of the contract – this is all going to be judged by those who are bidding versus the current oil prices. So if someone is aspiring to put, for example, very high or very tough terms at these prices, I don't think it's going to be successful if it's a new country entering into the opening up the concession. For us in the United Arab Emirates, we have 70 years' experience. We've been reliable. We launched a book, The Oil & Gas Year, and according to the customers, the UAE was given the highest rating in term of customer confidence, we got 95 percent. That's something we are proud of and something that makes us different from the others.

DS: Thank you very much, Your Excellency. ■

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SUSTAINABILITY

Mitigating Climate Costs, Accelerating CCS Deployment

By Jacqueline Redmond, Head of Commercial Power, Shell





THERE is wide consensus on the benefits of carbon capture and storage (CCS) for the future of sustainable global energy sources. Many go as far as to say that fossil fuels cannot continue to be utilized without far-reaching development and implementation of CCS technology to reduce carbon emissions and minimize global warming. In a recent report, the International Energy Agency (IEA) stated that CCS would need to reduce global carbon dioxide emissions by 20 percent by 2050 to ensure world temperatures don't increase above 2 degrees Celsius. This debate is particularly relevant now when the number of coal-fired power plants – among the highest producers of CO₂ – is multiplying around the world. The question is whether CCS can deliver?

There are currently 12 CCS projects operating around the world and the good news is that we are not taking on this mission from a standstill. It is an area that Shell is deeply involved in with the construction of three projects in Australia, Canada and Norway, which combined will store millions of tons of CO₂ a year. Significantly, Shell is looking at developing the world's first full-scale gas CCS

project with its partners that would store up to 10 million tons of CO₂ captured from the U.K.'s Peterhead power station deep under the North Sea.

The reality is that any CCS project involves extensive and integrated planning alongside large-scale investment to successfully identify and implement carbon solutions. Put simply, CCS projects are large beasts and in the near term they need governments to support their deployment and set the stage for further development. But we cannot rely on government alone to deliver our energy future. We need industry and society to work to solve the problems and sooner rather than later, the commercial case needs to be made to offer the private sector a genuine stake in pushing their boundaries further. Only then can CCS projects proliferate to the level required.

Right now the majority of CCS projects are located in North America, which boasts 16 of the 22 projects currently in operation or under construction. Many of those are geared towards using CO₂ emission for enhanced oil recovery (EOR) techniques to push up oil production. It helps that these are onshore projects, making the process less technically

challenging and therefore much more feasible. That is why CO₂ EOR is described by some as the “low-hanging fruit”, in that it offers a clear entry point to explore the potentials of joined-up planning and management of CO₂ emissions.

Let's not ignore the groundbreaking project being developed here in the UAE, a country with a large carbon footprint but which is intent on doing something about it. In 2013, Masdar signed a joint venture with ADNOC for a CCS project aimed at utilizing CO₂ emissions from Emirates Steel Industries for use in EOR at Abu Dhabi oil reservoirs. This is expected to provide notable savings when the project is fully operational and will reduce emissions by 800,000 tons a year. Not only will ADNOC benefit from enhanced oil production, but the project will also free up significant quantities of gas for other uses in the market, that would have otherwise been needed for the EOR if the CO₂ had not been available, so there is a strong commercial case here.

BEYONDEOR, there are many other potential applications for CCS but much of that is in its infancy and is ultimately dependent on government subsidies and regulations to facilitate their development. That is why the private sector largely remains skeptical towards CCS because of the heavy associated costs and financial risk. But the rewards are alluring: applied to cement, steel and chemical industries, alongside power plants, CCS can make real inroads in cutting emissions. Perhaps the largest reward of all is that, according to the IEA, adopting widespread use of CCS technology could cut the bills for fighting climate change by up to 70 percent.

However, a crucial factor that is required to mature the application of CCS projects to become a central part of any country's energy management infrastructure is a strong and stable global carbon price that actually reflects the cost to society of emitting carbon. The very existence of a vibrant carbon market could overnight become the lifeblood of CCS, ensuring its adoption around the world. But that is more of a political task than anything else and there is little doubt that it will take much time and effort to come to fruition. Some governments have taken important steps on this.

For example, take the U.K. which has implemented a carbon floor price, a mechanism whereby U.K. polluters pay an additional tax to the U.K. government if the

“The reality is that any CCS project involves extensive and integrated planning alongside large-scale investment to successfully identify and implement carbon solutions. Put simply, CCS projects are large beasts and in the near term they need governments to support their deployment and set the stage for further development.”

price of permits they are required to purchase from the EU emissions trading scheme (ETS) falls below a certain level. Governments are reliant on the will of their domestic audiences in how far they can go towards imposing additional burdens on their own markets. The bottom line is that unless the international communities adopt similar measures, in the short term, such regulations can put hefty burdens on national industries and potentially make them less competitive.

And for critics who are concerned about the impact of CCS on alternative energy sources, it works with them, not against. This isn't a case of CCS versus renewables. We can't cherry-pick which technology is best to fight global climate change. We have to use every tool we have available in the right way. Solar and wind are important elements of the alternative energy mix but in Europe they offer intermittent output which places CCS in an even more important position as the backbone of low-carbon energy.

The technology is getting there. We have heard that the Boundary Dam project—a coal-fired power station in Saskatchewan, Canada—believes it can reduce costs by around 40 percent, a significant amount, and we at Shell will be able to learn from them in our plans for the Peterhead project in the U.K. Case by case, lessons will be learned and improvements will be made. By 2050, I'm confident that there will be no technical obstacles to mass development of CCS. ■



Jacqueline Redmond,
Head of Commercial
Power, Shell



Collaboration Supports
Responsible Governance of
Natural Resources

**By Abdul Qader Al Kamali, VP, Health, Safety and
Environment, GASCO**

TODAY, food production is the largest user of water globally. It is responsible for 80-90 percent of consumptive water use from surface water and groundwater, according to the World Water Council. Water, however, is also used to generate electricity, with about 8 percent of global water withdrawal used for this purpose. Energy, meanwhile, is needed to transport and fertilize crops. Food production and supply chains are responsible for around 30 percent of total global energy demand. Crops can be used to produce biofuels. In short, water, food and energy are inextricably linked.

Against this backdrop, the responsible governance of limited natural resources is imperative in a world whose infrastructure is built on an interlinked system for the production and use of energy, water and food. This is particularly relevant for national oil companies (NOCs), which carry a great responsibility not just to satisfy energy needs

in their home markets but to do so in the most efficient and environmentally-friendly manner to preserve existing resources and environment.

Oil companies are heavy water users, with technologies for enhanced oil recovery (EOR) and the extraction of unconventional resources such as shale oil in particular requiring large volumes of fresh water. In the Gulf region, one of the world's most arid, where the era of easy oil has come to an end and more EOR techniques will have to be applied in the future, water use in the production of fossil fuels is set to rise.

With this in mind, Gasco has set an annual target of 5 percent of water to be conserved every year with the aim of eventually achieving zero discharge of the resource. The goal is to ensure that all produced water is ultimately used for purposes such as irrigation or reinjection into oil and gas fields. It is just one initiative among many

within the Abu Dhabi National Oil Co. (ADNOC) group of companies targeted at boosting efficiencies across operations and improving consuming processes. Such initiatives are important within the context of solving the water-energy-food nexus, which needs to be addressed on a local, regional and international level.

In the Gulf region, the interdependence of water, energy and food is more obvious than in other parts of the world due to the heavy reliance on energy-intensive seawater desalination and widespread oil exploration and production. At the same time, although agriculture contributes only 7 per cent of gross domestic product (GDP) in Arab countries, it consumes more water than industrial and municipal users, according to UNDP. Critically, even short disruptions in the supply of one of the resources can have a major impact on the supply of the other ones.

But despite their interconnectedness and growing stress levels, water, energy and food supplies are still largely managed in isolation from each other and without the consideration of trade-offs and potential synergies. This will have to change. A holistic, nexus approach is critical to ensuring that sustainable economic growth, security, political stability, and environmental health can all be achieved.

This, in turn, will require putting in place comprehensive policy and governance systems, and pursuing integrated solutions to guide decision-making about resource use and development. Such policies and governance mechanisms must be developed and deployed at different levels to implement a nexus approach as doing so will help reduce negative impacts of policies on each individual sector, saving resources, minimizing tradeoffs, and enhancing synergies.

To succeed, government, business, educators and civil society will all have to come together in a collaborative effort that goes beyond national borders and attempts to find strategies for sustainable and integrated solutions that address the rising complexities of the so-called food-energy-water stress nexus. Trans-boundary data collection and sharing will need to be promoted and investment opportunities be identified. Not only will this type of collaboration create greater awareness of the interconnections between water, energy and food; it will also be an important tool in driving innovation and exploring new approaches to the nexus.



“ In the Gulf region, the interdependence of water, energy and food is more obvious than in other parts of the world due to the heavy reliance on energy-intensive seawater desalination and widespread oil exploration and production.”

There can be little doubt that an integrated, nexus approach will play a key role in guiding relevant research and development (R&D) that has an impact not just on a national but also on a global level. Nexus-related research should be solutions-oriented to facilitate technologies and approaches that support increased land, water and energy efficiency in a more integrated way.

Failing to address the nexus comprehensively and on a global scale isn't an option. It would inevitably impede social and political stability as well as economic growth, leading to geopolitical conflict and irreparable environmental damage. The only way forward is true collaboration among all stakeholders – Gasco, like the other ADNOC group companies, will play its role in making it happen. ■



Abdul Qader Al Kamali, VP, Health, Safety and Environment, GASCO





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LET'S GO.



Cyber Security: Under Threat – How can Global Energy Industry Thwart Future Attacks?

By Sean Evers, Managing Partner, Gulf Intelligence

THE HACK of Sony Pictures Entertainment in November may have been the highest-profile one in 2014 but it was just one in a string of devastating attacks that have pushed cyber security to the very top of global policy agendas. The hacker attack on Sony followed those on U.S. retailers Home Depot Inc. and Target Corp., as well as U.S. investment bank JP Morgan Chase earlier in the year, all of which caused significant costs in damage repair and severely undermined customer confidence.

It was against this backdrop that U.S. President Barack Obama in January unveiled tough new, if controversial, draft cyber security legislation aimed at building up the country's defenses – coinciding with the theft of data from around 350,000 brokerage accounts at Morgan Stanley and the apparent hack of the U.S. Central Command's social media sites by a hacker group claiming to back Islamic State.

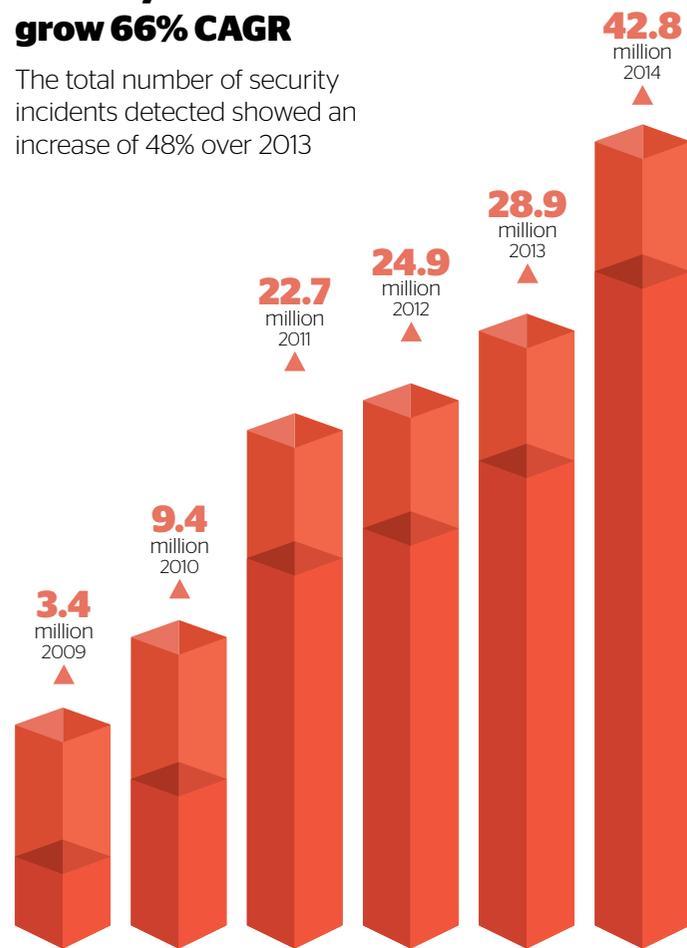
Outside the U.S., South Korea in December announced that non-critical data about its nuclear plants had been leaked by a hacker, raising concerns over the safety of the country's atomic energy infrastructure. Less publicized internationally but equally worrying was the cyber attack on an unidentified German steel mill in late December, in which hackers managed to manipulate and disrupt industrial control systems, causing serious damage to the plant and wrecking one of its blast furnaces.

The incidents allude to a worrying trend: the world's critical infrastructure, including energy systems that serve as the lifelines of global economies, are under constant threat and attack. BP's CEO Bob Dudley in 2013 said the oil major suffered, on average, a staggering 50,000 cyber attacks every day from both domestic and foreign attackers. According to a survey conducted by consulting firm PwC, the number of cyber security incidents jumped 66 percent year on year in 2014 to 42.8 million. At the same time, 40 percent of all cyber attacks in the U.S. have been against energy sector companies, data from the Willis Energy Market Review 2014 show.

While the threat arising from cyber crime has been recognized for some time now in the industry, the world's growing interconnectivity and the ongoing convergence of previously independent IT and operational technology systems in industrial plants mean that vulnerabilities to cyber attacks are only going to increase – with

Security incidents grow 66% CAGR

The total number of security incidents detected showed an increase of 48% over 2013



potentially severe consequences for people, environment and infrastructure.

As the number of cyber attacks on the energy sector keeps rising, the nature of the threat has begun to change. Attacks have become more sophisticated and complex, often seeking to take charge of control systems. Today, the greatest threat to the energy industry's operational systems arising from cyber attacks comes from breaches that seek to inflict damage to property and interrupt operations, as happened at the German steel mill in December.

One potentially devastating breach occurred last year when malware known as both 'Energetic Bear' and 'Dragonfly' infected computer systems of energy companies in the U.S. and Europe, allowing the attackers to monitor and capture energy consumption

data, and—potentially more worrying for the industry—to impact control systems for wind turbines, valves, gas pipelines, and power plants.

“Industrial systems designed without any consideration of malware or cyber-attack are now being hooked up to the internet and other business networks, and are now exposed to all the same IP borne threats that enterprise networks have been building defenses against for years,” BAE Systems Chief Technology Officer Dr. David Bailey wrote in a paper on convergence in the oil and gas industry in 2014.

The ongoing convergence of IT and industrial control systems in industries such as oil and gas is essentially driven by the need to create greater efficiencies and enhance productivity at a time when the extraction of fossil fuels is becoming technically more complex and demanding – and thus more expensive. Increased end-to-end connectivity in oil fields, often referred to as Digital Oil Fields (DOF), enables the harvesting of ever greater amounts of data in near or real time that in turn can be used to analyze and, subsequently, optimize operations.

The Middle East, which has entered the era of post-easy oil and nowadays has to spend more on extracting its hydrocarbon reserves, isn't exempt from this development and the regional oil industry has begun migrating into the digital sphere in recent years. Indeed, the Middle East is going to be the world's fastest-growing DOF market through to 2024, according to RnR Market Research, in turn raising its vulnerability to cyber attacks.

For a region that more than others depends on revenues generated from the export of hydrocarbons, safeguarding its critical energy infrastructure from cyber threats isn't just important, it's a matter of national interest. And the threat is real.

In 2013, a high-profile attack on Saudi Arabian Oil Co. (Saudi Aramco) infected as many as 30,000 of the state-run company's machines with a destructive virus that caused major disruptions at the world's largest oil producer. In the same year, Qatari liquefied natural gas (LNG) producer RasGas was attacked by a computer virus that crashed the company's website and office computer systems. Three years earlier, Stuxnet, a computer virus, destroyed almost 20 percent of Iran's uranium enrichment centrifuge capability in what was a targeted attack aimed at crippling the country's nuclear capabilities.

As more producers are being targeted in

“Today, the greatest threat to the energy industry's operational systems arising from cyber attacks comes from breaches that seek to inflict damage to property and interrupt operations, as happened at the German steel mill in December.”

the Middle East, companies are stepping up their investments in fortifying their cyber security systems in order to protect their critical infrastructure. In addition to putting in place the technological infrastructure to identify and stop the most damaging cyber attacks, companies will also have to place greater emphasis on training and raising staff awareness about the danger of malicious activities to create a more security-focused culture.

However, what's most important in this cyber battle is for governments to take a lead in addressing the issue, in particular by adopting regulations that demand better security than the market does. In the UAE, the government has formed the federal National Electronic Security Authority (NESA) to oversee the country's cyberspace and coordinate with national stakeholders. Qatar has made cyber security one of three research priorities to develop experts and expertise.

These are important initiatives. But ultimately, what's needed is the closest-possible collaboration and information sharing between all stakeholders in vital sectors such as energy – operators, vendors, manufacturers, governments and research institutes – to work jointly towards securing critical infrastructure and help protect the broader cyber ecosystem from digital disruptions. This may not be easy as it will require a truly coordinated and open approach across industries and national borders. But without it, a major cyber attack with devastating consequences may be harder to avoid. ■



Sean Evers, Managing Partner, Gulf Intelligence



IT'S HARDLY a secret that the world is producing ever-larger amounts of data. Indeed, according to some estimates, about 90 percent of all the data available in the world today was created in the past two years alone. And the volumes are only going to increase further. By the end of 2020, about 25 billion objects comprising everything from industrial machines to refrigerators will be connected to the internet, an almost 30-fold increase from 900 million devices in 2009, making up what we commonly refer to as the internet of things (IoT) and pushing data growth to new peaks all the time.

As a result, the world will see about 1.7 megabytes of new information being produced every second for every human being on the planet by 2020, according to a study published by IDC Digital Universe in late 2012. The trend is supported by the emergence of virtually limitless computing power, which has become available at increasingly low cost through cloud technology. Over the past 10 years, the cost to store one gigabit (GB) of data has fallen significantly, dropping from close to \$20 in 2005 to less than \$0.10 today – tendency declining.

These are impressive numbers by any standard. The ability to produce and harvest

growing amounts of big data with the intention of finding correlations and trends presents a unique opportunity for companies across the globe to optimize operations and drive efficiencies to unprecedented levels, thus producing major cost savings. This is also true for the global oil and gas industry.

Today, oil producers are in a position to capture more detailed data in real time than ever before at lower costs and from previously inaccessible areas. Oil fields, for example, today are essentially connected from end to end, enabling companies to harvest and analyze ever-larger amounts of data generated by people and assets along the oil value chain at ever-higher frequencies. As oil and gas firms venture into harder-to-reach and more challenging environments, while at the same time connecting more and more hardware to the internet, these data volumes will continue to grow and become more complex.

For oil and gas companies, the key will be to develop strategies and systems that integrate and manage these increased data volumes to use them in smarter, faster ways. For if they don't manage to make this data work for them, they risk becoming less competitive. The reason is simple: access to data ultimately affects and determines project economics

and plays a crucial role in the application and operation of technologies such as enhanced oil recovery (EOR) in oil fields.

This is of particular relevance at a time when oil prices have fallen by about half from levels of above \$100 a barrel over the past three years, undermining the economics of many projects under implementation and putting new ones into doubt. With oil prices likely to remain in the \$50-60-a-barrel range for some time, companies will therefore seek to boost efficiencies and optimize operations to get maximum value out of their investments.

Putting in place the technology infrastructure needed to harvest big data is one thing, making sense out of this data quite another, even for the largest of businesses. While gathering, storing and processing data has become increasingly sophisticated over the past few years, arguably the greatest challenge today is turning the massive amounts of raw data into insightful information. Yes, technology is critical to handling these streams of data but, by itself, isn't a silver bullet. What big data needs is robust analysis that's relevant to a particular business, in this case, the oil industry.

And even though data analysis as such isn't anything new for companies—it has, for example, always played an important role in decision-making processes in the oil industry—analyzing the vast volumes of information being generated in today's world of big data on a daily basis brings about a different set of challenges. What's critical today for companies seeking to exploit big data is people with the appropriate skills. This includes everything from specific expertise in big data and being able to understand, collect and preserve it to knowledge of statistics, maths and data visualization techniques.

Meeting these requirements won't be easy, however. McKinsey Global Institute has estimated that by 2018 the U.S. alone will be facing a shortage of 140,000 to 190,000 people with deep analytical skills across industries as well as 1.5 million managers and analysts to analyze big data and make decisions based on their findings. This skills shortage means that, according to consultancy Gartner, more than 85 percent of Fortune 500 organizations won't be able to effectively exploit big data this year.

One important way of addressing this issue is for oil companies to place more emphasis on developing analytical, big data and other relevant skills internally. For national oil companies (NOCs) such as the ones operating

“Putting in place the technology infrastructure needed to harvest big data is one thing, making sense out of this data quite another, even for the largest of businesses. While gathering, storing and processing data has become increasingly sophisticated over the past few years, arguably the greatest challenge today is turning the massive amounts of raw data into insightful information.”

in the Gulf Cooperation Council region in particular, the benefits would be twofold: they would potentially develop their national workforce on the one hand; on the other they would reduce their outsourcing requirements to third parties and build up their capabilities to analyze the data that sits at the core of their operations.

This latter point in particular is important because ultimately, it's the people who work in a company and who understand how the oil and gas supply chain integrates and what impact any actions along it may have, that are best placed to use the knowledge they gain from analyzing big data to identify the potential for optimizations and efficiencies. And the more people from within an NOC are engaged in this process, the more the company at large can potentially benefit.

Educating their employees on the value of the data they are using and the need to handle it systematically and rigorously will therefore be seminal to reap the benefits that comes with the application of new IT infrastructure and technologies. Beyond this, there has to be more involvement between industry and academia on a general level, while partnerships between solution providers and NOCs could lay the foundations for a long-term solution to the skills shortage in big data. ■



Ghassan Barghouth, VP Oil & Gas and Industrial Segments - MENA, Schneider Electric

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The Era of Energy Efficiency –
Already Here or Still to Come?

By Albert Holtslag, Technical Manager Upstream, Shell

WITH AN ever-growing global population and its increasing need for power, energy efficiency has become one of the most critical aspects of the world's development that we need to address. Alongside cutting carbon emissions, this task is about finding sustainable ways to provide for the growing consumption of power for the coming decades. And with industry contributing more than 50 percent to global energy demand, it has a crucial responsibility in driving forward better energy management.

From an oil industry perspective, one of the most significant factors driving our operations is the cost of energy. Controlling this major operating cost determines just how competitive we can be as a company. Simply put, if we can't succeed at doing this, we face going out of business. Fortunately, many businesses have succeeded. If we look at the refining industry since 1980, energy consumption has been cut by some 10 to 15 percent, which has been accomplished in an environment of stricter regulations that require cleaner fuel and more complex processing.

But we have to recognize that on the production side, energy use has been increasing. Every activity that takes place at the oil field consumes considerable amounts of power: drilling wells, pumping fluids, water and gas re-injection, processing, transportation and many others. Since the 1980s, the use of energy for production has increased by a third and that trend has been driven by the fact that more fields have matured, challenging

reservoirs are now being utilized and new sources of hydrocarbons are being developed – whether it is shale or other unconventional resources. All this has required more complex operations, additional processing and much greater use of energy.

For the oil industry, this is a commercial game so we need to minimize energy consumption in order to keep costs under control. This requires greater efficiency in equipment, in power generation, in design, and requires the use of cutting edge technology and also an emphasis on data monitoring and research to optimize operations. One good example is that of the Abu Dhabi Company for Onshore Petroleum Operations (ADCO) which is removing its own power generators and connecting to the grid, offering important savings.

We must also take a more holistic approach to planning, both in production and consumption. It is critical that oil companies and governments work together with an emphasis on research and education in-country with increased interaction with entities such as Masdar - the UAE alternative energy firm, and the Petroleum Institute for example. There is much knowledge to be shared and oil majors have a duty to support such

collaborations to ensure joined up planning. Take the United States for example, where such an approach could yield gross savings worth more than \$1.2 trillion, well above the \$520 billion needed in upfront investment, according to a study by McKinsey.

In Oman, there are considerable challenges to be faced from declining production, ageing fields and increasingly challenging reservoirs and limitations on water sources. But the declines have been halted through effective reservoir management, which have optimized production performance and balanced the requirements for water and enormous amounts of processing, and it is working. It is the difference between producing and not producing, the difference between being economic and uneconomic. On the production side, this isn't driven by regulation but a blunt recognition of the commercial advantages of being more efficient.

Unlike Oman, Abu Dhabi with massive oil and gas fields that are produced at very competitive rates doesn't feel the economic necessity to chase the benefits from improved energy efficiency in its production operations at this stage, but it will come. And growth regions like the Gulf realize that they have to address energy demand and change behaviors of consumers. Regulation will be key in this regard, also spurring on investment by government-owned utilities companies because they will benefit from the savings. But with general subsidies for energy and water in place across much of this region, there is little incentive at the moment for users—whether residential or industrial—to cut back, let alone invest in energy efficiency improvements. There are some positive signs here in Abu Dhabi with modest utility price increases being introduced at the start of this year.

As a construction hub, new building regulations can also play a major part in a UAE efficiency drive—an energy-efficient construction code if you like—which will offer considerable energy savings without requiring huge investment. Currently, investment by the private sector in energy and power generation would be flawed in this region, if it is on the basis of subsidized utility prices, but with changes in regulation, the private sector could assist in formulating and implementing new systems. If private companies are encouraged through initiatives and government support, we can work on creating ground-breaking new methodologies that will benefit everyone.

But we must also recognize just how far-reaching planning needs to be to properly



“ Since the 1980s, the use of energy for production has increased by a third and that trend has been driven by the fact that more challenging reservoirs are now being exploited and new sources of hydrocarbons are being developed - whether it is shale or other unconventional resources.”

tackle the issue of energy efficiency. Boosting energy efficiency means challenging waste in food production, which accounts for some 30 percent of energy consumption. Boosting energy efficiency means pursuing alternative energies to find a sustainable energy mix for the years to come. And energy efficiency projects need to be planned and implemented in tandem with the other crucial goals of water conservation and carbon emissions reduction. Working towards these challenges is paramount and I believe that alongside others, we in the oil industry have an important role in taking up that challenge. ■



Albert Holtslag,
Technical Manager
Upstream, Shell



Tapping the Potential of Crossover Technologies in the Oil & Gas Industry

By Ahmed Al Awadi, Director of CECC, Ministry of Energy, UAE



CROSSOVER technologies are playing an ever-more important role in today's oil and gas industry and most companies active in the sector today have recognized that they need to seek ways of utilizing technologies from other industries to address future challenges. In the past, the oil and gas industry largely looked at the space and defense sectors for new innovative solutions and technologies. Going forward, the industry will have to broaden its scope and tap into the expertise and technologies from other industries with the potential to contribute to its advancement and sustainable growth.

Indeed, at a time when the global oil and gas industry ventures into some of the world's most remote territories and deepest waters, the application of advanced technologies that ensure safe, efficient and reliable hydrocarbon production is becoming ever more important. At the same time, the equipment that's being used needs to be able to withstand the often extremely harsh conditions on the one hand and has to be easy to maintain to avoid time-consuming and costly down times on the other.

As the technological challenges of the oil and gas industry are mounting, some solutions can be found in other industries such as aerospace, automotive and even medicine. Whether it's the use of advanced materials for components and equipment operating in challenging environments, collaborating with other industries on the development of new solutions, or cross-sector sharing of best practices – sectors such oil and gas, medical, aerospace and automotive actually have a great deal in common.

In fact, they often share common needs, thus providing an incentive to identify new approaches to solving similar problems through crossover technologies. In the medical sector, for example, cardiovascular disciplines share the same fundamental objective of flow assurance as the oil and gas industries. Collaboration between the two industries has subsequently led to the development of such products as the Greenfield Kimray filter, a device developed from a pipeline filtration system and now used in heart patients.

Space agency NASA is operating in frontier regions, just as the oil and gas industry, which means both have a common interest in challenges such as optimizing the performance of robots in hostile environments. In Brazil, aerospace group Embraer and energy giant Petrobras have teamed up to utilize their joint expertise in areas such as reliability and safety

of critical systems. Elsewhere, 3D printing too is crossing over into oil and gas, with companies such GE Oil & Gas and Halliburton using the technology to print fuel nozzles and parts for drilling among other things.

Most significantly, rapid advancements in information and communication technology, big data capabilities and analytics are fundamentally changing the way the industry operates. The digital oil field—essentially integrated operation systems—helps in reservoir and production optimization as well as drilling and well completion among other processes. Whether in automation or robotics, innovative technologies will without a doubt drive further change in the industry in coming years.

In the UAE, initiatives such as Masdar aim at driving innovation in sectors such as renewables and create knowledge and intellectual property that can then be used in other sectors such as oil and gas, while also helping the country become a technology exporter in the future, rather than being essentially an importer. The carbon capture, usage and storage (CCUS) project developed by Abu Dhabi National Oil Co. (ADNOC) and Masdar in conjunction with Emirates Steel is one of many significant steps that the UAE is taking into that direction.

These kinds of initiatives are being supported by concerted efforts to build out domestic research and development (R&D) capacities and capabilities such as the efforts led by Masdar Institute and the Petroleum Institute, not just in renewables and oil and gas, but also in other areas such as semiconductors and aerospace for example.

To be sure, there's still a lot of room for improvement. But even though the oil and gas industry is in the midst of a personnel crisis as the baby boomer generation of engineers is entering retirement, one of the key prerequisites for success exists: there is talent in the UAE. What's important is that this talent is being nurtured and developed to advance the development of technologies in the future.

To this end, creating new platforms for knowledge exchange, collaboration and R&D between different industries will be seminal to identifying and developing technologies that have the potential to cross over from other sectors to oil and gas, and vice versa. I encourage workshops and discussions hosted by ADNOC and Masdar, and other entities globally and in the UAE specifically, to address these issues and be proactive about exploring crossover technologies, advancing them further and creating the partnerships that are required to do so. ■



Ahmed Al Awadi,
Director of CECC,
Ministry of Energy, UAE



Global Fault Lines – Outlook for Energy Security: Demand and Supply?

- **HE Suhail Mohammed Al Mazrouei, Minister of Energy, UAE**
- **HE Fouad Siniora, Leader of Parliament Majority & Former Prime Minister, Lebanon**
- **The Rt. Hon. Lord Howell of Guildford, Former Secretary of State for Energy, U.K.**
- **Xu Xiaojie, Advisor to the National Energy Administration, China**
- **Ali Khedery, Chairman & CEO Dragoman Partners**
- **Moderator: John Defterios, Anchor, CNN**

JOHN DEFTERIOS (JD): Minister what are your thoughts about how you define energy security with the price changes we've seen from June 2014 to January 2015 today? Have we changed the debate about energy security and how it really is defined today, whether it's supply security or investment security because of the uncertainty of demand security in your view?

HE SUHAIL MOHAMMED AL MAZROUEI:

I think supply and demand security would require a reasonable price, let's put it this way. Let me explain it a little bit. If under the lower oil prices we will have a supply issue because it does not make sense to invest, that may take time but we will see it. If the price is too high, again, we will have competition and oversupply; a competition like we have seen in the previous four years, with technology and investments focused on bringing more crude into the market. Now we have seen both, the higher and the lower, and I think now we're seeking the balance between the two. I don't think it's an issue today of the amount of supply that we can put in the market. We know that there is potential for shale oil to go further. We know that there is a potential for other countries to develop or to come back to normal production like Libya, Iran and the growth in Iraq. So supply is not going to be the issue as long as the price is right. If the price is not right, then we will have a supply issue.

JD: Ali, I think it's a very good time to bring you forward here on the fact that we're on the cusp of something quite grand in the energy business, if you think about it. Iran, if the sanctions are lifted over the next six months could be a major player. I interviewed after the OPEC meeting in November, the Iranian energy minister who suggested in three months we can get to almost 4 million barrels a day. Within a year, they can get to 4.5 million barrels a day. We know what's happening in Iraq right now. At \$50, \$60 a barrel this has to be a real shot across the bow to the emerging players who've based their budgets on around a \$100 if not more per barrel. This is going to be very painful.

ALIKHEDERY: I absolutely think it's going to be a bit painful in that, as you suggested, if sanctions against Iran are lifted, you have an additional million or more barrels potentially on the market. Iraq has very aggressive designs after decades of misrule under Saddam Hussein and Nuri Al-Maliki. Now with sort of a more or less national unity government in Baghdad, with a deal brokered recently between Baghdad and the Kurdistan region, a quarter million barrels a



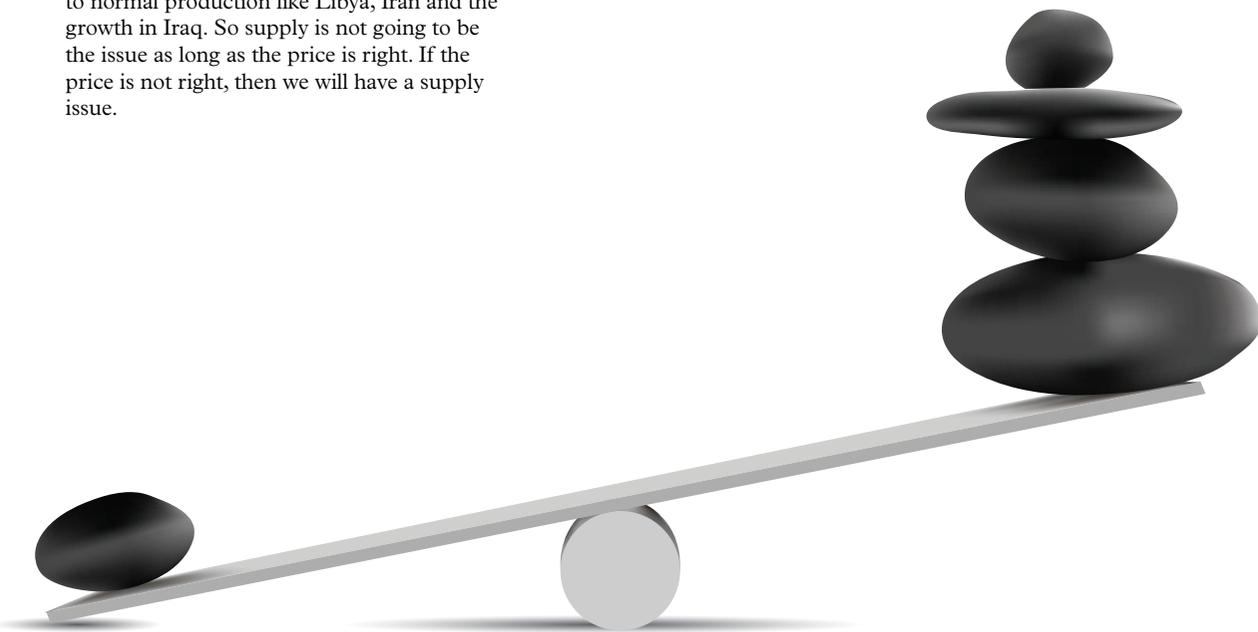
day of Kurdish crude is on the market; the Kirkuk exports via the northern pipeline have been reintroduced. The thing that concerns me though is the fact that I think the markets are not factoring in the geopolitical risk that we've seen since mainly 2011 and the beginning of the regional turbulence. Libya is facing a full-scale civil war; I think that is now beyond a shadow of a doubt. Yemen is disintegrating before our very eyes and has actually been for quite some time for those of us who have been visiting. Syria is obviously imploding. And frankly, I don't think one should discount the situation in Iraq, in that, while the coalition is now involved, again Iraq is in a full scale, not only insurgency, but more or less of a civil war. And the violence levels really take us back to the pre-surge highs of the ethno-sectarian conflict there.

The reality though of the introduction of North American unconventional production, both in shale and in for example Canadian tar sands, is that you've introduced millions of barrels of new production onto the market. So what we are facing globally, and this is sort of economics 101 here, the market will stabilize where demand and supply meet. What are the global markets willing to pay and what can producers live with. Obviously, in the case of Russia or Algeria or Libya or Iran or Iraq, all of these players have fiscal breaks at above a \$100 a barrel—in the case of Algeria, it's much higher; I think it's closer to 150. On the margins of the recent OPEC meeting I spent some time alone with my old friend the Iraqi Oil Minister, Adil Abdul-

“ Those highest-cost producers, they always need to be on the top. And I think it's going to be switching on and switching off of those shale oil producers; they will produce when it's economically viable for them to produce and they will shut off those wells when it does not make sense.”

HE SUHAIL MOHAMMED AL MAZROUEI

Mahdi, who was previously Finance Minister under our friend Ayad Allawi in 2004. He shared with me a shocking statistic: in Iraq, for example, the government's payrolls were 850,000 under the Allawi government in 2004. Today they're 3.5 million because that system in Iraq since 2003 is purely a patronage-based system. So you're facing here an addition to the dynamics in the industry which are very fundamental and it is



a trillion dollar issue across the planet. But for these producers themselves, they are looking at regime survival here, for the Iranians, the Iraqis, with the ruble collapse in Russia. What they are facing is deep pain from a government perspective, which threatens regime survival because very soon if these prices remain this low, you will have social instability in these countries. And I think as His Excellency knows all too well, the United Arab Emirates, Qatar, Kuwait, Saudi Arabia have reserves and sovereign wealth funds. Countries like Iraq, Iran, and to a certain extent Russia, don't have those reserves. So the situation we're facing globally and geopolitically I think is being discounted by the market and I think that would be a very serious mistake moving forward.

JD: It leads me to the former Prime Minister of Lebanon, Mr Siniora. That's not such a great Saudi-authored strategy within OPEC then to put incredible pressure on Iraq, Iran, Libya, and Algeria during the transition of the Arab Spring. Would you suggest that was the right strategy in November, to lead a charge, to lead production, to build up to have excess supplies to bring oil down to \$50 a barrel in a period of time when these people are in a period of transition?

HE FOUAD SINIORA: Well, I think that the motives of Saudi Arabia in this respect are not strictly political alone.

JD: It's not a political motive, but let's be very clear here: it's not a political motive and you live in a neighbourhood that's gone through major upheaval since 2011. One would argue this is not the time to test everybody on the downside to maintain market share. What do you think?

HE FOUAD SINIORA: Well, you see, in this situation of changes that are taking place, how long are you going to keep countries unaware of the changes that are taking place and that they really need to adapt to changes. In this regard, probably what really happens is going to affect most of these countries. And particularly, what I want to add to this is that much of this comes whether the Iranians or the Iraqis are not going to really be able to increase production as much as they really hope for, because this is going to require a great deal of investments in Iran and in Iraq in order to really increase production. So what is going to happen definitely, it's going

to really carry with it great risks politically and socially within these countries in that most of their budgets are based on a much higher level of price for oil; and to adapt to these changes requires very bold decisions. So this definitely is going to carry with it great risks politically within the region. And each of these countries would have to really try to come to their senses and see how to really adjust and adapt. This expansive policy, whether in terms of expenditure or intervention politically within the region, is going to be unsustainable.

JD: On the budget side you're suggesting?

HE FOUAD SINIORA: On the budget side.

JD: Sure, suggesting the patronage that Mr. Khedery was talking about.

HE FOUAD SINIORA: Sure. I mean, definitely in the case of Iran there is a great level of expenditure that's taking place because Iran is stretching itself too thin in its intervention policy within the region. As you know they are really from time to time boasting and saying that we have an influence over four Arab capitals. So this is the situation definitely, from the aspect of inability to increase production as much as they really want; and secondly with their expansive, let's say policy of increasing expenditures within Iran or outside Iran, because of their intervention. So this is going to really carry with it let's say changes and that would require a change in policy. Otherwise it is unsustainable.

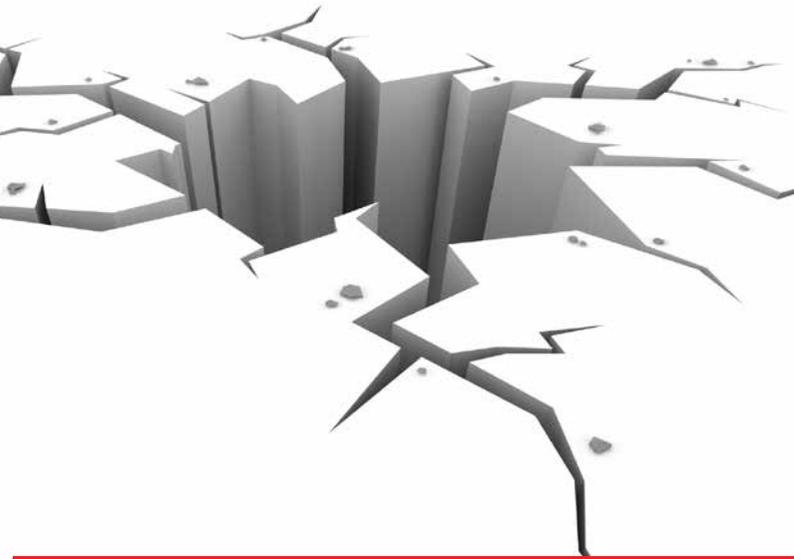
JD: Very quickly, you kind of avoided the Saudi equation here. Was it the right time after the Arab Spring and what we see in Libya today and in Yemen to be testing the downside for these countries in a period of transition?

HE FOUAD SINIORA: This situation is not only brought into being because of political motives. One has to get back to the basics that this is because of a change in the overall supply and demand. I think with this change in the economics of producing alternative sources of energy that it would not have been possible for the oil producing countries to stay as they are and watch their market share decline rapidly. So this is the situation, I think, that there were really obliged to resort to this policy.

JD: Lord Howell, what does \$50 to \$70 do to energy policy going forward? In terms of additional exploration, getting efficiencies, going after the potential shale market, which has been greatly resisted by the European public, as you know you, you can even add in the wild card of Russia which is a huge question, but let's cover that in a follow-up: what does it do to future exploration?

THE RT. HON. LORD HOWELL OF GUILDFORD:

Obviously it depends on how long it lasts; we're going to talk about that more. But I'd like to really start from the other point you mentioned, which is not oversupply so much as demand insecurity in the European region. We've got a lot of unknowns in Europe. To be rather local, from where I come from we don't know who the hell is going to win the next general election in Britain. We don't really know—although we hope that the United Kingdom is going to stay united—we don't know what's going to happen in the Eurozone, it's just about to hit another bout of sickness. We don't even know how the European Union, which is a 20th century model, is going to adjust to the digital age. And we don't know, since you've mentioned Russia, where Mr. Putin is going to take Russia next. These are huge unknowns and they have a direct impact on the pattern of demand and where we're looking for future supplies in Europe. So that's in the background and I think it adds up to a fact that our present recovery in Europe—it's been rapid in Britain, but it hasn't been so rapid in the rest of continental Europe—is going to continue very slow indeed with a lot of uncertainty and where we have signs of growth, we have to be realistic, it's fed by steroids, it's fed by QE, it's fed by abnormally low interest rates and these things don't last. So in the background we've got the possibility of very slow recovery in Europe, and that means slow recovery in demand for energy. On top of that, we haven't heard much this morning about the increase in the impact of technology on demand. Technology is going to increase supply. It's doing so the world around, we can see. Technology is going to reduce or flatten demand. It's flat anyway and has been for many years for oil in America and in Europe. I'm not saying that the green revolution is going to make huge inroads but energy efficiency is increasing at dramatic rates.



“ I think with this change in the economics of producing alternative sources of energy that it would not have been possible for the oil producing countries to stay as they are and watch their market share decline rapidly. So this is the situation, I think, that there were really obliged to resort to this policy.”

HE FOUAD SINIORA

JD: OPEC suggests between now and 2040, Lord Howell, that you will see a 60-percent increase in demand for fossil fuels. Do you think that's not going to be very realistic?

THE RT. HON. LORD HOWELL OF

GUILDFORD: No, I don't think that's realistic. I think there's a lot of wishful thinking in this area, understandable wishful thinking. People think, oh, recovery will come and demand will increase. I mean, Japan has no intention of increasing. On the contrary, Japan is going to get some nuclear capacity going again. The investment is there; they've just got to

get the machinery going again, not as high as it was before but half their nuclear stations. They're going to be cutting down on gas from Australia. They're going to be cutting down on their coal imports and they could certainly be cutting down on their oil imports. So the demand is going down from that side. Then China, everyone has gone around saying, oh, it's all right, in the end China is going to get back on high growth and it's going to be a fantastic first for oil and gas. I would long to hear from the Chinese experts, I don't think that is so. I think the Chinese people have a very clear view that they want a different pattern of modernization. They're talking about enough; they're talking about we don't want to go through the western gas guzzling greed. We're not going through that phase. China is going to develop, I believe, in a much more moderate energy way. And therefore, the future there, it's always going to have so much thirst it will keep the oil price up is, I think, a bit of an illusion.

JD: Mr Xu, all of a sudden we're in a very different environment, \$50 and below. This is the best thing that could happen to China! It's like the elixir for the G2 economy of the world. How do you play it now, do you go as Lord Howell suggested, forcefully into alternative energy sources? It's a buyer's market; you can lock in these contracts for as

long as possible. What's in the cards for 2015 and beyond do you think in pricing and what does it do to the economy?

XU XIAOJIE: I think currently the low oil price is simply a good thing for China and the major oil consumers. But for me it is not a totally good thing, it is a huge challenge for China as well. Low price is good for consumers but we are facing a lot of challenges as well. When the oil price is coming down, we also think about some projects we are working on with coal, renewables and other types – how to continue our strategies on projects like coal to gas. This is facing huge challenges because the oil price is going down. So the low oil price is seemingly a good thing for China, but in fact it is not. We have to think about the new realities that we are facing now. Externally, we're very heavily dependent on oil and gas. With oil [prices] falling, dependence will be increased from now, almost close to 60 percent and probably to 70 percent in around the year 2020. Natural gas dependence will increase from 30 percent to 40 percent. So this is a huge issue and there are also many issues internally. We have to manage our demand side well. The demand side in China now will, I believe, slow down a little bit, but generally it will increase; not as fast as some organization forecasts, like the IEA. Our



forecast of Chinese demand is much lower than that, but generally, chances are it will increase between 1-2 percent.

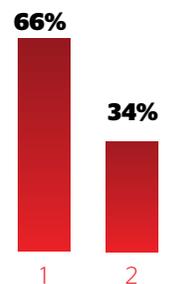
JD: A few years ago I did a story on goldilocks, not too hot, not too cold, but something that's a good level to keep demand going. I had an interview Ali Al-Naimi, the Energy Minister of Saudi Arabia in 2012 and he declared that goldilocks oil was a \$100 a barrel. I'm sure the investment scenario at \$45-50 is not fantastic. What is goldilocks oil today? If it's not a \$100 as the Energy Minister of Saudi Arabia was suggesting in 2012, what is the right balance to keep investment in play, market share for different players?

HE SUHAIL MOHAMMED AL MAZROUEI: I'm not going to give you a price, but I would suggest something. We all know that the shale oil producers are very important for market supply and we all need them to stay. So, if that is the case, since they are producing almost 4 million today, I think whatever price makes shale oil continue to be produced is going to be the fair price for the conventional producers to produce. So whether that's \$60, 70, 80, whatever the figure is, I think that's where the market will stabilize. And I said this probably one year ago in Paris, if there is an issue, the NOCs and OPEC, they're going to sit in the back and someone else needs to make a decision on what is the right price for us to produce. And that new someone is going to be the shale oil producers, because of their growing contribution in the next four to five years.

JD: We'll go to the first survey question: Which is the greater challenge to planning for global energy security through 2020, "demand uncertainty" or "supply uncertainty?"

Q1: Which is a greater challenge to planning for global energy security through to 2020?

- 1. Demand uncertainty
- 2. Supply uncertainty



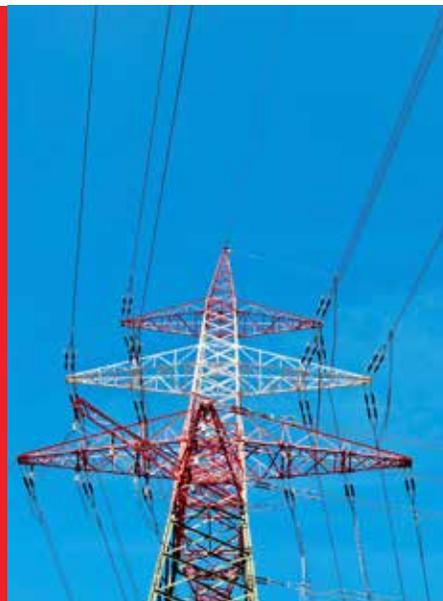
So there's plenty of supply around but we don't know what the demand equation is going to be.

THE RT. HON. LORD HOWELL OF GUILDFORD: Demand is a problem.

JD: If the engine of Europe is only growing at 0.1 percent and that's Germany, the Greeks may be running for the hills pretty soon after the election. It doesn't point to great demand from Europe and it puts so much burden on China, South Korea and Japan, doesn't it?

“ I think the Chinese people have a very clear view that they want a different pattern of modernization. They're talking about enough; they're talking about we don't want to go through the western gas guzzling greed. We're not going through that phase. China is going to develop, I believe, in a much more moderate energy way.”

THE RT. HON. LORD HOWELL OF GUILDFORD



“The demand side in China will, I believe, slow down a little bit, but generally it will increase; [though] not as fast as some organizations forecast, like the IEA. Our forecast of Chinese demand is much lower than that, but generally, chances are it will increase between 1-2 percent.”

XU XIAOJIE

THE RT. HON. LORD HOWELL OF GUILDFORD:

In Europe and in America, energy intensity is reducing dramatically. Energy efficiency is increasing dramatically. Let me give you two micro examples to bring home this point. In the U.K. petrol has dropped by about a third at the pump for the consumer in the last three months. It's had absolutely no effect on increased demand. People have got used to the fact that they want a motor car that does 20 to 25 miles to the litre or 80 or 90 miles to the gallon compared with 20 a few years ago. They're not going to go back to gas guzzlers as in the 1980s – it's not going to happen this time. The heating bills in the UK—a lot of houses are still heated, especially in the countryside—by oil, have dropped by a third. This is extra money in the pockets. It's not going to be spent on more heating. It's not going to be spent on more energy. The pattern has changed and on top of that the price of solar energy is now coming down to competitive rates with fossil fuels. On top of that, we haven't mentioned coal this morning, but the odd contrary fact is that for all of the efforts of the Greens and the energy transformation we're now burning more coal than ever. Europe is awash with coal; Germany is going back to lignite; India is developing more coal. The coal story has still got to through its full length. So it doesn't surprise me that demand insecurity, which is revenue insecurity, which we all dislike, is what may happen.

JD: If I can come back to you Mr. Xu about the pricing we see as a result of this demand uncertainty today. Qatar had very generous [LNG] pricing over the last few years, will China be more demanding and suggest 'look we have to break this link to the [oil-price] index and you should bring your prices down, we're living in a new reality' and this could have quite a sharp impact on Qatar going forward. Do you think that's going to be the outcome?

XU XIAOJIE: In China, I think in the future, around 2020, the natural gas price will be much lower than the current price, simply because we're facing multiple sources around the world, not only LNG from Qatar. But we have multiple sources, secured already from Central Asia to China by pipeline and Russia. And also, we have much more, LNG supply that will be available from America, from Canada, from Australia, even from Africa, for example. So I believe the future price in Asia will be much lower and China's market will be playing a big role in making such a price.

JD: Ali Khedery, why don't you weigh in with what Lord Howell was suggesting here with this demand uncertainty? China is going to be asking for lower gas prices going forward. This is going to be not great news for the emerging energy powers of Iran, Iraq, Libya in transition, Algeria, perhaps in transition at leadership with the health of Mr. Bouteflika. This is going to be a rough time in the broader Middle East, is it not with what we're talking about here about energy security?

ALIKHEDERY: Just going back to the issue of demand, I think that while globally demand patterns have fundamentally changed, particularly in Europe because energy prices have always been so expensive, I think in the United States that necessarily doesn't apply. In the sense that while Americans generally speaking over the past decade have gone to using more efficient cars, you're seeing an immediate effect now with oil plunging again. Americans are buying 4x4s again, they're buying SUVs again. They're reverting to their usual pattern.

JD: We're not long-term thinkers when it comes to consumption.



ALIKHEDERY: Well, if you're paying half or a third less of what you did a year ago for oil or for gasoline at the pump, that money tends to be spent in other parts of the economy. There's also an important issue to discuss here which is that in the U.S., as we know West Texas Intermediate has always been markedly lower than Brent crude, and that's especially the case for the spot price of natural gas. In the U.S., natural gas is now below \$3 a million BTU, it's about 2.80, 2.90. In some parts of Asia they're paying above \$15. And that has created a fundamental difference and a fundamental tailwind for the American economy and a fundamental headwind for its competitors. That's why, for example, BMW is opening its largest factory in the world, including Germany, in the U.S. now because even with relatively high labour price in the U.S., it's paying half of what it is in Europe for energy and it's paying probably a quarter of what it pays in Asia for energy.

With regards to regional geopolitics, I agree with His Excellency Mr. Siniora—and his Excellency the Minister would know better than me—but I think that for Saudi Arabia and the other Gulf Arab producers, the fundamental decision recently to maintain

production is fundamentally grounded in economics and trying to maintain market share. I don't believe that it was a politically-based decision, although there are some within various palaces around the region that I'm quite certain are very happy to see the Iranians and the Iraqis and their Russian patrons suffer after the genocide that Iran and Iraq and Hezbollah have inflicted on the people of Syria or Iraq over the past several years. The concern I have though is frankly we've seen the Iranian revolutionary guards, the Iraq Shiite Islamic militias, their allies in Syria, their allies in Lebanese Hezbollah and again, their global Patron, Russia, these are very ruthless actors and they have retaliated for much smaller perceived slights against domestic political opponents or regional rivals. I'm actually quite concerned that we may see a black swan event if prices remain low in the form of an asymmetric or irregular warfare attack on Gulf infrastructure, or frankly, cyber. The Russians capabilities are quite well known to the West. You've seen a small country with a small fraction of Russia's capabilities, North Korea, has dealt a devastating attack to Sony pictures in the U.S. And the U.S., for all of its tremendous global

capabilities, was unable to stop it in advance. It was only able to pinpoint it after.

I think the combination of regional radicalization—and this is where I respectfully disagree with Mr Siniora—I actually don't think the issue of Israel-Palestine today is a primary factor for regional instability; I think it's poor governance that is the primary factor. And I think the best indicator of that, or the best model, is only the United Arab Emirates, thanks to Sheikh Zayed and the other leaders of the United Arab Emirates who have diversified their economy, who have integrated their population, who, generally speaking, have exceptional governance. You see in the UAE, there's very, very little, almost no radicalization. In the rest of the region, the failed states that you mentioned, Libya, Egypt to a certain extent under Mubarak, Yemen certainly, Iraq certainly, Syria and Afghanistan and Pakistan, you've seen tremendous radicalization because of the poor governance. The problem that we face is not only does the poor governance remain in these countries so the fundamental driver of ISIS or Al-Qaeda is still there. But now with the reduction of oil prices, again in places like Iraq or Algeria or Yemen or Iran, I'm afraid that the reduced economic opportunities for these millions, tens of millions of young

men and women is going to further radicalize these populations and come back to haunt these fundamentally market-driven policies of keeping oil low for a sustained period.

JD: In light of what Mr Khedery said, Minister, it's nearly two months in to the decision by OPEC to leave production where it is. Do you look back and suggest this was still the right decision? This is going to be the correct path for 2015?

HE SUHAIL MOHAMMED AL MAZROUEI: Oh, yes, I'm confident and I think you need to look at this as a unified decision. This is not a decision driven by one country. We discussed the rationale of the decision and we discussed the reasons for us not to react to something that we did not create. Those who created this oversupply, they need to learn the lesson and adapt to stabilizing the market, because they are not small players anymore. In 2020, there will be 8 million barrels produced. Shale oil alone will be as big as Saudi Arabia. So if they don't behave rationally as a group—and I know how difficult it is to make them act rationally as a group—you cannot expect one country to do it. The other challenge that we have within the group is: we have countries that aspire to go back to their production.



If the quota that we protected as OPEC reduces, the challenge is going to be even further. It's not the fact that the UAE want to maintain a certain share alone. It's the OPEC share that we want in the international market that we want to protect. And that share, by 2020, will be reduced naturally because it does not grow. It just stays the same and the world demand on oil grows.

JD: For the collective good of OPEC, is it the right decision though for countries like Iran and Iraq and Algeria to go through this much pain in the near term?

HE SUHAIL MOHAMMED AL MAZROUEI: You need to look at and go back to 2008. What did we do in 2008? We reduced by 4.2 million barrels. The glut today in the market is about 2 million. So even if you reduce, I'm sure someone will take advantage and produce it and then you will have the problem again. So we took such a decision. [If not,] I think we'd be regretting it today because we won't see an impact. You are better off to leave the market to stabilize: it's good for the consumers; it's good for the world economy; it's good for China. And I think the reaction will need time. Those giant economies, China, are not going to drop everything that they have done and change suddenly to something else because the price for six months dropped to \$50.

JD: You saw the latest reports from Blackstone and Goldman Sachs suggesting that it's going to be a range of \$40-46 dollars a barrel in the first half of 2015. What do you make of these latest reports?

HE SUHAIL MOHAMMED AL MAZROUEI: I don't believe any of those because I have seen the same telling us in 2007, 2008, there's going to be \$200 by now. So I think we need to go back to the basics: does it make sense to produce at the current prices for all of the producers? I think the answer is obvious. Now, is this drop in the prices justified, to drop like this in this short-term? No. If you go back, the demand on oil at \$50, is it going to be the same demand growth on oil at \$50 dollars or \$70? Is it going to be the same as if it's at \$100? I think even in Europe, we have seen countries like Germany shifting to coal for economical reason, not for environmental reason. And I'm sure they will shift back to hydrocarbon if the price is right. So I think that's the fundamental rule of the market that

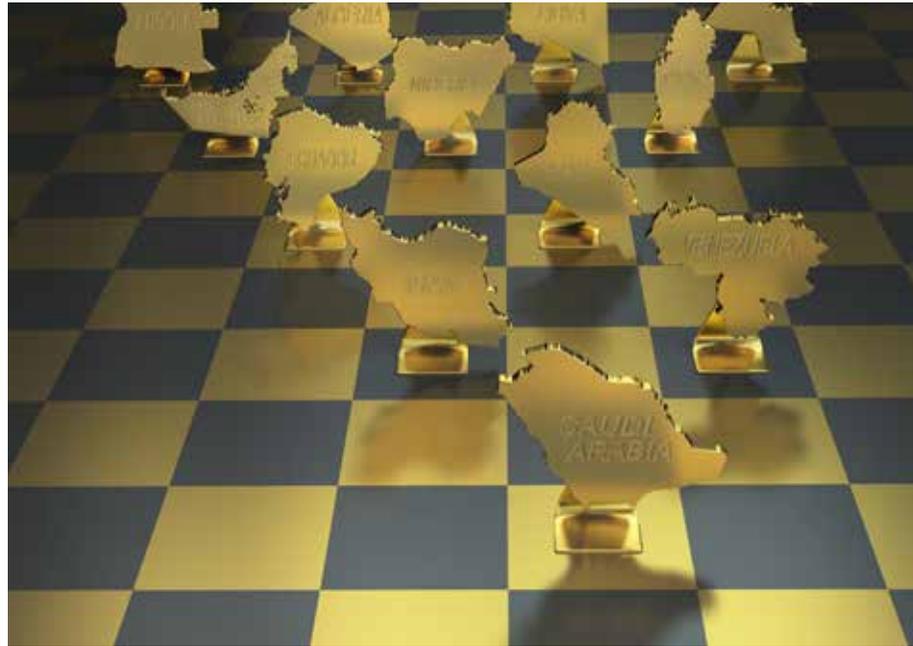
“I'm afraid that the reduced economic opportunities for these millions, tens of millions of young men and women is going to further radicalize these populations and come back to haunt these fundamentally market-driven policies of keeping oil low for a sustained period.”

ALI KHEDERY

we will see, but we need just to wait for it to happen.

JD: I've listened to you very carefully here. The new normal sounds like \$70 a barrel where the UAE is comfortable at.

HE SUHAIL MOHAMMED AL MAZROUEI: I told you, no one in this region can dictate that price anymore and take that from me. No one from this region can dictate and is interested to dictate that price anymore. We are not in the 1970s or 80s anymore. We are open economies and we are looking and working with great economies like China and others as responsible producers. Who is going to dictate the price? I think it's the lowest, who should be a swing producer. Those highest-cost producers, they always need to be on the top. And I think it's going to be switching on and switching off for those shale oil producers; they will produce when it's economically viable for them to produce and they will shut off those wells when it does not make sense. And that is going to be the stabilized price that you will see. And no one can tell you if it's \$80, \$85 or \$70 or whatever price. We will produce always, as long as it makes sense for us to produce.

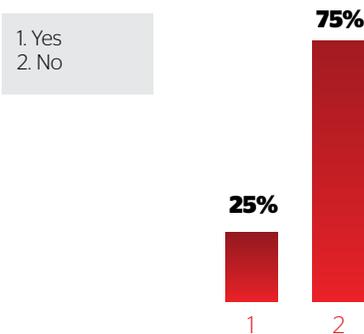


JD: Okay, final point, which I didn't get a chance to bring up. We've seen the price cutting; Russia is entering in that market. Is this the new battle ground, securing your customers in Asia and this is what it's all about?

HE SUHAIL MOHAMMED AL MAZROUEI: I think we are forgetting a whole continent called Africa here, in this discussion. If you look at the growth in certain countries in Africa, and China is a prominent investor there, whether from hydrocarbon or whether from other sources, Africa, I think, at lower oil prices, will wake up and will grow. Asia is going to be staying as a major demand source, everyone is focusing on Asia. But I think even the Asians, especially China and India, they are now focusing on Africa, investing in Africa. And they are smart. They foresee that the growth is going to be in Africa. Supply for hydrocarbons, I don't see it softening in the long run. Yes, in the short term; but in the long run I think it will be there. There is a limit to the growth and production from shale oil, 2020, 2025, wherever that number is and then they'll start declining and OPEC and others, of course, need to supplement that growth. Technology will help us of course. But what is the price? The price is always going to be what is fair for those who are the most expensive producers.

JD: Let's take the vote then from the floor. Following recent carbon treaties including last year's climate agreement between the U.S. and China, should oil exporters and international oil companies revise downwards their recoverable oil reserves?

Q2: Following recent carbon treaties, including last year's climate agreement between the US and China, should oil exporters and International oil companies revise downwards their recoverable oil reserves?



No. Not such a bold decision after all, right? Nobody is taking it quite into stride unless the rest of the world takes it on cue. ■

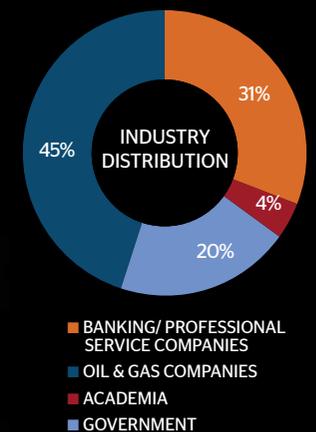
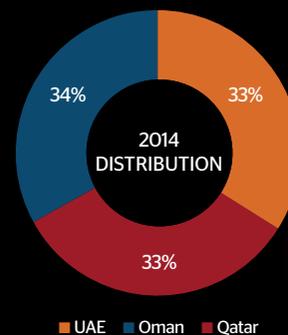
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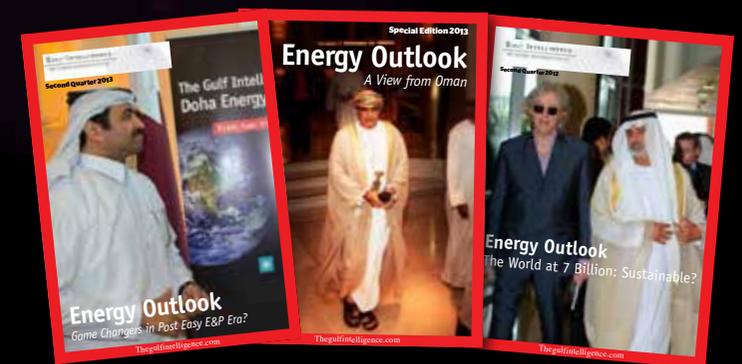
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