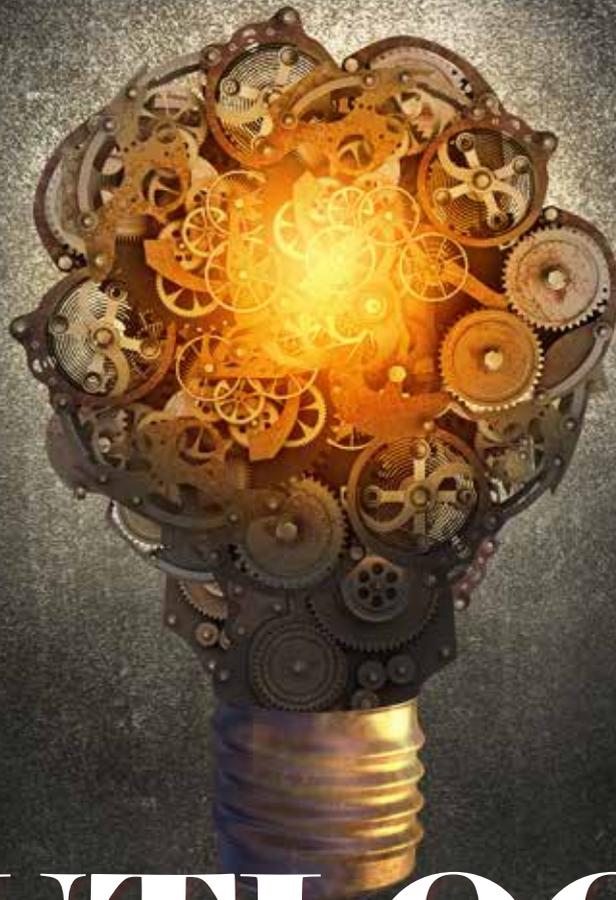




The Abdullah Bin Hamad Al-Attiyah International Foundation
for Energy & Sustainable Development

ENERGY ELDERS

~ Harvesting Solutions for Tomorrow from the Wisdom of Yesterday ~



OUTLOOK 2020+

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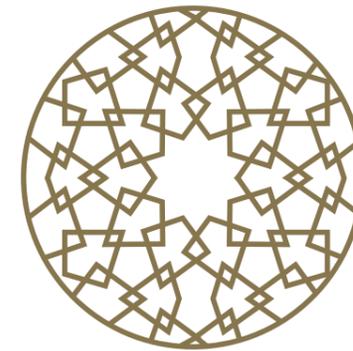
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INTRODUCTION



The Forum of ENERGY ELDERS

~ Harvesting Solutions for Tomorrow from the Wisdom of Yesterday ~

INAUGURATION MAY 9th, 2017

The Forum of Energy Elders are being inaugurated by The Abdullah Bin Hamad Al-Attiyah International Foundation for Energy & Sustainable Development on May 9th, 2017 to commemorate the Fifth Anniversary of the Foundation's International Energy Awards for Lifetime Achievement.

The Abdullah Bin Hamad Al-Attiyah International Energy Awards are given annually to individuals for their Lifetime Achievement in the advancement of global energy in seven categories. The nominees are selected by an international committee who chooses candidates for an outstanding record of accomplishment over the whole of their careers. Since 2013, the accolade has recognized many of the world's most respected energy figures from Asia, Africa, the Middle East, Europe and the U.S.

The Forum of Energy Elders is an initiative to harvest the collective wisdom of the now 30 distinguished Alumni of the Al-Attiyah Awards, and present their vision to the world on how to tackle some of the most pressing energy issues facing industry and society over the coming decades.

This Publication – “Energy Elders – Outlook 2020+” – is the first offering from this exemplary

group of leaders, who emulate the Al-Attiyah Foundation's independent voice, not bound by the interests of any nation, government or institution.

The Energy Elders will gather in Doha in early May for what we hope will be the first of many live knowledge-exchange forums, where they will brainstorm with policy makers, industry and academia on how to resolve some of the most pertinent energy challenges. The results will be put forward in a Whitepaper of recommendations for sharing with a wider group of stakeholders – Harvesting Solutions for Tomorrow from the Wisdom of Yesterday.



H.E. Abdullah Bin Hamad Al-Attiyah
Chairman, The Abdullah Bin Hamad Al-Attiyah International Foundation for Energy & Sustainable Development

Foreword



“OUT OF THE DESERT”

BY H.E. ALI I. AL-NAIMI

HONORARY AWARD FOR THE ADVANCEMENT OF INTERNATIONAL ENERGY POLICY & DIPLOMACY 2016

I was born in 1935, in the eastern deserts of modern-day Saudi Arabia. My mother was a Bedouin and, for the first eight years of my life, we travelled the region with our extended family seeking water and a place to graze our livestock. My first job, aged four, was tending baby lambs.

The image seems romantic, but it wasn't. It was a precarious existence. We had little water, food was scarce and there were no modern sources of power. You can't flick a switch in the desert. The weather and conditions were harsh – blisteringly hot in the summers and freezing at night in winter. I didn't own a pair of shoes until I was nine years old. But

then you didn't need shoes in the desert. This life made you tough. We were survivors.

Then, in 1938, American prospectors struck oil. Life in Saudi Arabia would never be the same again. Through luck, and some ill-fortune that befell my close family, at twelve years old I began working as an office boy at this strange US oil company, then simply called Aramco. Almost seventy years later I'm still here.

All of us Bedouin kids were quick learners and hard workers. We had to be. My enthusiasm was appreciated and I was lucky to be encouraged into education, first in Saudi Arabia, then in Lebanon.

“The Arab people are like all people. We are concerned about our families, our kids, our health and their education. The Arab people are fun loving, good natured and tremendously loyal.”

I then studied geology at Lehigh University in Pennsylvania, and followed this with a Masters at Stanford University in California.

All this set me up for a life in the oil business. I returned to the Kingdom in November 1963 and started to apply my knowledge in a bewildering range of jobs. I must have done something right, because I was soon getting regular promotions.

People ask me the secret of my success and I tell them: hard work, luck and making my bosses look good. The idea is simple. If your boss looks good, he might get promoted – and you can take his job. It certainly worked for me.

In 1984 I became the first Saudi president of Aramco. In 1988, the year the company was renamed Saudi Aramco, I was installed as the first Saudi CEO. It was, by any measure, quite an achievement for a Bedouin kid.

But I didn't have time to celebrate. In 1990, the first Gulf War kicked off, directly threatening Saudi Arabia and its huge oil reserves. Thanks to the courage of Saudi citizens and leaders, and with vital support from our allies, the battle was won. And thanks to the hard work of Saudi Aramco employees, the oil kept flowing.

Meanwhile, I began to look east. China was on the rise and Saudi Aramco sensed a growing opportunity for future growth across Asia. It was a fascinating time for me, exploring new cultures, meeting new people and grappling with negotiations that took me well outside my comfort zone.

Then, in 1995, aged sixty and looking forward to retirement, a call came from the king asking me to become Saudi Arabia's oil minister. That's not an offer you turn down.

So began a new odyssey lasting more than twenty years, meeting world leaders, grappling with oil politics and overcoming various international and domestic challenges. In 1997/8, oil prices collapsed to under \$10 a barrel, leading to a hectic round of global diplomacy. By 2008, prices spiked at a staggering \$147. Cue more negotiations and tough decisions.

It's been a rollercoaster. I've never looked back. And I'd do it all again.

As for my motivation for writing my autobiography, let me be clear: I didn't do it because of my ego, I didn't do it for the glory and I certainly didn't do it for the money.

For many years people asked me to tell my life story but I didn't have either the time or the inclination. To be honest, I'm still not sure it's a good idea, but I understand that I've had an interesting life and career, and I appreciate that other people are interested in it.

The reasoning behind this book is simple: if one young person who reads it is inspired by my career, then I've done a good job. Saudi youth, male and female, and in fact all Arab youth, could use more positive role models. There are many already, but I hope I can be added to the list. If I, a poverty-stricken Bedouin kid born in a desert, can make it, anyone can.

More broadly, the Arab world is often misunderstood. It receives a lot of media attention, but much of it is negative because of the seemingly endless squabbling and fighting throughout the region. But that's not what we're really about. The Arab people are like all people. We are concerned about our families, our kids, our health and their education. The Arab people are fun loving, good natured and tremendously loyal. ●

“This article is an extract from H.E.'s biography “Out of the Desert” (2016)



H.E. Ali I. Al-Naimi is a world authority on energy. He was Minister of Petroleum and Mineral Resources for the Kingdom of Saudi Arabia (1995–2016), and primary architect of OPEC strategy. He helped to create the International Energy Forum, key to improved producer-consumer dialogue. He led the Kingdom's UN delegations on climate change and remains a champion of solar energy, and carbon capture and sequestration. Al-Naimi was Chairman of the Board of Saudi Aramco from 1995–2015, the first Saudi CEO of the company (1988) and the first Saudi President (1984). In 2006, Al-Naimi led the development of King Abdullah University of Science and Technology (KAUST), where he remains Chairman of the Board of Trustees. He holds a degree in geology from Lehigh University (US) and a Masters in hydrology and geo-economics from Stanford University (US). His memoir, *Out of the Desert*, was published by Penguin Random House.



SECTION I

Sustainable Development?



OUTLOOK FOR THE PARIS AGREEMENT

BY H.E. ABDULLAH BIN HAMAD AL-ATTIYAH

CHAIRMAN, THE ABDULLAH BIN HAMAD AL-ATTIYAH INTERNATIONAL FOUNDATION FOR ENERGY AND SUSTAINABLE DEVELOPMENT

As Founder of the Abdullah Bin Hamad Al-Attiyah International Foundation for Energy and Sustainable Development, it is an honor for me and a thing of great joy to see the creation and inauguration of the Al-Attiyah Elders Forum by the Foundation. It is very befitting to the caliber and achievements of the members of the Elders Forum, to mark the inauguration with this special publication on “Energy Outlook 2020”. This allows some words of wisdom, vision and insights from these eminent personalities with many years of experience and service in the energy sector, to be captured for posterity.

We do not need to look too far into the future, to realize that responding to climate change is one of the greatest challenges facing the global energy industry. Hence, I have chosen, as a lead article for this special publication, to share some insights on the Paris Agreement. When 196 countries that are Parties to the United Nations Framework Convention

on Climate Change (UNFCCC) adopted the Paris Agreement in December 2015, it represented a major breakthrough. After more than 20 years of negotiations, the world agreed on a blueprint on how to keep global climate change well below 2 degrees Celsius. The agreement is seen by many as the last hope for humanity to preserve the foundations for a healthy planet.

Now that the focus is shifting from negotiating an agreement to implementing action on the ground, it is important to reflect how the energy industry can contribute to the global effort to combat climate change. Under the Paris Agreement, each country has to set forth a climate action plan (a Nationally Determined Contribution - NDC), which describes the targets of the country, and the means for reaching the target. These NDCs have become front and center of attention for companies and organizations who want to understand what role they can play, and how they will be impacted by the new climate policies. In



**DURBAN
2011**



**DOHA
2012**



**WARSAW
2013**



**LIMA
2014**



**PARIS
2015**

this short article, I will use what I refer to as the four “Ps” to briefly describe the scenario that creates an opportunity for the energy sector to contribute to a bullish outlook for the Paris Agreement.

THE PROCESS

Paris was the most successful climate change conference ever, but it was a culmination of a very long evolutionary process of painstaking bilateral and multilateral diplomacy and negotiations at national, regional and international levels.

The painstaking journey from Durban to Paris passed through Doha at COP18, which I was privileged to serve as the President. The process allowed for the involvement of all governments and all sectors of the economy and civil society. It enabled the concerns and interests of all countries to be adequately considered.

THE PURPOSE

The Paris Agreement succinctly captures the ultimate objective of the Convention by emphasizing the need to address the urgent threat of climate change through commitment to aggregate emission pathways that are consistent with holding the increase in the global average temperature to well below 2 degrees Celsius above pre-industrial levels. There is recognition that the required response needs to be effective, progressive and based on the best available scientific knowledge. The purpose is underpinned by a recognition in the Paris Agreement that climate change actions, responses and impacts have an intrinsic relationship with equitable access to sustainable development and eradication of poverty.

THE PRINCIPLE

The interpretation of the UNFCCC core principle of ‘common but differentiated responsibilities and respective capabilities, in the light of different national circumstances’ has always been a heavily contested issue between developed and developing countries, throughout the many years of climate change negotiations. The breakthrough reached in Durban on this core principle, allowed countries to focus more on inclusivity, collaboration and cooperation, during the critical stages of the Paris process. This ensured a consensus on the five foundational contours of the Paris Agreement

– national climate actions, a comprehensive framework, long-term goals, periodic stock takes, and financial resources.

THE PARTICIPATION

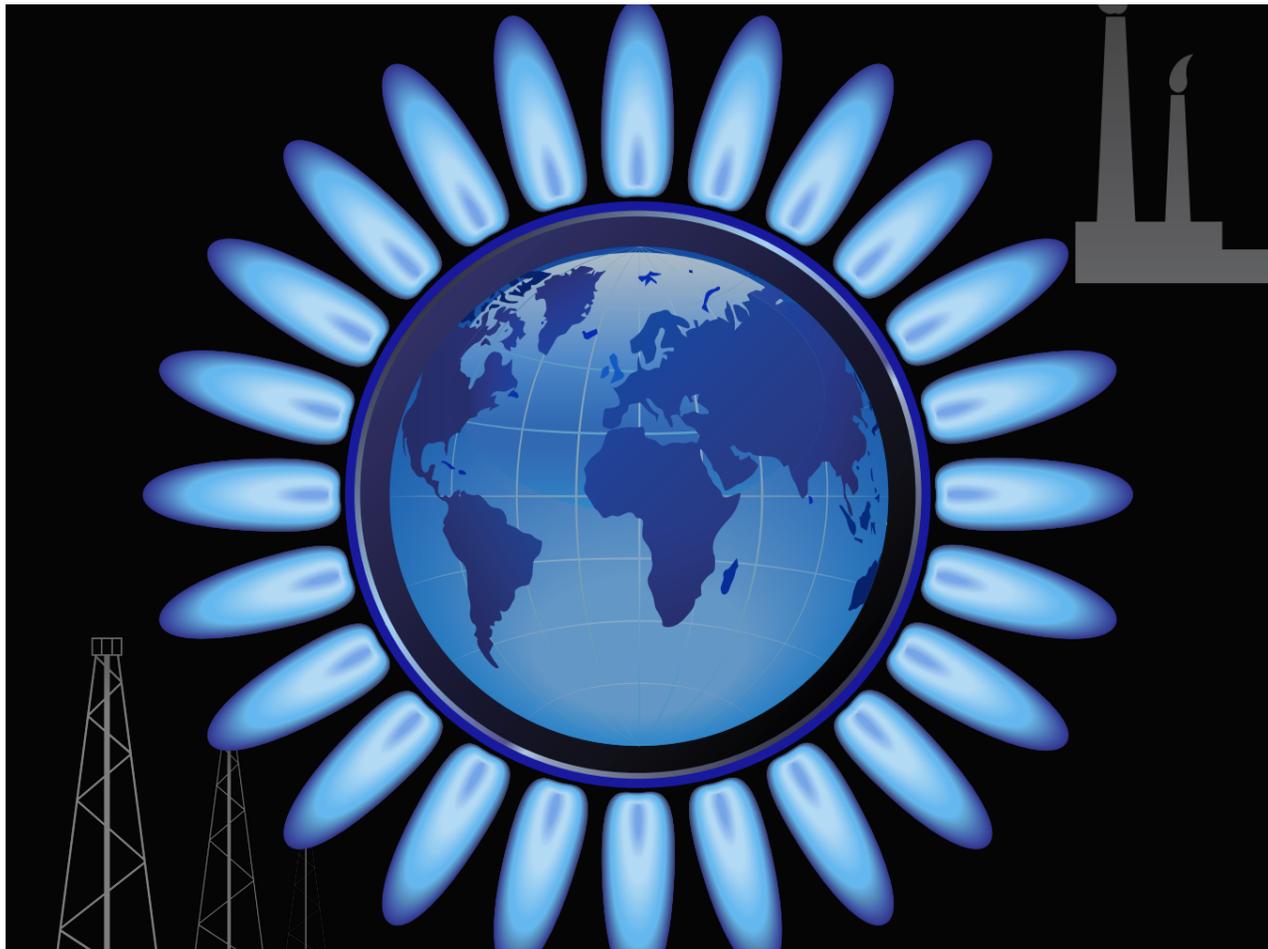
The Paris Agreement recognizes the need for the widest possible cooperation by all countries and participation of all sectors of society, including the different tiers of government. The Agreement is indeed a game changing outcome, as it represents a paradigm shift from the Kyoto Protocol era, where big industry – particularly energy – was largely seen as the culprit, to a new era where the sector could now become part of the solution.

The Paris Agreement signals that real transformation of the energy sector is the will and undertaking of all world governments. In a recent report produced for the German government as President of the G20, the International Renewable Energy Agency (IRENA) indicates that investment in renewable power and energy efficiency could add about 0.8% to global GDP by 2050, boosting the world economy by \$19 trillion.

Nobody understands what it would take to transform the energy sector more than the players within it. The prognosis of the Paris Agreement becoming an effective global tool for addressing the climate challenge is very high and I am delighted that the energy industry is stepping up to be counted among the leading actors. The Al-Attiyah International Foundation is ready to be a committed partner on this important mission. ●



H.E. Abdullah Bin Hamad Al-Attiyah has more than 30 years of experience in the energy industry and has served in several senior leadership positions within the government of Qatar. In 1992, H.E. Al-Attiyah was appointed Minister of Energy & Industry and Chairman and Managing Director of Qatar Petroleum, before being entrusted with the additional responsibility of Second Deputy Prime Minister in 2003. Four years later, H.E. was elevated to Deputy Prime Minister, and in 2011 was appointed Chief of the Amiri Diwan. H.E. Al-Attiyah has also served as Chairman of Qatar’s Planning Commission, and was elected as Chairman of the United Nations Commission on Sustainable Development in 2006; and the President of 18th Session of UNFCCC Climate Change Conference (COP18/CMP8), Doha in 2012. During his illustrious career, Al-Attiyah has been bestowed a number of international awards as well as the Necklace of Independence award by H.H. Sheikh Hamad bin Khalifa Al Thani, the Emir of the state of Qatar.



CHALLENGES FOR MAJOR OIL & GAS COMPANIES POST-PARIS

BY SIR MARK MOODY-STUART

HONORARY AWARD FOR THE ADVANCEMENT OF INTERNATIONAL ENERGY POLICY & DIPLOMACY 2017

The Paris climate agreement of 2015 has had an impact on thinking in the oil and gas industry. For the first time, all countries acknowledged that steps had to be taken to mitigate the effects of damaging climate change. The focus was very much on the reduction of carbon dioxide emissions from fossil fuels. While companies assume different rates of change, by now effectively all assume that the changes will be profound. This remains broadly true despite the scepticism of the new US Government. However, although the direction of travel is clear, the lack of clarity on timing and form presents major planning and strategy challenges for energy companies.

This uncertainty is compounded by the fact that the outcome of Paris was not an agreement in any conventional sense, but a collection of commitments by each country to contribute to the process. These

independently determined commitments vary greatly and do not add up to anything approaching the 2-degrees centigrade target, let alone the aspirational 1.5 degrees. The agreement neglected any commitment to pricing carbon, a step regarded by most economists and many major energy companies as essential. Furthermore, the paradox is that while many experts believe that technology exists to meet the climate targets, few have any confidence that the political will exists to make it happen.

Energy companies look at the growth of electric vehicles, moves towards self-driving vehicles and the sharing economy and realise that the long-held belief that transportation is the last bastion of hydrocarbon use is under threat, or is at least reduced to aviation and marine transportation. The real last redoubt of hydrocarbon demand is the petrochemical industry, demand for which is likely to grow with

new technologies, and of course lubricants. Together these could ultimately represent some 10-20 million barrels a day of demand. Having said that, there is much variation in industry estimates of when peak demand will occur, ranging from 2030 or earlier to 50 years or more hence.

While it is possible to create many entirely plausible scenarios covering different rates of change and different technological paths, a company can implement only a single strategy, designed to be robust to different possible scenario outcomes.

The basic building block of any strategy is clear. At some point in the future our industry will face a battle for share under a fixed or declining demand curve, with probable price competition. Only investment in projects with a breakeven cost well below the current oil price range of \$50-60 are likely to be robust. Furthermore, light oil and projects with low energy input into the extraction process are likely to be favoured if carbon is priced. Wise companies are now applying shadow carbon prices somewhere above \$50 per ton, comparing for example carbon price implications of shale production versus conventional light oil projects. Most companies are already emphasising gas production in their portfolios as an important fuel in the transition to intermittent renewables, probably with a later demand peak than oil.

Such a strategy represents only a small modification to business as usual and is applicable in any commodity market. It is instructive to look at the mining industry; for example iron ore, where three or four major low cost producers dominate and others scramble for small shares around the edges unless they can penetrate the market with truly low cost production in modest increments.

The real challenge comes in the search for lines of business to replace the loss of markets for hydrocarbons. This challenge is compounded by the historical fact that few companies have managed to transition to a new and unrelated technology and thrive. An obvious strategy is therefore to build on existing skills or adjacent areas of business.

One possible no-regret approach is carbon capture and storage. While the technology to safely store carbon dioxide is available, the challenge is one of economics. A carbon price of more than \$50 per ton of CO₂ is needed and there is little sign of this happening. Furthermore, the most likely sites for successful applications are large power generation complexes and most major oil companies have historically few links to utility power generation. Currently usage, as opposed to storage, of carbon dioxide is limited at the scale required.

The development of biofuels is a route being followed by several majors. Unfortunately, the use of cellulosic material for fuels is proving challenging in energy and economic terms and the production

of biofuels from algae remains experimental. The scope for non-cellulosic biofuels is thus currently limited by the priority which must be given to food production. However, the prize for success is great.

A major asset of global companies is their network of retail outlets and daily connection with millions of customers. This is leading some to seek alternative uses for these assets, for example for electric vehicle charging or as delivery points for e-commerce. Retail networks also have potential as delivery points for hydrogen fuel-cell fuelling.

Major refiners are already the largest producers of hydrogen and, pending a transition to renewable hydrogen, production of a hydrogen rich fuel by reforming gasoline on retail sites or on vehicles could compete with battery electric vehicles by providing faster and more convenient refuelling options. In the nineties, this appeared to be promising. While interest from motor vehicle manufacturers appeared to wane in the early 2000s, there now appears to be a renewed push. Such a development would allow effective use of fuel retail networks and a transition easier for hydrocarbon companies.

The last and perhaps most radical step for oil and gas companies is through direct investment in renewable energy production. This takes companies into areas requiring new skills and different business models. Offshore hydrocarbon production duplicates some skills required for offshore wind generation. An industry move to renewables is probably essential if the global economy is to be progressively powered by electricity. In such a scenario, it is indeed wise for companies to look at increasing involvement in electricity at all stages from generation to storage and use.

In the coming decade, we are likely to see different companies following combinations of the above approaches at differing rates, as well as others not yet apparent. There will inevitably be winners and losers. In a world where few chief executives and management teams are likely to be active for more than ten years, those with persistence and thinking beyond the short term demands of the market are likely to find the most effective transition route. ●



Sir Mark Moody-Stuart is Chairman of the Global Compact Foundation and of the Innovative Vector Control Consortium (IVCC). He was Chairman of the Royal Dutch/Shell Group 1998-2001, of Anglo American plc 2002-09 and of Hermes Equity Ownership Services 2009-2016. After a doctorate in geology, he worked for Shell living in Holland, Spain, Oman, Brunei, Australia, Nigeria, Turkey and Malaysia, and UK. A director of Saudi Aramco 2007-, Advisory board of Envision Energy 2012-, Accenture (2001-2015) and HSBC (2001-10). Chairman of the FTSE ESG Advisory Committee. Vice Chairman of the UN Global Compact Board 2006-. Honorary Co-Chairman of the International Tax and Investment Center 2011-, Member International Council for Integrated Reporting, Author of "Responsible Leadership – Lessons from the front line of sustainability and ethics". Married to Judy with four children.



LOW CARBON ECONOMY AFTER THE PARIS CLIMATE AGREEMENT

BY PROFESSOR TAN CHORH CHUAN

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF EDUCATION FOR FUTURE ENERGY LEADERS 2014

On 4 November 2016, the world welcomed the landmark Paris Agreement on climate change, less than a year after it was adopted. This unprecedented development in international climate negotiations is testament that with strong political will, countries can set aside their differences and work towards a common global imperative.

Two other agreements last year similarly made headlines and impacted the shift to a low carbon economy. In October, the International Civil Aviation Organization (ICAO) reached an

agreement for the sector to achieve carbon-neutral growth beginning 2020 and in Kigali, Rwanda in late October, countries agreed to cap and phase-out the use of super powerful greenhouse gases called hydrofluorocarbons.

All these steps combined demonstrate the sense of urgency in tackling the problem of climate change. And in large part because global leaders have realized the enormity of this challenge, the world is now beginning to move forward together towards a low carbon economy and clean energy future.

¹ PricewaterhouseCoopers, The Paris Agreement: A turning point? The Low Carbon Economy Index 2016, November 2016. <http://www.pwc.com/ee/et/publications/pub/low-carbon-economyindex-2016.pdf>

CARBON INTENSITY IN DECLINE

Indeed, 2016 saw a marked change in the transition of the global economy towards a less carbon intensive one. A recent report by PricewaterhouseCoopers highlighted that the global decarbonization rate averaged 1.3% over the last 15 years. In the lead up to the Paris Agreement in December 2015, carbon intensity fell by a record-breaking 2.8% (up from 2.7% in 2014).¹ Some major emerging economies, including China, showed sharp reductions in carbon intensity last year. Several countries also saw falls in coal consumption.

These may potentially be the first signs of the uncoupling of emissions from economic growth but it is not enough if we wish to stay within the 2 °C temperature threshold.

In Singapore, we do not subsidize renewable energy options but have taken steps to use a cleaner fuel mix for electricity generation, switching from fuel oil to natural gas. Singapore invests actively in research, development, and demonstration (RD&D) of clean energy technologies to improve the performance of existing systems and develop innovative ways of integrating renewable energy systems into our urban environment. The National University of Singapore (NUS) is proud to contribute to RD&D in several areas including energy efficiency, energy storage, smart technologies, renewable energy sources and natural gas.

CHALLENGES FROM THE PERSPECTIVES OF EMERGING ECONOMIES

Emerging economies have long stressed the need to consider the economic and social consequences of response measures, particularly those with negative impact, when addressing enhanced national and international action on climate change mitigation. Challenges have and will continue to arise with the progressive reduction or phasing-out of market imperfections, use of fiscal incentives, tax/duty exemptions, subsidies in greenhouse gas emitting sectors and energy price reforms to reflect negative externalities of burning fossil fuels.

Any effort to mitigate climate change will affect countries whose economies are highly dependent on fossil fuels. As Singapore positions itself for the next phase of growth in its energy and chemical industry, the Republic is taking the lead in terms of raising the bar in energy efficiency, emissions management and accelerating development of new, sustainable feedstock and technologies in partnership with industry through the Jurong Island version 2.0 initiative.

Recognizing the importance to companies of plant-level sustainability efforts, the Singapore government recently enhanced measurement

“In Singapore, we do not subsidize renewable energy options but have taken steps to use a cleaner fuel mix for electricity generation, switching from fuel oil to natural gas.”

and reporting requirements under its Energy Conservation Act of 2013 and actively supports and encourages companies to adopt energy efficiency improvement projects.

FLEXIBILITY IS KEY TO CONVERTING POTENTIAL HEADWIND INTO OPPORTUNITIES

The world is facing vital decisions about the energy of tomorrow but it is clear that there is no one size fits all approach. We must recognize that strategies will be different and flexible to take into account the latest climate science, how measures affect one another and acceptability by stakeholders. To date, there is little consensus on what a low carbon world would look like and this is troubling for some.

Greater clarity on the plan of action at the country level and how governments intend to translate aspirational goals into laws and regulations will be important for investors, who seek robust country and sector risk analysis when making decisions. Core climate policies must be backed by a clear long-term commitment by governments and continuous, systematic efforts to support the low carbon transition, giving stakeholders the confidence they need to take long-term decisions.

PARIS RULEBOOK WILL ACCELERATE TRANSITION

The momentum that has brought the Paris Agreement into force at unprecedented speed is clearly welcomed but the Paris Rulebook needs to be developed and adopted urgently if countries wish to deliver a clear process for tackling the global problem. We are hopeful that it will provide the impetus for accelerated action across the world, and prove to be a significant step forward in the global low carbon transition. ●



Tan Chorh Chuan is President of the National University of Singapore. He concurrently serves as the Chairman of the Board of the National University Health System; Deputy Chairman of Singapore's Agency for Science, Technology and Research; senior advisor to the Governing Board of the Monetary Authority of Singapore; and of Mandai Park Holdings. He is a member of the World Economic Forum's Global University Leaders Forum, which he chaired for a 2-year term. He is the first Singaporean to be elected as an international member of the US National Academy of Medicine.

ENERGY: CO² MATTERS, COSTS MATTER AS WELL

BY CLAUDE MANDIL

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF PRODUCER-CONSUMER DIALOGUE 2016

Among many unknowns, we can expect three domains of certainty which will impact energy markets through to 2040. The global population will dramatically increase (albeit at a slower pace), in particular in Africa where energy consumption per capita is currently the lowest.

Secondly, fossil fuel resources will remain plentiful, contrary to what some were fearing a few years ago; this is due to the shale revolution and lower demand growth trimming as a consequence of energy efficiency gains and renewables policies.

Thirdly, climate is changing more strongly and faster than anticipated. Combatting GHG emissions is not only a must, but a matter of urgency: the sooner we curb GHG emissions, the better the result. That is why I assume that the 2015 Paris Agreement will be fully implemented because failing to achieve this would draw the world into uncharted territory.

Now what about the uncertainties? The main one is electricity mass storage and whether it will become commercially available. If the answer is yes, we can predict that electricity will become the dominant final energy consumed, including in domains where it is today poorly developed, such as space heating and transport. The reason is that you can always produce electricity without emitting CO²: renewables, nuclear and fossil fuels together with CCS (carbon capture and sequestration). As both power demand and supply will be increasingly variable, storage will be the solution to avoid expensive investments in production and transport capacities.

If scientists and engineers however fail to provide safe, large, cost-effective storage products, space heating and transportation will remain the domain of choice for fossil fuels. Does that mean that we should abandon any hope to limit global warming to less than 2°C? Not necessarily, but the tools become more diverse and more difficult to implement.

Examples of these tools are hybrid vehicles able to consume less than 2 litres per 100 km; hybrid buildings using electricity for heating when it is available and cheap and natural gas when it is not

“The demographic surge in Africa renders the prospect of North American style energy consumption simply unviable going forward.”

or district heating with CCS; and second or third generation biofuels for transportation. Another tool is general implementation of CCS, which will be key for abating industrial emissions from steel, cement, fertilizers, refining, etc. and which is the only way to obtain negative emissions (capturing biomass-produced CO²).

The demographic surge in Africa renders the prospect of North American style energy consumption simply unviable going forward. We cannot avoid deep, necessary changes in our behaviours which are now required; these will certainly be different but not necessarily make us less happy.

Equally, we cannot continue to ignore the costs related to our policy choices, and moreover to let the end-user consumer ignore it; we need to implement the least-cost options first. To make this clear, we should scrap all energy subsidies and give a price to CO² emissions which triggers appropriate investments in low carbon energy production, energy storage and energy efficiency. The urgency today is addressing global warming and policy tools for that purpose should be technology neutral. ●



Claude Mandil served from 2003 to 2007 as Executive Director of the International Energy Agency. This post climaxes his commitment to international cooperation in energy affairs, in parallel with his career as a distinguished French civil servant. Before joining the IEA, Claude was CEO of the Institut Français du Pétrole. Earlier posts have included Director General for Energy at the Ministry of Economics, Director General of Bureau of Mines and Geology and Advisor in the Prime Minister's office. Claude is a graduate of France's Ecole Polytechnique and Ecole des Mines. He advises governments, companies and organizations on Energy Policy.



PEAK OIL DEMAND & CARBON CAPTURE & SEQUESTRATION

BY PROFESSOR GIACOMO LUCIANI

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF EDUCATION FOR FUTURE ENERGY LEADERS 2015

The debate on peak oil demand is raging. Opinions differ widely concerning when oil demand might peak, but few deny that it will. We face the mirror phenomenon to the peak oil production theory: it is banal to say that sooner or later oil production will peak, but is this imminent? We discovered that it is not, and now the prevailing narrative is one of oil (and fossil fuels generally) abundance. Hence, we are now concerned about peak demand.

I find discussing when oil demand will peak not very productive. It largely depends on the behavior and perceptions of decision makers - a category which includes governments, corporations and billions of consumers. The date of peak oil demand is not written in destiny, it is in our hands.



“The new approach of the major oil producers is to emphasize that low cost oil should be produced first. This means that prices should be kept relatively low, to avoid excessive supplies from expensive sources, and maintain a healthy momentum in demand.”

Oil producing companies have started worrying about peak demand, and we can already see the implications in their production and price strategies. Until quite recently, a conservationist attitude had prevailed: in this view, oil is a scarce resource and should be used with moderation, making sure that enough is left for future generations. This strategic approach was shaped by debates in OPEC already in the 1960s, and has remained prevalent until recently. In fact, some expect (or hope) that currently low prices cannot be maintained, because production might not keep pace with global demand.

The new approach of the major oil producers is to emphasize that low cost oil should be produced first. This means that prices should be kept relatively low, to avoid excessive supplies from expensive sources, and maintain a healthy momentum in demand. It is a difficult strategy to implement, because it obviously clashes with the fiscal constraints of all oil exporting states, albeit at very different levels of stringency.

But is price the only relevant policy variable? In the new environment of abundant fossil fuels, the major limiting factor for global demand is concern for global warming. The drive to decarbonize our energy system is equated with increasing reliance on electricity, generated from low-carbon sources. The green approach to the future of energy preaches accelerated phasing out of all fossil fuels, and in many cases also rejection of nuclear energy.

Oil, and indeed all fossil fuel producers will need to compete to defend their role in global energy provision. A technological battle is underway: proponents of renewables are investing massively in seeking a solution to the problem of intermittency through the establishment of smart grids, interconnections and better storage technology. Fossil fuel producers should defend their trade, concentrating on carbon capture and sequestration (CCS) to prove that their resources can still be used in a decarbonizing world.

It is indeed very surprising how little attention is being paid to CCS by all major fossil fuel exporting countries - in many, there is an attitude of complacency towards unacceptable practices such

as gas flaring or venting and methane leaks from pipelines still prevail. There is one CCS project underway in Saudi Arabia and one in the UAE, but one would expect to see much more aggressive investment and large-scale implementation. It is clear that CCS can only be implemented to capture fixed point emissions, notably in industry - while in the use of oil concentrates in transport, carbon capture cannot be envisaged, at least not with existing technology. However, pursuing decarbonization from major industry sources would not be a minor contribution by any means.

CCS may not be commercially viable under current circumstances, but most new renewable sources are not. Betting on the latter has allowed a very significant decline in costs, such as the fact that cost parity in power generation now appears to be at hand. Betting on CCS may lead to a similar decline in costs.

Major international oil companies and producing countries have favored pursuing decarbonization through the imposition of a price on carbon emissions. The latest report jointly published by the IEA and IRENA (Perspectives for the Energy Transition 2017) envisages carbon prices at \$ 190 per ton of CO² - a distant objective. Such a level of carbon prices would certainly change the commercial viability of CCS, and betting on the technology reinforces the credibility of insisting that the carbon price should be the main policy tool for pursuing decarbonization. ●



Prof. Giacomo Luciani was called to establish a Master in International Energy at the Paris School of International Affairs of Sciences Po in 2010. The Master accepts approximately 60 students per year from all over the world. In 2010 Giacomo, in association with John Gault and Alexander van de Putte, started working on the establishment of a Master of Advanced Studies (Executive Master) in International Oil and Gas Leadership at the Graduate Institute of International and Development Studies in Geneva. Since then, this Master has completed three cycles in Geneva and was once offered in house to a select group of managers of a major Gulf National Oil Company. In January 2015, Giacomo launched a MOOC (Massive Open Online Course) entitled Politics and Economics of International Energy, which had 4'000 students enrolled in its first edition. Since May 2016 the MOOC is running on Coursera and has seen close to 13'000 students enrolled in one year.

THE UNTAPPED POTENTIAL OF ENERGY EFFICIENCY

BY NOÉ VAN HULST

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF PRODUCER-CONSUMER DIALOGUE 2017

What is the single most important fuel? And what is the energy resource all countries possess in abundance? The answer to both questions is, somewhat surprisingly, energy efficiency! That is the powerful message of the insightful Energy Efficiency Report 2016 of the International Energy Agency (IEA). A strong energy efficiency policy is vital for achieving the central energy policy goals of improving energy security and reducing CO₂ emissions and air pollution in the most cost effective way.

More and more countries are discovering that the safest and the cleanest power plant is the one you don't have to build at all because of higher energy efficiency. Whereas energy policy has been traditionally dominated by a supply side bias (how do we produce more oil, gas, electricity), policy makers increasingly understand that we need to focus much more on the demand side management of consumption. Over the last 15 years for example, we have experienced economic and population growth and vehicle use has increased substantially. Had efficiency levels not improved, then energy demand in IEA countries would have been 12% higher in 2015 than it actually was. And in China, the annual savings from higher energy efficiency now equal the country's renewables supply. One reason why demand side policies tend to be underrated is because energy efficiency is generally politically more difficult to propose to a domestic electorate.

Having said this, the important efficiency gains that we have experienced in the last decades have been driven by stronger policies. Today, 30% of the world's energy consumption is covered by mandatory standards and regulations, up from only 11% in 2000. Significant progress has been made in particular in the area of lighting, as well as cars and space heating and to a lesser extent in appliances.

However, there is still a lot of upward potential with 70% of global energy consumption not yet subject to mandatory efficiency standards. Trucks and electric motors are two key areas where a lot more can be done. Electric motor systems account for more than half of today's electricity consumption in a range of end-use applications such as fans, compressors, pumps, vehicles and refrigerators. In space cooling, 58% of energy consumption has no minimum efficiency standards - applying average stringency standards would reduce energy needs by 30%. Mandatory standards are a critical policy instrument to maintain the long-term drive to

improve energy efficiency, particularly at a time of lower energy prices which generally dampen enthusiasm for chasing savings.

In terms of countries and regions, China and the US are global leaders in imposing mandatory efficiency standards, followed by Japan and the EU. India, Brazil and Middle Eastern countries are still lagging although they have made significant progress since 2000. The share of Middle Eastern energy consumption covered by mandatory efficiency standards was 15% in 2015, at half the global average. In the case of oil and gas producing countries in the region, further improving energy efficiency would also help them expand their export potential.

How should we assess the current state of affairs in energy efficiency from a global perspective? The good news is that it is improving and accelerating, even in the current low oil price environment. In 2015, global energy intensity improved to 1.8%, three times the annual average of the last decade. In the same year, global investment in energy efficiency increased by 6% to \$221 billion, led by growth in the buildings sector. Intensity gains in 2015 were higher in emerging economies like China, a trend that is expected to continue.

The bad news however is that this progress is still considered as too slow, according to the IEA. Annual intensity gains need to increase to 2.6% to achieve the global climate goals of the Paris agreement. Since we now know that there is so much untapped potential in energy efficiency, it should be feasible for all countries to further boost this to unprecedented levels by applying already existing best practices in energy efficiency mandatory standards. As the famous Nike slogan goes: "Just Do It!". ●



Noé Van Hulst is Ambassador of the Netherlands to the OECD and the IEA since 2013. He holds a Master's Degree and a Ph.D. in Economics (Free University, Amsterdam). Mr. van Hulst started his career as Researcher in Micro-economics at the Free University in Amsterdam followed by an appointment as Senior Economist and Deputy Head of the Social and Economic Council (SER) in the Netherlands. In 1999 he became Director-General Energy at the Ministry of Economic Affairs, prior to that he subsequently worked as Deputy Director Technology Policy; Director Competition & Fair Trading and Deputy Director-General Economic Structure. In 2003, Mr. van Hulst joined the International Energy Agency (IEA) in Paris as Director for Long-Term Co-operation and Policy Analysis. From 2008 to 2011 he held the position of Secretary-General of the International Energy Forum (IEF) in Riyadh, Saudi Arabia. In 2012-2013 he was Director of the Energy Academy Europe.



RENEWABLES & THE DECARBONISATION OF THE ENERGY SECTOR

BY ADNAN Z. AMIN

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF RENEWABLE ENERGY 2016

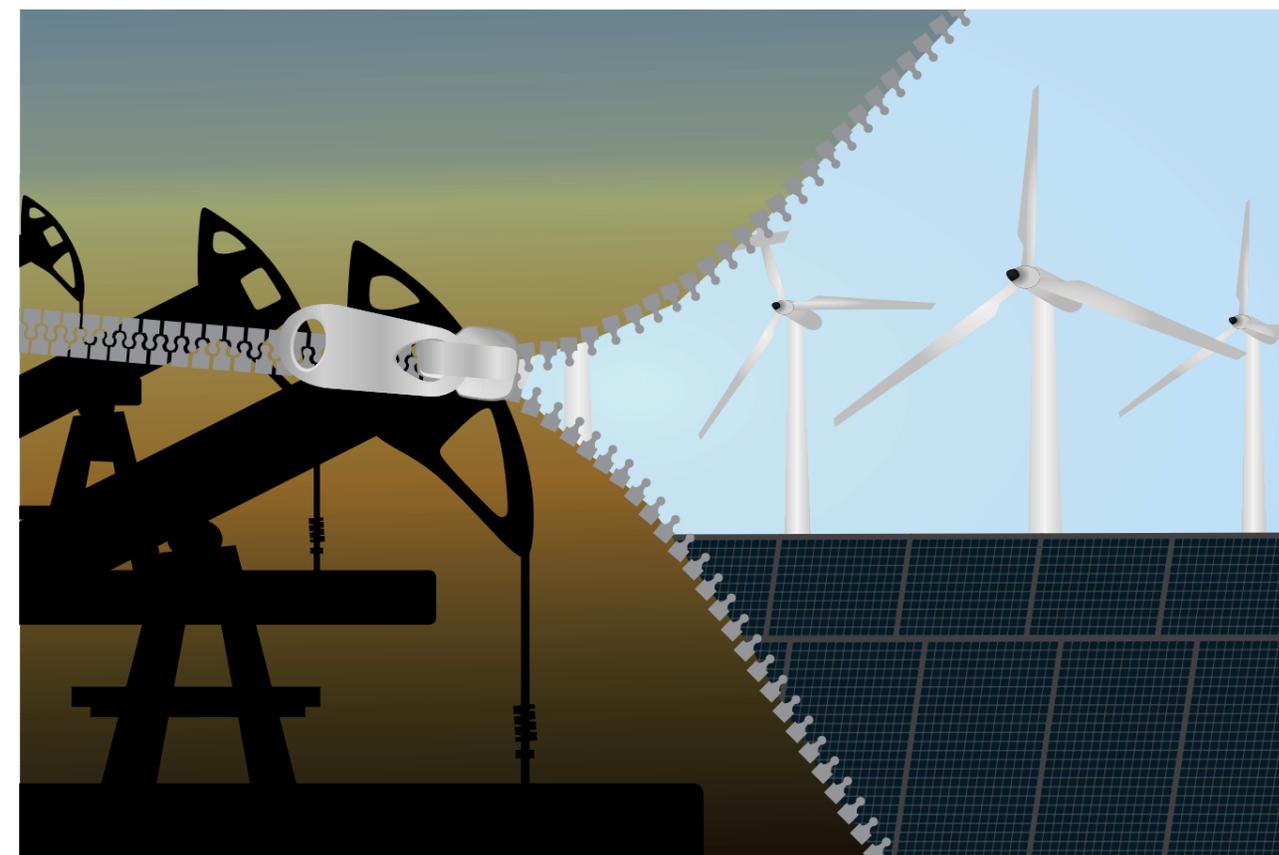
With the adoption of the Paris Agreement, the international community has demonstrated an unprecedented determination to address climate change and dramatically reduce carbon emissions. Yet, many countries are grappling with translating the objectives of the agreement in the energy sector, which is responsible for two thirds of emissions. In this context, renewable energy is the readily available solution to put us on a path to implement the Paris Agreement. IRENA's new study - Perspectives for the energy transition: Investment needs for a low-carbon energy system - finds that a decarbonisation of the energy sector by 2050, in line with the 'below 2°C' objective of the Paris Agreement, is both technically and economically feasible, and will bring vast economic benefits.

We are undergoing a period of profound change, with renewable energy moving from the fringes to centre stage of the energy landscape. IRENA's newly released Capacity Statistics report found that renewables generating capacity increased by 161 gigawatts last year, making 2016 the strongest year ever for new capacity additions. Remarkably, over 50% came from developing countries, showing the global nature of the opportunity before us. Investment in renewables reached a record \$348 billion in 2015, up from just \$50 billion in 2004. The tremendous growth experienced by renewables is largely the result of continued cost declines, with solar PV module costs falling by as much as

80% since 2009, and wind turbine costs by almost a third. Renewable energy has become a sound business and investment proposition, and is poised to be cost-competitive with any other energy source on the grid around the world.

This transformational opportunity is truly global. Around the world, countries are raising ambitions as they look to boost renewables deployment. Earlier this year, China announced plans to invest at least \$361 billion in renewable power generation by 2020. Several small island developing states, including the Cook Islands, Cape Verde, Fiji, Saint Vincent and the Grenadines, Vanuatu and Samoa, have all taken concrete steps to increase the shares of renewables in their electricity mix to between 60% - 100%. In the oil producing Gulf region, the UAE, where IRENA is headquartered, announced last January that it would cut carbon emissions by 70% and have 44% of power generation from renewables by 2050. Meanwhile, the private sector is increasingly using sustainable energy to power its operations, with major global corporations actively sourcing renewables and conventional energy companies expanding their renewable energy portfolios.

The socio-economic benefits of the transition to sustainable energy are enormous. Our decarbonisation study shows that investing in the energy transition can fuel economic growth and create new employment opportunities, boosting global GDP by 0.8% in 2050 compared to our Reference Case. That is the equivalent of almost



“Our decarbonisation study shows that investing in the energy transition can fuel economic growth and create new employment opportunities, boosting global GDP by 0.8% in 2050 compared to our Reference Case.”

\$19 trillion in increased economic activity between today and 2050. Moreover, renewable energy jobs would be around 25 million by 2050, from our current estimate of 9.4 million jobs today, with solar and bioenergy being the main employers.

We find that the net additional investment needed to undertake the transition would amount to \$29 trillion over the period 2015-2050. These investments are affordable, in part because of further significant cost reductions we will see in renewables expected between 2015 and 2050, and some of these quite dramatic. In addition, savings due to reduced health impacts from air pollution and climate change exceed the costs by a factor of between two and six in 2050.

If we delay action, however, total investment costs will rise, and stranded assets will increase. Negative climate trends will escalate with major social and economic repercussions. The cost of inaction will be much higher than the cost of action.

At the same time, hydrocarbons will continue to play an important role in the energy sector for the years to come, as total fossil fuel use in 2050 would remain at a third of today's level in the

energy supply mix. Through the pursuit of their economic diversification strategies, Gulf countries are positioning themselves to reap the economic benefits of the energy transition, which include freeing up more domestic fossil fuel resources for export or use in the petrochemical industry, reducing water usage in the power sector, and creating local jobs and manufacturing. Looking ahead to 2050, the Gulf region can maintain its leadership in the energy sector while ensuring its long-term economic and social prosperity.

As we enter this new era of change, the energy transformation will drive economic transformation. A sustainable energy future is within our reach if we take action now. ●



Adnan Z. Amin, as the first Director-General of IRENA, has led the Agency to become one of the world's fastest-growing international organisations, and established it as the global voice of renewables. With 25 years of experience in international cooperation, Mr. Amin has a proven record as a driving force in advancing the global agenda on sustainable development, environment and energy, and an active player on the world stage.

INNOVATIVE TECHNOLOGIES OUTLOOK: Adaptability Equals Profit

BY THE ABDULLAH BIN HAMAD AL-ATTIYAH INTERNATIONAL FOUNDATION FOR ENERGY AND SUSTAINABLE DEVELOPMENT

Innovative technologies, such as robotics, digital data and solar tools, are revolutionizing the energy industry as steam power did in the 1700s, electricity in the 1800s and hydrocarbons in the 1900s. The industry's status quo is being overhauled – again – and the days when PDFs of data were manually passed between engineers at refineries, or between desks at offshore oil rigs will soon be remembered as a charming historical habit.





Balancing the books for the Gulf's energy companies is not getting any easier. Turbulent oil prices, soaring energy demand, green regulations and competition from energy producers in the US, Iran, Russia and many others is only going to intensify. Innovative technologies represent the much-needed pressure release valve that can

enhance safety, cost and operational efficiency. To unlock this potential, energy companies must get to grips with the rapidly evolving lingo and application – quickly. The pace of change for those who want to remain commercially competitive will not be measured in decades, but by a few years. The tick of the clock is louder than ever before.

QATAR: SETTING THE TREND

Many energy voices in the Gulf claimed that Qatar's geography would spell the end of its foray into the liquefied natural gas (LNG) markets in the early 1980s before it gained any traction, as the country is not located close to the ports in East Asia, Europe, or the US. Fast forward three decades and Qatar is the world's biggest LNG exporter, with revenues from LNG, natural gas and oil accounting for approximately 70% of government revenues and 85% of export revenues. The country also has one of the world's highest rates of GDP per capita. How did Doha sharpen its competitive edge in an industry so focused on keeping shipping costs low by prioritizing convenient geographies? Qatar's innovative mindset led it to creating an integrated value chain – from production to shipping – that cut costs and established Qatar as one of the world's most reliable suppliers. This was best illustrated by Doha's ability to immediately divert every possible ton of LNG to support long-time ally Japan following the Fukushima nuclear crisis in 2011. Novel ideas have also been used to respond to new global environmental guidelines and in support of Qatar's National Vision 2030, such as reducing gas flaring to almost nil and correcting damaged coral reefs.

NEED FOR ENERGY SECURITY IN THE MIDDLE EAST WILL ONLY INTENSIFY

49%

Energy consumption in the Middle East is expected to climb by 49% by 2035, according to BP's Energy Outlook.



OLD HABITS CANNOT DIE HARD

The hydrocarbons sector is often described as conservative, clunky and slow moving, with an internal bureaucratic structure that does little to foster and promote new ideas. It can be extremely risk averse and carries the mantra that there is everything to lose, as opposed to everything to gain. This will no longer suffice.

While the oil and gas industry helped trail blaze some digital concepts in the 1980s and 1990s, the evolution of the Internet of Things (IoT) and digital analytics in recent years, for example, means energy stakeholders must update their knowledge. The alternative is to fall behind while competitors widen their profit margins.

Using IoT – where objects have network connectivity that enables them to send and receive data – can significantly accelerate the pace at which companies build their historical and comparative databases, thus boosting safety and efficiency. The

IoT market is estimated to grow from \$157 billion in 2016 to \$662 billion by 2021 at an annual growth rate of 33.3%. Such technologies enable industry to predict when a process may fail and why, which has the potential to cut the bill down to one hundredth of the initial cost.

Crossover technologies, which are tools from other sectors that can be applied to the energy sector, have long been applied to the energy industry. But squeezed finances mean they are increasingly popular strategies to hedge against very expensive unexpected shutdowns, safety challenges and environmental hazards.

Examples include automated image analysis used by security forces for facial recognition being applied to determine drill bit damage and using data mining that is typically applied to reducing the drag on a racing car whizzing around a track at 200km/hr by milliseconds to bolster efficiency in oil and gas operations. Ultrasound technologies

X8

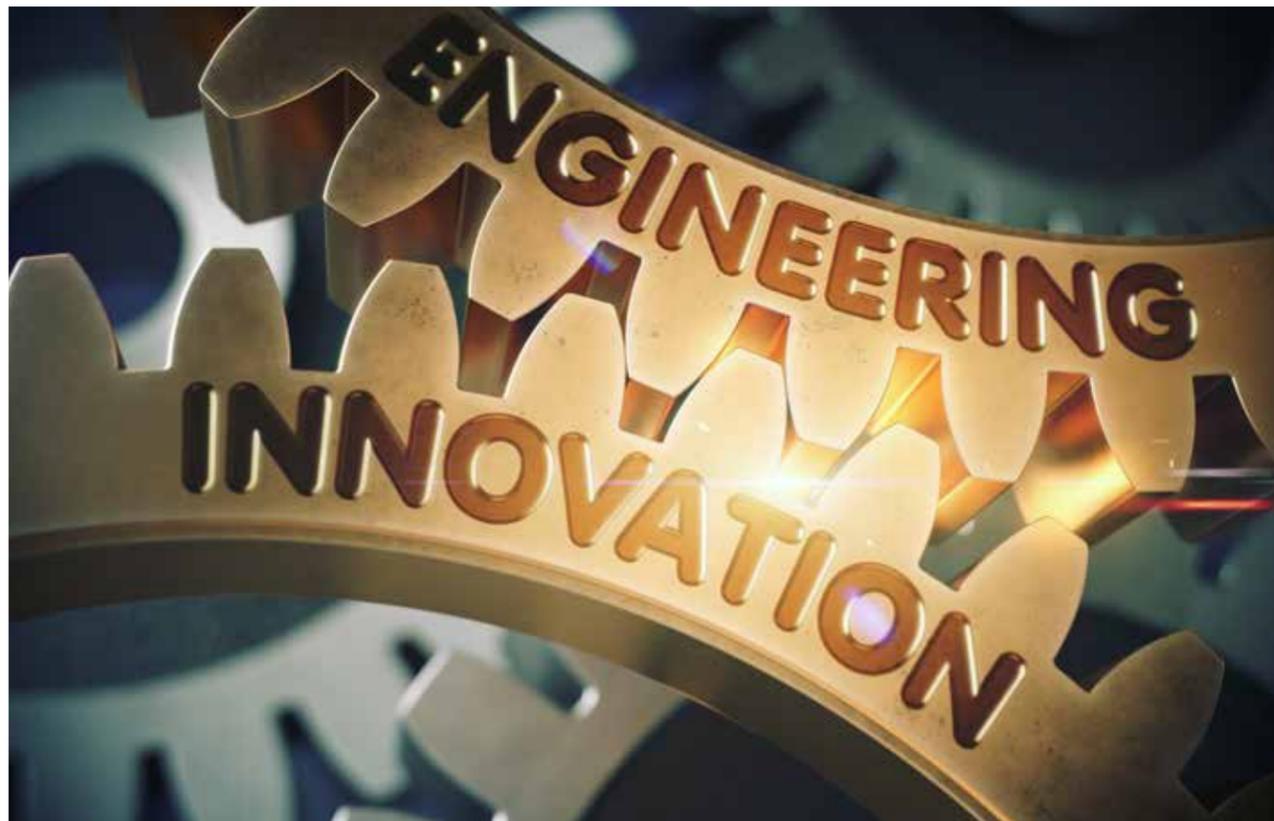
Qatar's population of 2.67 million could swell eight-fold by 2050.

5

Dubai's population is expected to double to 5 million by 2030.

500,000

Half a million people this year will join the 12 million people already in Cairo – one of the world's fastest growing cities.



originally developed for medical uses can be used to detect cracks during upstream exploration, which is especially vital for the maturing fields onshore and deep-sea sites that need special attention.

Lessons can also be learnt from different parts of the value chain within the energy industry. Robotics, which have long been used in underwater exploration, can be programmed to ‘crawl’ along the tens of thousands of kilometres of the Gulf’s oil and gas pipeline network to detect leaks and corrosion before costly damage occurs, for example.

Low oil prices mean savings are especially popular in today’s penny-pinching industry. Global upstream oil and gas investments fell by more than \$300 billion in total over 2015 and 2016, which marks the greatest fall in more than 40 years, according to the International Energy Agency (IEA). The bearish trend is expected to continue in 2017.

FAIL FAST

The ‘fail fast’ concept is gaining traction, with the view that covering as much ground in R&D as possible keeps high-value talent engaged in an industry that sees a lot of staff movement. It also raises the chances of R&D efforts hitting gold – the launch of an innovative technology. The ‘fail fast’ approach differs to exploratory R&D, which is typically associated with allocating a team to work for several years on a project with no definable finish line. While equally valuable in the field of technical and scientific research, exploratory R&D

does not feed industry’s hunger for quarterly and annual progress.

Whatever the route, industry needs to communicate more clearly with government and academia to ensure that global talent working on R&D are confident that their efforts will have tangible value in day-to-day operations. This will raise the chances that a R&D team will see a project through its ‘life’, rather than an idea being left rudderless as staff move onto new pastures.

Innovative technologies require imaginative minds – there are no short cuts. R&D teams must have the grit and perseverance to fail and fail again. The eureka moment will eventually come – Amazon, Google and Apple are just a few of the world’s biggest names that have all had multiple failures. Thomas Edison, US inventor and businessman, said it best: “Innovation is 1% genius and 99% perspiration.” Such perspiration must be facilitated by a forward-looking management, as well as governmental support and corporate partners who share a thirst for reasonable risk and knowledge sharing.

An individual will struggle to think outside the box when the confines of that box are bogged down with processes, procedures and guidelines. Initiatives that can be introduced include Google’s 20% rule, which sees employees spending a fifth of their time working on novel ideas that they think will most benefit the company. Industry could also adopt aspects of much bigger changes, as seen in the UK where the Financial Conduct Authority (FCA)

6,000

Innovative solar technology will enable Oman’s Miraah project to create 6,000 tons of steam per day to support enhanced oil recovery operations at the country’s Amal field.

33.3%

The IoT market is estimated to grow from \$157 billion in 2016 to \$662 billion by 2021, with an annual growth rate of 33.3%.



has created a ‘regulatory sandbox’. This structure allows financial technology firms to test their innovative business models, products and services without strongly stipulated processes stifling their progress.

FLEXING INTELLECTUAL MUSCLE

A simple question lies at the heart of fostering a collaborative partnership to create, fund and apply innovative technologies in the energy industry: what do you think? Tactfully exposing internal company challenges will generate solutions faster. Speed is vital.

Large organizations like national and international oil companies with sizeable R&D budgets often fall into the trap of keeping information close to their chests for fear of hampering their intellectual property (IP). They tend to hire in-house R&D teams instead of working with external thinkers, which can create circular theories – the recycling of the same ideas that leaves the status quo unchallenged. Therein lies the importance of nimble small and medium-sized enterprises (SMEs) and entrepreneurs, which also represent the fastest growing work force in the Middle East. Qatar alone estimated in late-2015 that SMEs accounted for 97% of the country’s companies. Continually reducing the financial entry

hurdles into R&D and innovative technologies for SMEs and entrepreneurs worldwide is essential to ensuring that small ideas bloom into influential progress.

Enabling the brightest brains to break free of conventional thinking in the field of green energy could prove especially profitable as illustrated by Oman’s Miraah solar project, which will start coming online this year and will eventually be one of the world’s largest solar plants at 1,021 MW of peak thermal energy. The project will create 6,000 tons of steam per day to support enhanced oil recovery (EOR) operations at the country’s Amal field. In the UAE, Al Reyadah, a joint venture between ADNOC and Masdar, officially inaugurated the Mussafah facility last November. The first commercial-scale carbon capture, utilization and storage (CCUS) facility in the Middle East, Al Reyadah will capture up to 800,000 tons of carbon emitted from Emirates Steel and transfer it to ADCO’s Bab and Rumaitha fields via pipeline for EOR. The two projects are just the tip of the iceberg.

As Andre Gide, the winner of the Nobel Prize in Literature in 1947, said: “Man cannot discover new oceans unless he has the courage to lose sight of the shore.” The Captains of the first ships to set sail into uncharted territories often claim the greatest treasures. ●

CORPORATE INNOVATION IN 5 STEPS:

LEVEL 1: Innovation to sustain the deployment of a project. The majority of the energy industry is already adept at maintaining this level.

LEVEL 2: Applying innovation across an organization by redirecting teams and resources to explore a new area, or direction.

LEVEL 3: Emerging as a regional leader in innovation by spearheading a new process, or product on a widespread basis.

LEVEL 4: Enhancing the level of innovation industry-wide by importing ideas from outside the industry and creating something new.

LEVEL 5: Creating a unique concept that can be used on a global basis.

20%

One of Google’s rules includes employees spending a fifth of their time working on novel ideas that could cut costs and benefit the company.

114

The number of countries that have ratified the Paris Agreement as of last November, which encompasses around 79% of global emissions. Political momentum for green innovative technologies has never been stronger.



SECTION II

Future of OPEC?



Oil Diplomacy With A Difference – CREATING A WIN-WIN FOR ALL

BY H.E. DR. MOHAMMAD BIN SALEH AL-SADA

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF THE QATAR ENERGY INDUSTRY 2013

Since the financial credit crunch of 2008, the oil market has been in a state of flux as a result of over-supply and a fragile global economic recovery. Low revenues and profitability amongst producers have adversely impacted investment in the oil industry and in many cases, it has not even been sufficient to prevent the natural decline of oil wells. The significant decrease of capital expenditure in the past two years has now reached a critical state, jeopardizing the security of supply; unless this is reversed, we could see shortages and unwarranted price spikes two to three years from now.

It has been a moot point whether low oil prices have been a “boon or a curse” for the world economy. While initially it may have appeared to be positive for consumers because of lower energy bills, the subsequent consequences have been to

the contrary, characterized by a slowdown in GDP growth, job losses and deflation. When the oil price was above \$100 a barrel, GDP growth was healthier at 5% plus, but dropped to below 3% during the oil price downturn. Even economists agree that there were no real winners, calling it a “negative sum game”. They would also agree that fossil fuels will be needed for a long time to come, to continue fueling the global economy and that a healthy oil industry leads to a healthier world economy.

In such a scenario, the challenge for both OPEC and non-OPEC producers was to address the oversupply and bring back stability to the market. The challenge was compounded by the fact that unlike OPEC which has a platform, non-OPEC producers had no formal framework under which to congregate. Amid these trying circumstances, Qatar, holding the presidency of OPEC and under



“It has been a moot point whether low oil prices have been a “boon or a curse” for the world economy.”

the leadership and wise guidance of His Highness Sheikh Tamim bin Hamad Al Thani, undertook the responsibility to bridge both cooperation among OPEC members and between OPEC and non-OPEC, towards a common platform with a unified objective.

Persistent and persuasive diplomatic initiatives were adopted, leading to the Algiers Accord in September on the sidelines of the IEF conference and paving the way for the OPEC Vienna Agreement on November 30th last year. The culmination was delivered in a deal between OPEC and non-OPEC ten days later to cut 1.8 million b/d from the market during the first six months of 2017.

These were milestones in oil diplomacy, the tangible impact of which is being felt in the financial corridors of several capitals of oil producing nations today. These efforts and the consensus achieved have had a very positive impact on the oil price narrative and market outlook. The dedication of 24 oil producing countries who participated tirelessly in the diplomatic process to find common ground, despite significant political and economic considerations, was no easy feat! However, it was the common objective that was the driving force.

The noticeable feature of these engagements was that most of them were done through consultative meetings in an informal setting, sometimes on the sidelines of prominent energy fora and events. More time and space was allowed to brainstorm and discuss the rationale of each other’s thinking and constraints. The fact that discussions took place in

an open, transparent and friendly manner paid off and helped to alleviate apprehensions and doubts.

These engagements led to a consensus amongst a diverse group of countries, from all corners of the world. It showed that multi-lateral, global agreements are still possible through positive initiatives, can be beneficial and also help to resolve other international issues.

It is heartening to note that reputable international energy agencies see the Vienna agreements and their effective implementation as a promising signal for better prospects for the oil industry. They are forecasting that the market will rebalance as early as the third quarter of this year and these results are in fact already manifesting. ●



H.E. Dr. Mohammed Bin Saleh Al-Sada is the Minister of Energy and Industry, and Chairman of the Board of Qatar Petroleum. Dr. Al-Sada is a member of the Supreme Council for Economic Affairs and Investment. In addition, he is the Chairman of RasGas Company Limited, Qatar Gas Transport Company Ltd. (NAKILAT) and Qatar Electricity & Water Company. H.E. is also the Chairman of the Permanent Water Resources Committee at Qatar General Electricity and Water Corporation (Kahramaa). Dr. Al-Sada has over 33 years of experience in the energy sector. Dr. Al-Sada is a member of the Qatar Foundation Board of Directors. In addition, he is the Chairman of the Joint Advisory Board at Texas A&M University Qatar and of the Joint Oversight Board of the College of North Atlantic Qatar. His Excellency holds an MSc degree and a PhD from the University of Manchester in the UK and a BSc degree in Marine Science and Geology from Qatar University.



TRUMP VS. OPEC: *A Case of Déjà Vu?*

BY ALI AISSAOUI

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF EDUCATION FOR FUTURE ENERGY LEADERS 2017

This is a time of great challenges for OPEC. Hardly has it recovered from the oil supply shock of the US shale revolution than it has found itself faced with a new disruptive development: President Trump's 'America First' Energy Plan. In addition to its potentially far-reaching consequences for global markets and prices, the plan has specifically committed to "achieving energy independence from the OPEC cartel and any nations hostile to [US] interests".² This antagonistic creed comes as no surprise knowing that it had already been spelled out in an earlier context. In 2011, expressing his desire to enter politics and bid for the presidency, Mr. Trump stated in an interview with ABC News: "My big focus

is China and OPEC and all of these countries that are just absolutely destroying the United States".²

Disturbingly, the latter statement echoes President Ronald Reagan's political stance towards the Soviet Union and OPEC. Obviously, any analogy between the US confrontational approach towards the Soviet Union in the 1980s and towards China today might be out of topic here. Instead, we will focus on the parallels in the attitudes and policies towards OPEC, which are remnant from the 1973 Arab oil embargo and, in that context, from the loss of oil pricing power in favour of OPEC. Since then, the illusions of OPEC as a conspiring monopolist or colluding cartel have been hard to shed.

¹ US White House, "An America First Energy Plan" (posted 20 Jan 2017), (www.whitehouse.gov/americafirst-energy).

² Donald Trump's interview with George Stephanopoulos (ABC News) on 19 April 2011, (blogs.abcnews.com/george/2011/04/donaldtrump-interview-transcriptpart-one.html).



Regarding President Reagan, perhaps the best starting point is the turn of the 1980s, when, in the wake of the Iranian Revolution and Iran-Iraq war, OPEC's official selling prices rose sharply to reflect a severe market tightening. In that context, President Reagan's first act in office consisted of an Executive Order repealing the prevailing domestic oil price regulation. This was seen as a necessary move to induce a demand and supply response, ultimately lowering petroleum imports, primarily from OPEC.³

Subsequently, several price-induced structural changes in the oil market combined to erode OPEC's market power. Seizing on OPEC's announcement, in December 1985, of a major policy shift to regain market share, President Reagan claimed credit for the resulting global oil price collapse. In January 1986, he famously and impudently declared in a radio address that "deregulating the price of oil [...] made oil prices tumble and brought OPEC [...] to its knees."⁴

In light of the above, the Trump Administration's energy policy agenda sounds like a déjà vu. In essence, the policy is geared towards mobilizing US vast energy resources to minimize dependence on foreign oil and OPEC. More specifically, the new Administration intends not only to support the shale revolution and continue tapping US vast shale resources, but also to develop all hydrocarbon reserves, especially those located on federal lands, where drilling had been barred by successive Administrations. Furthermore, discounting environmental concerns and brushing aside the fact that coal's demise is not so much due to over-

"To be sure, every US president had, since 1973, big plans for achieving independence from foreign oil, with different policies and outcomes."

regulation than competition from cheap natural gas, President Trump has also committed to reviving the coal industry. Finally, while aiming to use domestic resources as a first-best alternative to foreign oil, the Administration appears to consider Canadian oil among the second-best. In this respect, a series of decisions have been taken to enable the completion of the environmentally most controversial northern section of the Keystone XL pipeline system, ultimately shipping crude oil from the Athabasca oil sands of Alberta as far as the US Gulf Coast.⁵

To be sure, every US president had, since 1973, big plans for achieving independence from foreign oil, with different policies and outcomes. President Reagan and President Trump are no exception. While Reagan relied on using price signals to influence demand and supply, Trump seems focused on the mobilization of primary energy resources to expand supply. For the latter, the likely effect is that even if US oil demand - which was thought to have peaked but is now slightly growing - continues to recover, it will hardly absorb the potential supply additions. It is therefore very likely that the surplus production will be placed in the international market.

Consequently, the risk to OPEC is not so much being completely eliminated from the US market. After all, its members have managed to find other markets as their exports to the US have been shrinking to nearly half their 2008 peak of 5.4 million barrels per day. The risk rather is that of a US permanently glutting global markets and, as a result, bringing prices further down durably. If this were to happen, President Donald Trump would certainly brag on Twitter, in the same manner as President Reagan did on radio some three decades ago, about having "brought OPEC to its knees". ●

³ Executive Order 12287 dated 28 January 1981, US Federal Register, (www.presidency.ucsb.edu/ws/?pid=43901).

⁴ President Ronald Reagan's Radio Address to the Nation on Economic Growth, January 11, 1986, (www.presidency.ucsb.edu/ws/index.php?pid=36936).

⁵ US White House, Presidential Memorandum Regarding Construction of the Keystone XL Pipeline, 24 Jan 2017, (www.whitehouse.gov/the-press-office/2017/01/24/presidential-memorandum-regarding-construction-keystone-xl-pipeline).



Ali Aissaoui has retired from a long career by returning to the Oxford Institute for Energy Studies as a visiting research fellow. He is also acting as an independent consultant, providing advisory in his field of experience and expertise. Ali has long been involved in extensive research on the political economy of petroleum with a particular interest in exploring how political, institutional, socio-economic and technological factors combine to shape energy policy. During his last years working for a regional multilateral development bank, he broadened his research perspective and sharpened his focus on energy investment, investment climate, and financing across the Middle East and North Africa. In addition to informing policy decision-making, Ali regularly shares his research findings and put them to use as a speaker, discussant and peer reviewer. Ali is a member of the Oxford Energy Policy Club, the Arab Energy Club, and the Paris Energy Club.



OPEC & PRODUCER COOPERATION

BY DR. RAMZI SALMAN

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF THE ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES 2015

The track record and high flexibility of the global energy sector has enabled it to deal efficiently with the many challenges that it has had to confront during the last century. In all cases, overcoming adversity needs the cooperation of many operators and players. In the early years, pre-agreed arrangements, such as the Achnacarry Agreement, reduced the chances of confrontation and increased cooperation, securing stable markets and fair sailing. However, in later years, the energy scene was dominated by the struggle of sovereign states for control over their natural endowments.

Since the birth of OPEC in 1960, it has been through several phases. After a phase of preparing trenches for the confrontation phase to follow, OPEC dominated the energy scene. But it wasn't long before OPEC was in retreat. The oil market collapse of the 1980s saw its member countries moving from budget surpluses to deficits, and therefore becoming more inclined towards cooperation

rather than confrontation. Now that OPEC's phase of confrontation is part of history, it would be useful to look at the options available for it and other producers to cooperate towards achieving stable markets and prices, that are rewarding to investors and resource owners - prices that will maintain the competitiveness of crude oil as a major source of energy for consumers. Early OPEC - non OPEC cooperation came in response to the "free for all" 1985 -1986 market; there were no signs then of any relief to the pain of the low prices that all producers were feeling, which was way above the threshold most could tolerate.

The First Gulf war was decisive for the producer - consumer dialogue. The Paris meeting in July 1991 was the beginning of what was to develop into the International Energy Forum (IEF), which has since developed into the most inclusive platform for dialogue on a regular basis between producers and consumers.

Since the start of this century, the energy sector



has had more than its fair share of upheavals. Drastic price increases followed by collapses of magnitude that were difficult to justify. In spite of that, there was no real cooperation to address these abnormal situations. However, the most recent market collapse and a prolonged period of low prices, has caused problems for all producers, especially those invested in shale and high cost conventional production. There were discussions in early 2016 in an attempt to agree on freezing production to allow demand growth to absorb some of the supply glut and then later in the year, agreement was reached to cut production during 2017.

This gave a boost to prices and encouraged shale oil producers to reactivate mothballed facilities and increase the number of operating rigs. As expected, this is pressuring prices and might support extending the agreed duration of production cuts beyond June. Going further down the cooperation path, we have recently heard of invitations to shale oil producers for a dialogue with OPEC and other conventional oil producers. While it is rather difficult to predict the outcome of such dialogue, it will certainly be helpful for most parties to be aware of the source of marginal barrels that will be influencing global oil prices in years to come. Increased cooperation and coordination amongst producers of all affiliations will support market and price stability.

It is to be remembered that OPEC's recovery after the market collapse in the mid-1980s, was the result of cooperation with certain non-OPEC producers who themselves were also keen to put an end to the crisis. As there was no formal organisation that could serve as a forum for the producers' discussions, the dialogue between them was convened under the umbrella of the IEF - which although is formally set up to facilitate producers

and consumers at the state and international organisation level - did make room in its regular ministerial forums, for non-governmental energy industry leaders to participate in, and contribute to discussions. In addition to convening oil producers - both governmental and independent - the IEF secretariat can also provide statistical services required through its Joint Oil Data Initiative, JODI.

It would be advantageous to have regular meetings between oil producers with the objective of not only monitoring the oil markets but also to secure price levels that are rewarding and encourage investment in new capacity; this counters the natural depletion of producing fields and helps to meet the forecasted growth in demand. In seeking to achieve these objectives, producers should not act as a cartel but rather maintain the principles of free trade and fair competition. As can be expected, political and strategic considerations might hinder some of the initiatives on cooperation but irrespective of the number of those that participate, a transparent dialogue will always be beneficial. ●



Dr. Ramzi Salman, started his professional life as a lecturer at Baghdad University in 1962, then joined the Iraq National Oil Company as head of petroleum engineering. On Iraq's nationalisation of the IPC in 1972, moved to oil marketing; establishing SOMO and serving as its CEO and Iraq's governor to OPEC until 1991, when he moved to Vienna and served two consecutive terms as Deputy Secretary General of OPEC. In 1997 moved to Doha as senior advisor to the minister of Energy and CEO of QP until retiring in 2013. Was an active participant and contributor to the IEF, and represented Qatar on its board until 2013 as well serving as secretary of Qatar's national committees for WPC & WEC until 2011. Was decorated by the governments of Brazil and Austria and was also honorary fellow in the Centre for Petroleum and Mineral Law and Policy at Dundee University. Holds a B.Sc.(1st.Hon.) in petroleum production and a Ph.D. in chemical engineering, both from Birmingham University."



OPEC MAJORS VS US SHALE OIL

BY RANDA TAKIEDDINE

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF INTERNATIONAL ENERGY JOURNALISM 2013

The challenge major oil producers from OPEC face through to 2020 is the quick return of US shale oil producers. The cost of shale oil production technology has been reduced significantly and the election of Donald Trump has prompted a redeployment of cash towards rigs and workers in the sector.

Major OPEC producers like Saudi Arabia, the UAE, Kuwait and Qatar are ideally aiming for a \$60 oil price, but so far this year, it has averaged in the \$50s. Trump's energy policy seems to be one of encouraging shale oil producers to ramp up output regardless of clean energy concerns and so oil prices may very well drop once again amidst such a context. The Trump administration has also started slashing regulations and US companies such as Occidental, Conoco Phillips, and Chevron have begun to add rigs. Oasis Petroleum Inc., a North Dakota producer, recently bought 55,000 acres from SM Energy Co. for \$785 million for shale oil extraction.

In fact, even before Trump's election, US drillers were already adding rigs and the EIA has forecast

that US domestic production will rise by 450,000 b/d this year.

The future challenge and uncertainty about the oil price has pushed major producers like Saudi Arabia and the UAE to adopt ambitious programs in renewables such as solar and wind and to find integrated solutions to add value to their oil by investing in petrochemicals and refineries.

In February, Saudi Aramco signed a \$7 billion deal in Malaysia with Petronas to take a 50% stake in the 300,000 b/d RAPID Malaysian oil refinery and petrochemical complex, helping to secure and increase Saudi oil trade in Southeast Asia.

Saudi Arabia's Energy Minister Khalid Al Falih announced that the country plans to launch a renewable energy program of between \$30 and \$50 billion by 2023 to produce 10 gigawatts of power.

The UAE has embarked on massive investment in refineries and petrochemicals and is targeting to produce 50% of its electricity needs from renewables by 2050 as part of a \$165 billion investment.

The prospect of further shale oil development in the US and the possibility that the country could become a net oil exporter one day, increases



“The future challenge and uncertainty about the oil price has pushed major producers like Saudi Arabia and the UAE to adopt ambitious programs in renewables such as solar and wind and to find integrated solutions to add value to their oil by investing in petrochemicals and refineries.”

the likelihood that major oil producing countries will face an era of lower oil prices in the future, particularly amid an outlook of slower global demand growth for oil.

The threat or challenge of increased US shale oil on the global market could be an opportunity or incentive for major Gulf oil countries to reconsider their energy mix and develop clean electricity. Consumption of electricity in the Gulf is huge, particularly in the summer months and a country like Saudi Arabia could generate increased oil export revenues if it can substitute its oil with renewables to produce more of its electricity needs in the long term.

The immediate concern however remains the need for producers to continue to invest in maintaining and increasing reserves, to keep the oil price stable for the next few years. This should mean that they will stick to their decision to cut production this

year and to perhaps extend the cuts for another six months at the end of June. Much of this will rest on how long the danger of low revenues will prevent OPEC from cheating on production level pledges. ●



Randa Takieddine began her career in journalism at the Daily Star newspaper in Lebanon and then worked in Paris as a freelancer for French publications, including Politique Internationale for whom she interviewed King Hussein of Jordan, Yasser Arafat and Muammar Gaddafi. Ms. Takieddine began her coverage of the energy industry on the newsletter Al-Nahar Arab Report and reported on her first OPEC meeting shortly after in Caracas, Venezuela in 1977. In 1990, Ms. Takieddine was appointed Paris correspondent for the Arabic language Al-Hayat newspaper, covering energy and French and Middle Eastern politics. While there, she interviewed French presidents François Mitterrand, Jacques Chirac, Nicolas Sarkozy and François Hollande. Ms. Takieddine is a recipient of the Legion d'Honneur de Chevalerie and the OPEC Prize for long-standing Journalism in 2010. She graduated with a BA in Political Science from the American University of Beirut in 1972.



THE CHALLENGE OF AN EXTENDED OIL PRICE DOWNTURN

BY HAMAD RASHID AL MOHANNADI

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF THE QATAR ENERGY INDUSTRY 2016

As we progress into 2017, it is a good time to reflect on last year, on the legacy of this historic oil price downturn and what the future may hold for the remainder of 2017 and beyond. We entered 2016 in a state of uncertainty – the sustained low oil prices of 2015 had not resulted in the collapse of the industry that many had expected. Rather, 2015 was a year underscored more by what did not happen - massive bankruptcies and widespread Mergers & Acquisitions (M&A) – than what did.

When oil prices hit the mid-\$20s/barrel (bl) in

February 2016, it triggered a survival mindset in many industry players and a continued reduction in Capex and headcount. The air of pessimism began to lift last June as the impact of falling US production helped to reduce the supply glut and strengthen prices. At the same time, the cost reduction strategies implemented across the industry, especially by US unconventional producers, began to take hold. The result has been a price range of \$40-\$50/bl and a reducing cost structure that, while not leading to substantial profit, seems to offer a path to survival.



“By the end of the first quarter of 2017, we were witnessing an increase in M&A and divestitures activity and OPEC finally implementing production cuts with reportedly high compliance.”

By the end of the first quarter of 2017, we were witnessing an increase in M&A and divestitures activity and OPEC finally implementing production cuts with reportedly high compliance. However, we have also had an increase of drilling activity following the decision by OPEC to support higher oil prices and recent reports showing high oil inventory levels may mean the oil production cuts are not sufficient to stabilize oil prices.

The impact of an extended oil price downturn – which started in mid-2014 – will have long-term effects on the industry. There has already been a mindset shift toward shorter cycle projects; \$620 billion of projects through to 2020 are estimated to have been deferred or cancelled and the appetite for long-term complex major capital projects has disappeared, with a few notable exceptions. Although this shift is perhaps not surprising given the beating the industry has taken, the growth of unconventional resource projects makes for a different investment landscape than in previous cycles. This new trend certainly seems to lower the risk of for companies in the industry, but it may also pose the broader challenge of future supply and energy security; where will supply come from in 2020 and beyond and will there be enough short cycle projects to fill a supply gap?

Prior to June 2014, one of the common challenges facing the industry was talent. Would the industry find enough skilled personnel to feed the explosive shale development in the US as well as growth in deep water and related mainstream projects? In the wake of the recent massive layoffs, these concerns seem very distant but the question now is whether these people will return if and when a recovery begins.

When shale development took off in the US, the industry initially struggled to draw people

with the critical disciplines needed, but over time and with the evident success of shale projects, companies operating in that space were able to draw the necessary talent to pursue careers in the sector. However, the current downturn and resulting layoffs in the industry threaten to once more damage the oil and gas brand as a career destination.

So, it is more imperative than ever that companies are innovative in their approach to attracting and developing talent, particularly as a large number of senior employees head towards retirement. Companies should find ways to transfer this wealth of knowledge to the next generation. We should view people as equal to, if not more critical, than capital to the future of the industry. The challenge of capital allocation and people will be the constraint for the recovery of the sector in the future, and it is a question that can and should be addressed by the many brilliant minds in the industry. ●



Hamad Rashid Al Mohannadi is a Board Member and Senior Advisor at Qatar Petroleum (QP), as well as a Board Member and Chairman of the Gas Marketing Committee at RasGas Company Limited. He is also an Advisory Board Member of the Bilateral US-Arab Chamber of Commerce and a founding member of the Abdullah bin Hamad Al-Attiah Foundation for Energy and Sustainable Development. Mr. Al Mohannadi was the Managing Director and Chief Executive Officer of RasGas in April 2007-2015 and has been a board member of Ras Laffan Liquefied Natural Gas Company Limited since 1993. Previous roles also include being the General Manager at Qatar Petrochemical Company (QAPCO), the Vice Chairman of the Board of Directors of Qatar Petroleum (QP), and a Deputy Vice Chairman of the Board of Industries Qatar (IQ). He was also a member of the Board of Trustees of Qatar University and was appointed by His Highness Sheikh Tamim bin Hamad Al Thani as Chairman of the Board. Mr. Al Mohannadi was awarded a BA (Hons) degree in Applied Engineering Science by Portland State University, US in 1981.



OPEC: DEALING WITH 21st CENTURY CHALLENGES

BY WALID KHADDURI

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF INTERNATIONAL ENERGY JOURNALISM 2014

OPEC has encountered several challenges during the past four decades, among them, the rapid increase of non-OPEC production during the 1980s, the Asian financial crisis of 1998-1999 and the rapid increase of tight US oil production since 2004.

Experience has demonstrated that the organization is vulnerable during price crashes. OPEC needs unanimity to agree on new production

ceilings and production cuts but this is often made difficult by geopolitical conflicts among member states with different national interests influencing the decision-making process.

The OPEC ceiling has been around 30mn b/d for several decades, while global OPEC production has been gradually increasing from approximately 80mn b/d to over 95mn b/d. OPEC's percentage share of global output has been decreasing and it

has become necessary to have non-OPEC producers on board while reducing production; this is no easy feat as experience has demonstrated. Several OPEC member states are being categorized as failed states, their political systems and economies in disarray. A leading OPEC producer has accumulated over \$100bn in foreign debt, several member states were obliged during the price collapse crisis to freeze or slow down scores of projects while others have failed to carry out fundamental economic reforms that go beyond reducing subsidies on public utilities.

The nature of the energy industry, similar to other industries, is to encounter constant challenges. Crude oil was the dominant fuel during the 20th century. This is not the case now - rapid technological developments are reducing the cost of production, making available commercially new sources of energy. Vocal global public opinion and concern has also become politically influential in its endeavors for action on global climate change, pollution, less traffic congestion and the necessity of public transportation in urban cities.

Sustainable sources of energy are gradually replacing hydrocarbons. Oil is being used mainly in the transport sector, gas for generating power, while coal use is in serious decline. European states have been able to stop the increasing use of petroleum products for transportation by improving the size and efficiency of public transport systems. Even gas use has decreased in the European Union around 1% annually during the past decade, being replaced by sustainable energy (solar and wind) supported by high state subsidies. The European experience may not be an isolated one; it could set an example for other states intent on reducing pollution in their mega-cities.

While oil demand is on the rise on the back of increasing populations and sustainable economic growth in Asian emerging countries (China, India, and Korea), so are the above challenges. There is a need to work with non-member producing countries to stabilize markets. Market stability assists oil producing countries in planning their economies with more pragmatic projections and expectations, and to maintain crude oil competitiveness with other sources of energy.

SUGGESTED MEASURES

OPEC should embark on talks with the International Energy Agency (IEA) and the International Energy Forum (IEF), bringing together the three organizations that include most of the world's consuming and producing countries, in pursuit of gaining wide support for energy market stability.

There is common interest among both conventional and non-conventional producers to have stable markets. Price collapses cost OPEC and non-members billions of dollars in investment in

“The euphoria of \$100 oil brought havoc to the producing countries’ local economies, raising expectations that could not be met by governments when prices collapsed. A stable oil price assists producing countries in tackling their economies with more pragmatism.”

future production capacity. Consuming countries also suffer because the research and development of sustainable energy becomes no longer competitive with petroleum.

OPEC member countries should also be supported to pursue economic reforms that would diversify their economies. Failure to do this would lay the burden of a financial crisis during the next price collapse on the countries themselves.

A volatile oil price is detrimental to the stability of OPEC member states’ domestic economies. The euphoria of \$100 oil brought havoc to the producing countries’ local economies, raising expectations that could not be met by governments when prices collapsed. A stable oil price assists producing countries in tackling their economies with more pragmatism.

It would also be beneficial for two of the leading producers, Saudi Arabia and Russia, to continue their coordination during future price crashes, as they did in September 2016, to pursue market stability, in cooperation with other producers. Ideally, the US should participate in this coordination but this is unlikely for legal and political reasons. In this case, producers should endeavor to pursue a production cut that would stabilize prices just below the cost of production for unconventional oil, thereby exerting an influence on the level of production and investment in that sector. ●

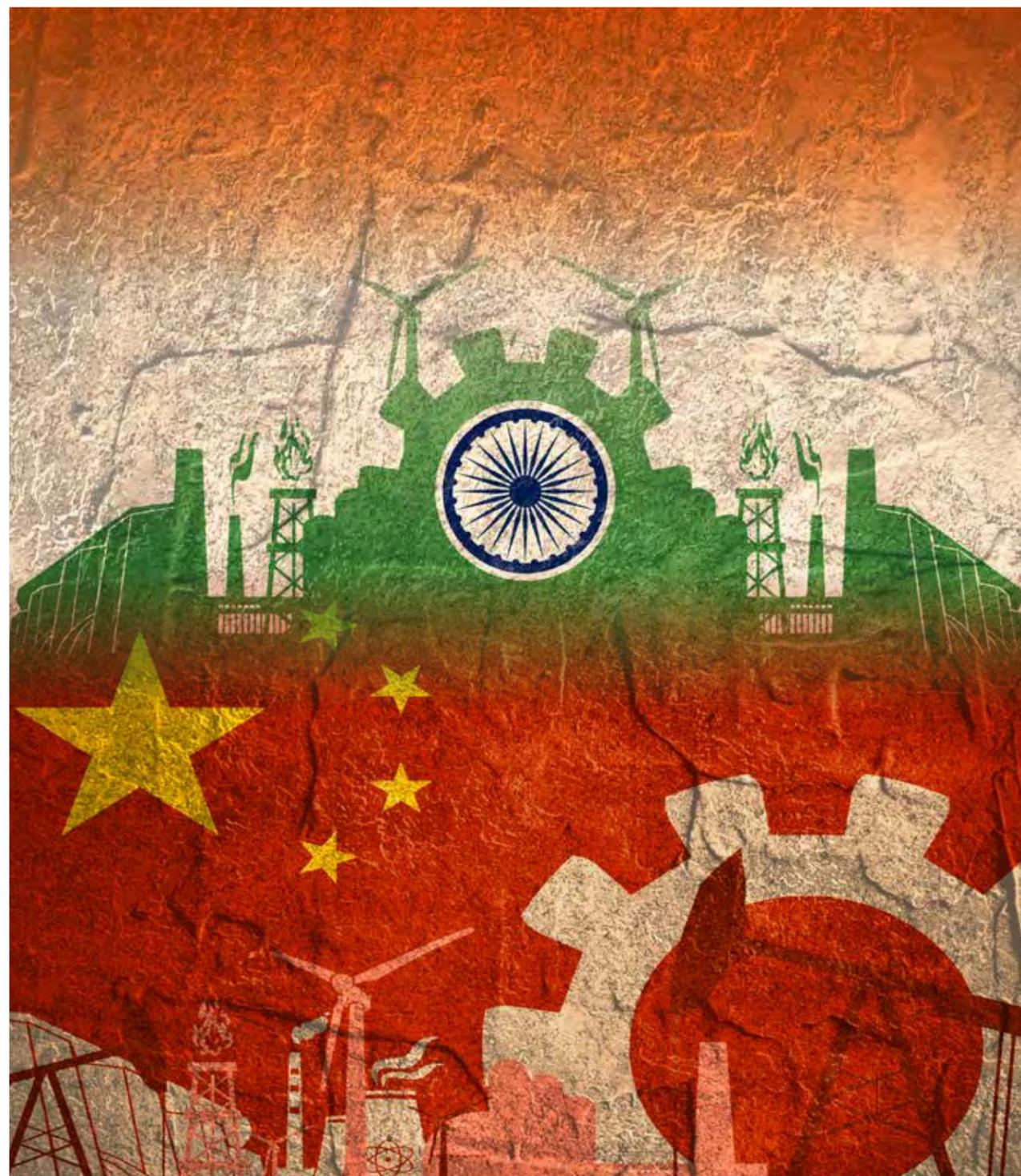


Walid Khadduri, Former Managing Editor and, Editor -in-Chief of The Middle East Economic Survey (MEES), Nicosia 1981-2004 and former Editor of The Economic Section of the Arab-daily, al-Hayat, Beirut 2004 -2006. Dr. Khadduri underwent his graduate studies at The Johns Hopkins University School of Advanced International Studies (SAIS), Washington, D.C., He is the author of several books, and articles on Global Petroleum Markets, as well as Oil & Middle East Geopolitics. Dr. Khadduri was born in Baghdad, Iraq, 1942.

The Future of Oil: IT'S MORE THAN JUST CARS

BY DR. FATIH BIROL

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF PRODUCER-CONSUMER DIALOGUE 2015



With increasingly fuel efficient engines and the rise of electric vehicles, it would be easy to assume that oil demand is set to fall. But this ignores the significant potential for growth in emerging economies and from those sectors outside of passenger transport that will continue to rely heavily on oil. In short, we can expect to see continued growth in demand for many years to come.

In 2016, oil demand grew by a robust 1.6 million (m) barrels per day (b/d), down from 2 m b/d in 2015 – the largest year-on-year growth since the exceptional post financial crisis recovery year of 2010. The IEA's latest market forecast is for demand to continue to rise in the next five years, passing the symbolic 100 m b/d threshold in 2019 and reaching about 104 m b/d by 2022. Developing countries account for all of the growth and Asia dominates, with about seven out of every 10 extra barrels consumed globally. In five years, India's oil demand growth will outpace China.

In the medium term, much of this growth will be fuelled by gasoline, and low prices have certainly contributed to growing demand in recent years. From SUV sales in China to increased driving in the United States, there are numerous examples of consumers taking advantage of cheaper fuel.

But looking forward, the picture is more complex – despite global oil demand (excluding biofuels) growing by more than 11 m b/d between 2015 and 2040, the IEA's World Energy Outlook 2016 shows oil demand associated with passenger cars actually declining in the next 25 years. This might seem like a surprising projection considering that the global car fleet is expected to add a billion vehicles in the next quarter century. Some of these vehicles will be electric but the bulk will have increasingly efficient engines. Electric cars have made significant progress in recent years, and they certainly have the potential to grow further; the cleanliness and efficiency of the electric engine, coupled with consumer excitement, is creating a compelling combination for growth. But, despite the recent enthusiasm, for now electric cars only displace 0.01% of global oil demand. This highlights a fact too often ignored: passenger cars represent only a relatively minor share of global oil demand growth.

Rather, it is shipping, aviation and heavy duty trucking that are expected to grow robustly as emerging markets experience rising incomes and increased integration to the world economy. Manufacturing of modern consumer goods – everything from televisions to refrigerators to electric cars – generally have supply chains

spanning several continents, all being shuffled around by internal combustion engines.

The other major driver of oil demand growth comes from plastics. In fact, the growth in petrochemical demand alone is larger than the reduction we currently expect to see from adding more electric cars. Taken together, this explains why without further changes in policies, we can expect to see robust oil demand growth for many years to come.

In the medium-term, this demand will be met in part by increasing production in US tight oil: even in today's lower oil price environment, a second wave of this supply is on its way, driven by the industry's remarkable ability to cut costs and improve technology. Brazil, Canada and Kazakhstan are also set to see output rises, reaping the rewards of investment decisions taken before oil prices declined.

But growth in non-OPEC production as a whole all but stalls from the early 2020s, leaving members of OPEC increasingly relied upon to meet a rising share of global demand, reflecting their lower costs and abundant resources.

Yet none of this is a given. All of this forecast supply hinges on a huge amount of investment, and outside of spending on US light tight oil, capex on global upstream projects today is either being cut, or only marginally increased. As the current overhang of surplus stocks is eroded, will investment recover? Will governments and companies have sufficient confidence in market conditions to commit to bringing forward new projects? Without such action, a new period of price volatility looms on the horizon.

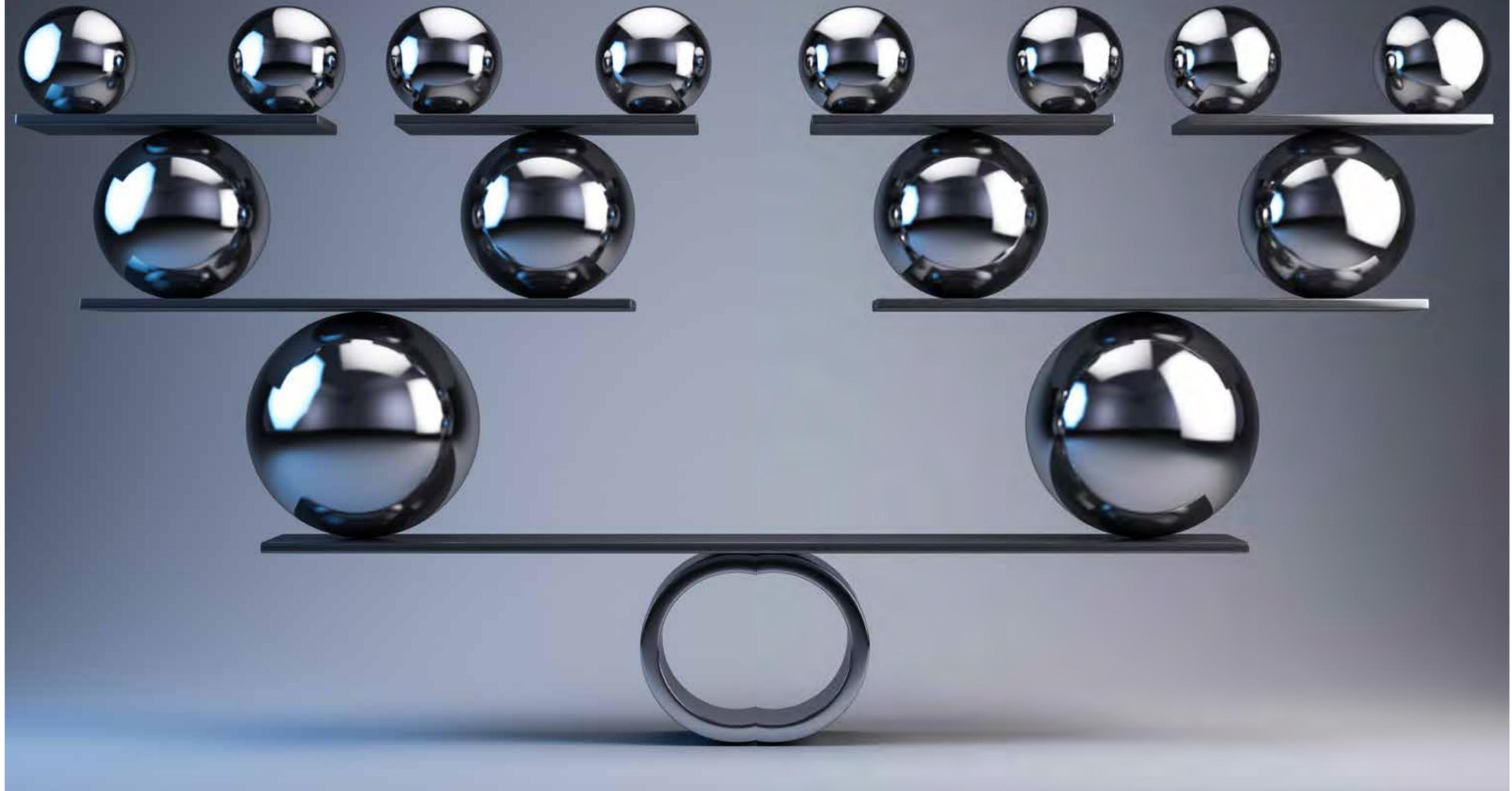
The oil industry prospered through the ups and downs of the 20th century thanks to its commitment to innovation and its perseverance in the face of challenges. To prosper in this next century, it will need to continue to invest in the future, maintain its efficiency and discipline, drive innovation and increase its strategic commitment to new sustainable technologies. ●



Dr. Fatih Birol, Executive Director, International Energy Agency, Paris. Dr. Fatih Birol took office as Executive Director of the IEA in September 2015, twenty years after first joining the Agency, marking one of the rare occasions that the head of an international organisation has been selected internally. He is also the Chairman of the World Economic Forum's (Davos) Energy Advisory Board and serves as a member of the UN Secretary-General's Advisory Board on 'Sustainable Energy for All'. Dr. Birol has been named by Forbes Magazine among the most powerful people in terms of influence on the world's energy scene and is the recipient of numerous awards from government, industry and academia.

OIL MARKETS OUTLOOK: A New Horizon, or a Trick of Light?

BY THE ABDULLAH BIN HAMAD AL-ATTIYAH INTERNATIONAL FOUNDATION FOR ENERGY AND SUSTAINABLE DEVELOPMENT





A rare meeting of minds between OPEC and non-OPEC producers in Vienna on November 30 has quelled the simmering panic that has burdened oil producers since a supply glut pushed oil prices to a 12-year low at sub-\$30 a barrel (bl) in January this year. Saudi Arabia-led OPEC agreed to cut output by 1.2 million barrels a day (m b/d) from January 2017, which will limit the 13-member group's output to 32.5m b/d. The cuts follow a record high production of 34.2m b/d in November. Russia-led cuts by non-OPEC producers of 558,000 b/d will also start in January.

Most importantly, the collaboration that underpins the Vienna Agreement is a welcomed break from the bickering and backroom talks that have long characterized the oil markets. The Agreement marks the first cut made by OPEC since 2008 and the first deal including non-OPEC producers in 15 years.

It also communicates OPEC's retreat from efforts to control market share - especially against the booming US shale market - which has significantly contributed to the global supply glut since November 2014. It appears that the price crunch has become too heavy a cross to bear in exchange for weakened competitors.

But, it is a risky strategy for OPEC. Mounting debt piles and bankruptcies have severely depressed US shale production since 2015, but the beleaguered market will have the financial breathing space it needs to ramp up domestic production if bullish sentiment surrounding the Agreement pushes prices to \$60/bl and above. A stronger domestic market would also allow the US to leverage the removal of Washington's 40-year ban on domestic crude exports in December 2015 and expand its global footprint.

On the demand side, the Paris-based International

1.2

After two years of intentional inaction, OPEC has agreed to cut production by 1.2m b/d from January

34.2

OPEC's production reached a record high of 34.2m b/d in November



Energy Agency (IEA) has increased the global forecast for 2017 by 110,000 b/d to a total of 1.3m b/d. China, the US and India are the world's biggest energy consumers, respectively, and the IEA has pegged India to be the fastest growing crude consumer up to 2040. Plus, the rising appetite of countries in the Organization for Economic Co-operation and Development (OECD) should not be discounted, with many eager to spur domestic growth now that they have a firmer financial footing following the global recession in 2008.

The Agreement has not extinguished the lurking mistrust that characterizes the relationships within OPEC, non-OPEC producers and energy investors. It makes sense for producers to agree to cuts to quickly bolster the oil price and their strained balance sheets, but the temptation to cheat will rise in correlation to a rising oil price. Saudi Arabia's decision to only proceed with the involvement of Russia worries what is already a nervous market. Russia's Minister of Energy, Alexander Novak, agreed to cut 300,000 b/d up to mid-2017. But, this potentially puts the price of oil in the hands of a producer who has a checkered past when it comes to implementing agreed cuts.

SHINING LIGHT ON THE SHADOWS

A Joint Ministerial Committee has been established to oversee producers' compliance of the Agreement up to OPEC's next scheduled meeting in May, which helps give the deal a stamp of credibility. Yet, it remains to be seen whether the committee can successfully improve producers' sense of accountability, as stakeholders frequently provide misinformation on production figures to protect their market share.

Multiple data sources and basic data harvesting can also be problematic. OPEC publishes production estimates from figures reported by members, as well as those generated by independent sources. While this helps counter a monopoly on information, it can also lead to numerical discrepancies and risks denting stakeholders' confidence in the figures.

A greater push by OPEC and non-OPEC members to improve data submissions - whilst safeguarding intellectual property - would offer a clearer insight into the supply-demand balance of oil products and potentially ease price volatility. OPEC and the UAE's Ministry of Energy contributed to what must be a global effort by launching a new and free smartphone application in November for OPEC's

558,000
Non-OPEC
producers, including
Russia, will cut
558,000 b/d in the
first half of 2017

2001
The Vienna
Agreement is the
first deal including
OPEC and non-OPEC
producers in 15 years

2008
The Vienna
Agreement marks
the first production
cuts made by OPEC
in eight years



Annual Statistical Bulletin (ASB). Many more similar steps must be taken by stakeholders along the supply chain, from research and development (R&D) into innovative technologies through to shipping and trading.

Opaque data hinders oil stakeholders' adaptability to sharp price and policy changes, which is a hazardous habit considering the market's strained bank balances, bankruptcies and shortened payrolls since 2014. The need for flexibility was most recently illustrated by the UN agency International Maritime Organization's (IMO) decision in October to introduce a new Sulphur emissions limit of 0.5% from the current 3.5% in 2020, instead of 2025.

Aside from the value of data transparency to help carve out robust strategies, the IMO's decision highlights two key points for the oil industry. Firstly, the new Sulphur limit will be one of many increasingly strict environmental regulations that the oil industry must adapt to as the world's leaders, including those in the Gulf, pursue a low-carbon future. Secondly, the decision will reshape refinery economics, which could play well for the Middle East's booming refining sector if stakeholders work with the shipping industry to discourage the use of cheaper and non-compliant fuels.

NAVIGATING POLITICAL SHIFTS

A wave of surprise political developments will create a challenging policy environment in 2017, which may force some investors to reposition their portfolios towards a more cautionary spend rate. For example, the IEA said the global spend on oil and gas fields fell by 25% in 2015 to \$583 billion,

with another 24% decline to approximately \$450 billion anticipated for 2016. A similar narrative in 2017 is likely, which would mark the first consecutive three-year decline on record.

Topping the list of political surprises is the US' President Elect Donald Trump's move into the Oval Office in January. Oil men in the US welcomed the prospect of what President Elect Trump described as a "bonfire of regulations" in the oil and gas sector in 2017. Democrat Hillary Clinton would have likely taken a similar pathway, but she also would have introduced a progressive agenda on other issues, such as foreign policy. How the President Elect's campaign promises, including the economic stimulus, impact the country's energy outlook will have global ramifications.

Brexit is also on the agenda, with the UK's Prime Minister Theresa May likely to trigger Article 50 next year. The formal notification of the UK's intention to withdraw from the European Union (EU) could see the country's split from the EU being confirmed by April 2019. General elections in the Netherlands in March will reveal the depth of the country's appetite for a 'Nexit' and give a wider indication of the state of the EU's energy allies. The selection of China's political bureau – the nexus of all power in China, the world's biggest energy consumer and second largest economy – is scheduled for the fourth quarter next year.

Iran's presidential election on May 19 will reveal whether current President Hassan Rouhani can add a second term to his time in office since 2013. Advocates point to his efforts to improve relations with the West and the lifting of the majority of the

1.3

The IEA has increased its global oil demand forecast for 2017 by 110,000 b/d to 1.3m b/d

2040

India, the world's third largest energy consumer and sixth biggest economy, will be the fastest growing crude consumer up to 2040

300,000

Russia's has agreed to cut 300,000 b/d up to mid-2017

3%

The percentage cut to the Sulphur emissions limit introduced by the IMO in October – the new limit will be 0.5% from 2020



Western-imposed sanctions on January 17, 2016. Whether President Elect Trump's unsupportive comments jeopardize the sanctions deal will be clearer next year, but a deteriorating relationship with the US could significantly impact Iran's strong return to the global energy stage this year. Oil production in Iran, which is OPEC's third largest producer and home to the world's fourth largest proven crude reserves, is already nearing pre-sanction levels of just over 4m b/d with current production at 3.89m b/d. A cap of just under 3.8m b/d will be applied from January, as per the Agreement.

NEW IDEAS, NEW BLOOD

Whatever transpires from the tentative OPEC and non-OPEC alliance, the intellectual and technological solutions of yesteryear that have spearheaded the growth of the global oil industry no longer suffice. Many Gulf countries' bid to evolve into knowledge-based economies as per their National Visions by 2020 and 2030 means government, industry and academia must do considerably more to strengthen millennials' skill sets. Much of the wisdom in the oil markets currently lies with the older and retiring generation.

The volume of petroleum engineers graduating in Europe and the US is rapidly shrinking, with half of the world's such professionals expected to retire over the coming decade, for example. Part of the talent gap is being plugged by petroleum engineers from Asian universities, but the poor culture of collaboration that pervades the global oil industry means such talent remains locked in small geographies and the fragmentation of the industry worsens.

Disjointed efforts must be replaced by partnerships, especially against a backdrop of

increasingly demanding consumer profiles over the longer term. The United Nations (UN) expects the global population to climb by 30% to 9.7 billion people by 2050, while the US' Energy Information Administration (EIA) forecasts a 48% increase in global energy consumption between 2012 and 2040. BP's Energy Outlook forecasts a 60% rise in the Middle East's energy consumption alone by 2035.

Amidst the intensifying demand, energy-centered Gulf countries are running short on time to establish supply chains of innovative technologies and mindsets that can spearhead knowledge building across the global oil industry. The extraordinarily fast evolution of the US' energy markets – it has become a net gas exporter for the first time in six decades – highlights how Gulf countries risk missing a golden opportunity to maintain their position as the epicenter of global oil markets if they do not act quickly.

Adjusting mentalities has recently been successfully demonstrated by Gulf governments' cuts to energy subsidies, which have long been considered a birthright in the region's psyche. Aside from saving governments billions of US dollars in today's low oil price environment, the cuts will also take some of the sting out of future price volatility.

If the Vienna Agreement were to crumble before May next year, the supply glut would intensify, investors would shy even further away and the chances of another alliance between OPEC and non-OPEC producers to counter unsustainable price volatility would be considerably slimmer. For now, the narrative of oil markets in 2017 depends on producers' loyalty to the game plan. The Agreement could herald an era of stability, or rule-breaking by just one producer could trigger a domino effect that sees the alliance becoming yet another empty promise. ●

583

Global spending on oil and gas fields fell by \$583 billion in 2015 – a 25% reduction, according to the IEA

24%

Nervy investors and strained budgets means the IEA expects the global spend on oil and gas fields to slide by another quarter to \$450 billion this year

19

Iran's presidential election is scheduled for May 19, with current President Hassan Rouhani seeking a second term since he took office in 2013

3.8

Iran, which is nearing its oil production target of 4m b/d, has agreed to limit production to 3.8m b/d from January



CHALLENGES FACING THE GLOBAL ENERGY SECTOR THROUGH 2020

BY SULEIMAN JASIR AL-HERBISH

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF THE ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES 2017

The global move towards a low-carbon economy was affirmed when the Paris Climate Agreement became legal on November 4, 2016. This is expected to drive major transformations in the power, transportation and other economic sectors in the coming years. Businesses involved in renewable energy (e.g. solar and wind power) and energy efficiency will see expanding markets, as countries aim to reduce their carbon emissions.

Meanwhile, producers of fossil fuels will face growing pressures from shrinking markets. Countries dependent on hydrocarbon revenues such as those in OPEC and Russia, which have already suffered from low oil prices, will have to cope with lower demand.

A decline in demand beginning in 2020, as required to comply with the 2°C scenario, could drive “lower forever” oil prices and reduce future cash flows. If that happens, the oil and gas industry will

experience ever-increasing pressures, requiring more business agility and responsiveness.

However, the industry has the opportunity to cope with the climate challenge and at the same time protect its market share. The opportunity is presented by the huge potential for energy demand which exists in the poorest countries. Meeting this so-called unconventional or hidden demand will help eradicate poverty and improve the lives of millions. Yet it also presents the energy industry with the greatest opportunity of this century – an opportunity it must grab.

Today, nearly 1.2 billion people live without access to electricity and 2.7 billion still rely on wood fuels and dung for cooking and heating. This exasperates deforestation, soil degradation, and greenhouse gas emissions. Meeting the needs of these billions through modern energy services can help mitigate the impacts of climate change and reduce the health risks associated with the use of traditional biomass.

The oil and gas industry is already undertaking a

“Since 2008, with the goal of alleviating energy poverty, OFID has delivered a total of US\$3.4bn in energy financing through governments, private companies, small and medium-sized enterprises, non-governmental organizations and through entrepreneurs.”

range of actions to address both climate change and provide access to modern energy services. Some leading companies, for instance, supplemented their use of fossil fuels with renewable energy sources, particularly solar energy and biomass. Others have focused their efforts on the use of technology in Carbon Capture and Storage (CCS) initiatives for cleaner energy and have committed to end gas flaring as well as providing financial and technical support to foster the adoption of clean cookstoves and fuels.

These and similar actions are integral to addressing the challenges of sustainable development since they tackle universal access to sustainable energy, which is a cause that OFID has championed for many years.

The central development framework for our activities is the Energy for the Poor Initiative. This flagship campaign was launched in 2008, following the Third OPEC Summit of the previous year, where OFID was mandated to align its programs with energy poverty eradication, in association with the energy industry and other financial institutions.

OFID has taken up this call as a special mandate and has intensified its energy poverty eradication programmes, with the Declaration on Energy Poverty, issued in 2012 by OFID’s Ministerial Council, providing the strategic guidance for OFID’s work. Its efforts, together with other like-minded institutions, were central in bringing the eradication of energy poverty to the fore of the global development agenda as Sustainable Development Goal (SDG) 7.

Since 2008, with the goal of alleviating energy poverty, OFID has delivered a total of US\$3.4bn in energy financing through governments, private companies, small and medium-sized enterprises, non-governmental organizations and through entrepreneurs. This sum leverages 91 projects worldwide, with a combined total value of over US\$23.8bn.

In fighting energy poverty, OFID delivers a wide range of solutions to suit all kinds of circumstances; from large, capital-intensive investments to innovative, small-scale community schemes. The technologies used in these projects are based on need and cost considerations, not on any preference on OFID’s part. The end result—providing people

with the energy they need to live safe and productive lives—is far more important than the fuel source.

The impacts of the actions by individual actors could be multiplied many folds when undertaken in the spirit of cooperation. Therefore, the broadening and strengthening of partnership alliances has been a key pillar in OFID’s strategy for alleviating energy poverty.

A prime example of this is the “Oil and Gas Industry Energy Access Platform (EAP)” we recently launched in cooperation with the World Petroleum Council (WPC). The collaboration that includes also TOTAL, SHELL, Schlumberger, OMV, IGU, GLPG, BCG and other strategic partners such as the Shell Foundation, aims at leveraging the oil and gas industry’s unique technical expertise and knowledge that could drive creative solutions for providing better access to energy and to create opportunities for replicating and scaling up investments in energy access. The membership of the EAP is open to all companies within the oil and gas industry, as well as to other stakeholders, including development funds and business developers.

OFID remains committed to continuous and scaled-up actions in the cause of energy access, and it is ready to cooperate with the oil and gas industry to this end. Let us prove that the industry, which has provided the world with its engine of growth, will continue to provide future inclusive development with the energy it needs. ●



Suleiman Jasir Al-Herbish, a Saudi national, has been the Director-General of the OPEC Fund for International Development (OFID) since November 2003. Al-Herbish is a long-time supporter of people-centered development, and has been especially vocal on the issue of energy poverty eradication, a cause he has championed tirelessly at the highest level and one that forms the central pillar of OFID’s strategic plan. As a member of the high-level group and the Advisory Board of the Sustainable Energy for All (SE4ALL) initiative, Al-Herbish helped to secure a place for universal energy access, as SDG7, in the 2030 Global Development Agenda. Al-Herbish holds a BA in Economics and Political Science from the University of Cairo and an MA in Economics from Trinity University, San Antonio, Texas. He joined the Ministry of Petroleum and Mineral Resources in 1962 and served as Assistant Deputy Minister from 1982-1990. He also served for 13 years as the Governor of Saudi Arabia at OPEC. Just recently, he has been nominated to join the OPEC Award Advisory Panel to select the recipient of the 2018 OPEC Award.



ALL ABOUT ASIA

BY JOHN DEFTERIOS

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF INTERNATIONAL ENERGY JOURNALISM 2017

One can become romantic about the rebuilding of the ancient Silk Routes, but the trade links being re-established in the 21st Century have nothing to do with nostalgia. Rather, they are all about business, especially when it comes to the arteries of commerce being built from the Middle East to Asia.

The size of Saudi Arabia's King Salman entourage on his recent tour of Asia attracted most of the attention, but there are big business and political priorities that drove this month-long journey. They can be broken down into three categories: energy, diversification and geo-politics, but the overarching theme was: Asia remains a big deal to the Kingdom.

"As Saudi looks to the future, Asia of course is front and center. It is two-thirds of the world's population, half of its economy and those shares

will only grow. Asia is Saudi Arabia's commercial future," says Ben Simpfendorfer, Founder and CEO of Silk Road Associates.

As the world's number one exporter of oil, not surprisingly energy took top billing in this Saudi Arabian version of shuttle diplomacy.

On the first leg of the King's visit to Malaysia and Indonesia, Saudi Arabia signed deals worth \$13 billion to expand downstream operations. State oil giant Saudi Aramco plans to double its refining capacity to 10 million barrels a day (b/d) by 2025, according to Riyadh based Gulf Research Center and these transactions could help bolster the IPO plans for Aramco next year.

But basic crude still matters and fresh demand is coming from this part of the world. Asia represents

"The name of the game in oil is new demand growth and right now Asia represents the industry's pot of gold. According to FACTS Global Energy, of the estimated daily demand increase of 1.4 million b/d, one million is coming from Asia."

nearly a third of daily global demand at 31.4 million barrels last year. It is a fact not overlooked by the major producers, with the Kingdom vying against the other Gulf states, plus Iran and Russia for their slice of the Asian market.

The name of the game in oil is new demand growth and right now Asia represents the industry's pot of gold. According to FACTS Global Energy, of the estimated daily demand increase of 1.4 million b/d, one million is coming from Asia.

"Saudi Arabia's largest market is no longer China but Japan now. So this is why the King is going to Japan...it is very important for them that they keep the Japanese market warm," says Fereidun Fesharaki, Founder and Chairman of FACTS Global Energy.

The Kingdom is also considering whether to list part of the Aramco IPO in Tokyo, which is another reason to carefully court Japan's investment community.

After Japan, came the visit to Beijing, where Aramco has its Asian headquarters. Saudi Arabia and China have already set up refineries in each other's territories to cement their energy co-dependence. Whilst this latest trip did not produce concrete deals, there is clearly a willingness to do more as outlined in \$65 billion worth of MOU's between Riyadh and Beijing.

The United Arab Emirates has a well-defined Silk Road Strategy which brings together the policy interests of the Ministries of Foreign Affairs and Energy and UAE Inc. if you will. It started in China and is making its way to India. At the start of 2016, the Crown Prince of Abu Dhabi, Sheikh Mohammed bin Zayed Al Nahyan, convened a high-profile tour of India to expand trade ties already worth \$75 billion a year. Energy is a key pillar of that strategy with current demand on Abu Dhabi's crude running above 300,000 b/d.

"That can go much higher and there are many, many areas to explore in the oil sector, among them of course is strategic reserves, greater sales of UAE oil to India and downstream," according to Anwar Gargash, the Minister of State for UAE Foreign Affairs.

China and India's combined market share, according to the Dubai Mercantile Exchange, has tripled to 16% of daily demand since 1990 and is expected to double between now and 2040.

But there is plenty to consider beyond energy, especially in Far East Asia. Saudi Arabia is eager to have China assist in its drive to diversify the Middle

East and North Africa's largest economy, a top priority of King Salman's young but powerful son, Deputy Crown Prince Mohammad bin Salman.

His plan called "Saudi Vision 2030" aims to reduce what he said is the country's addiction to crude, boost the role of the private sector and make the Kingdom a competitive hub for manufacturing and services.

"When you have to start thinking of your non-oil future, basic manufactured goods or service offerings, then all of a sudden geography matters," says Simpfendorfer.

King Salman's tilt to Asia dovetails nicely with China President Xi Jinping's "One Belt, One Road" plan. The initiative is designed to connect China with over 60 countries, from Asia to the Middle East and Europe, through the rebuilding of infrastructure to facilitate trade.

China, with its one-party, communist party structure, makes it common practice to put in long term strategic plans, an approach that can benefit the Kingdom which was lacking such thinking beyond oil until the 2030 plan was launched last year.

"You have somebody in China who has technology, money, people and the market and somebody in Saudi Arabia who wants to look at future options - the Chinese provide the options," says Fesharaki.

Those options, strategists say, take on added importance today with U.S. President Donald Trump in office. He has not defined Washington's policy in the Middle East with all its complexities, especially the long-standing rivalry between Riyadh and Tehran.

"Saudi rediscovered Asia over the last ten years, yet momentum was fading. With a less certain political landscape, the re-pivot to Asia has been reinvigorated," says Simpfendorfer. ●



John Deferios is the CNNMoney Emerging Markets Editor. His reporting focuses on the top business stories from emerging markets, with a specialty in energy. In addition to his daily reporting for CNNMoney programming, he hosts 'CNN Marketplace Middle East', a business programme featuring in-depth analysis and top newsmakers and the monthly feature "One Square Meter". Deferios has more than two decades of award winning coverage including the Gulf War, the fall of the Berlin Wall, World Trade Centre bombings and G8/G20 summits from his postings in London, Washington, New York, Los Angeles, Rome and Abu Dhabi. He's been a World Economic Forum media leader since 1996, board member of the Global Agenda Council on the Arab World, and the Stern Stewart Institute. Deferios chairs: the OPEC Seminar, World Energy Congress, Gulf Intelligence Energy Series, Atlantic Council Energy Summit and Islamic Development Bank Forum.



INVESTMENT, TECHNOLOGY & PEOPLE

BY H.E. ABDALLA SALEM EL-BADRI

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF THE ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES 2013

Over the past year or so, most of the talk in oil industry circles has been about the market oversupply and what the industry can do to bring supply and demand back into balance and reduce the large stock overhang. It is evident that the rebalancing process has begun and there is now more optimism about where the market is heading. However, it is vital that the industry keeps it focus, and not only on the short-term rebalancing, but on the medium to long-term too.

It is important to appreciate that the oil industry remains a growth industry. The world will need more oil in the years ahead. In OPEC's World Oil Outlook 2016 it is expected that oil demand will increase by around 17 million barrels a day (mb/d) between now and 2040 to reach close to 110 mb/d. This will require major investments, more technological innovation and given the intensive nature of the industry, more well-trained people, to help the industry produce the required volumes in a secure, safe and increasingly efficient and environmentally sound way.

From an investment perspective, new barrels are needed to not only increase production, but also to accommodate for declining rates at existing fields. Overall, it is envisaged that oil-related investment requirements of around \$10 trillion will be needed in the period to 2040.

In both 2015 and 2016, however, the industry witnessed a dramatic contraction in investments, as a result of the market downturn that began in mid-2014. Global oil and gas exploration and production spending fell by around 26 per cent in 2015 and a further 22 per cent drop is anticipated for 2016. Combined, this equates to above \$300 billion. This will impact not only new projects coming onstream, but new discoveries too.

A third year of contraction in investment would be unprecedented for the industry. It is crucial the industry sees the necessary investments return. If not, we could end up sowing the seeds of a future oil price spike if future supply growth fails to keep up with expanding demand.

Two related components to the industry's future



investment needs are technology and people. Over the history of the industry these have combined to continually transform the industry, playing a fundamental role in supporting the efficient production of hydrocarbons.

For example, technological advancements have enabled the industry to increase the estimates of the amount of oil and gas that can be found, and what can be recovered. Improvements in the quantity and quality of information about different geological structures has enhanced the likelihood of finding oil and gas, and extended the reach of the industry into harsher and more remote locations in 'frontier areas'.

Over the past few years, however, there has been a significant drop in the amount of investment going into research and development into existing and new technologies. It is vital that this is rectified.

The backbone of the industry's expansion and the driving force behind technological developments is the human resource. It has been the lifeblood of the industry from its very early beginnings. However, since mid-2014 there have been sweeping job losses across the industry, and in general, there is now a shortage of young people entering the industry.

This is a major cause for concern, particularly given the sizeable section of the industry's workforce that is now rapidly approaching retirement, and given the fierce competition for talent the industry is facing from the dramatic expansion in the services and 'emerging knowledge' industries.

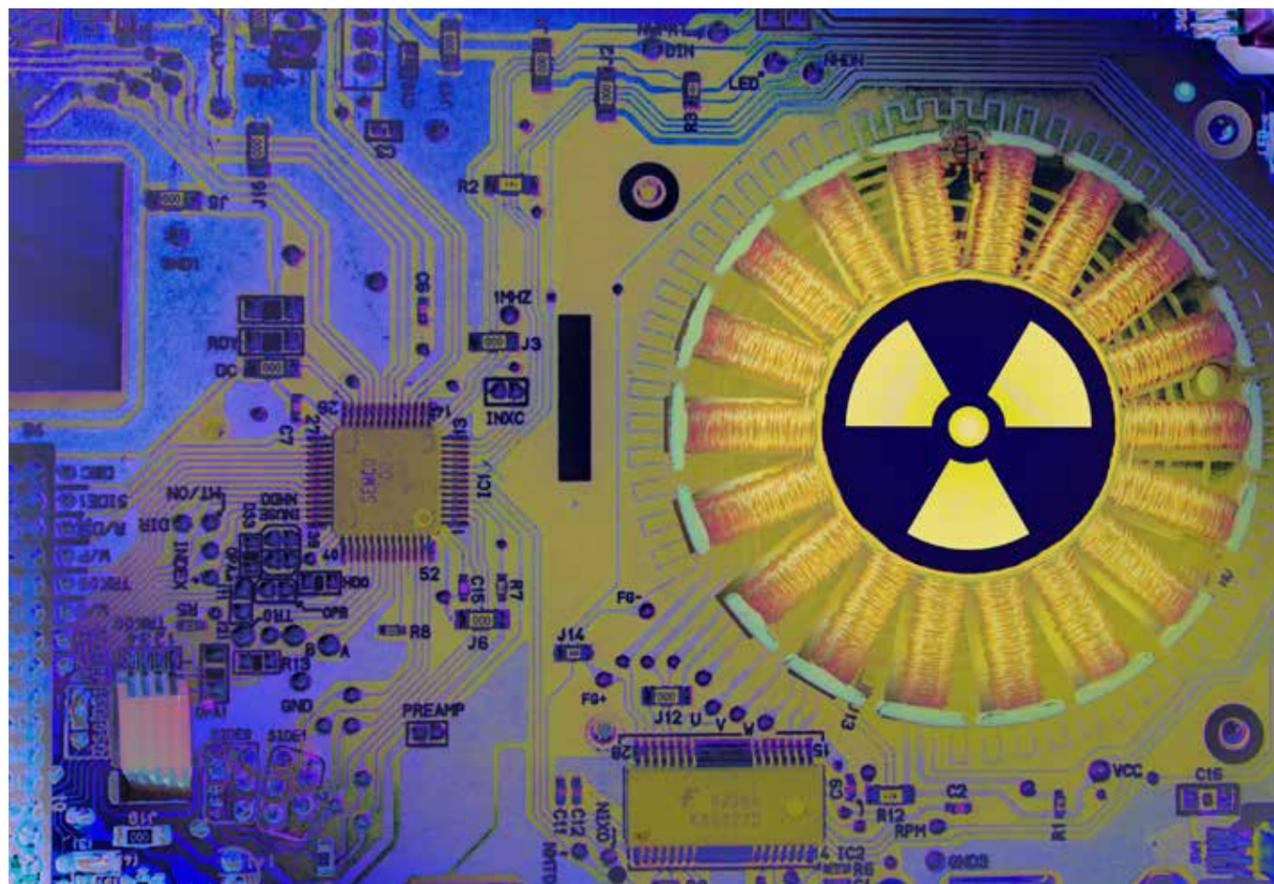
Of course, meeting the human resource challenge

will not happen overnight. But it is vital the industry and all its stakeholders support the schools and universities that will deliver the next generation of engineers, scientists and managers, and ensure that the industry is viewed as a ground-breaking, innovative and expanding sector with long-term career prospects.

In the current search for market balance, it is vital that stakeholders view the industry over all timeframes – short, medium and long-term. We need to make sure that the stability we strive for today helps deliver a strong and secure platform that enables the industry to overcome the challenges it will no doubt face, and deliver on the huge opportunities ahead. Central to this are investments, technology and people – each one of these entwined issues is a major cog in ensuring a bright long-term future for the industry. ●



H.E. Abdalla Salem El-Badri became Chairman of the Libyan National Oil Company (NOC) in 1983, before being made Minister of Petroleum in 1990. He was appointed Minister of Energy, Oil and Electricity in 1993 and Deputy Prime Minister in 2004, before returning to chair the Libyan NOC until 2006. He was OPEC Secretary General from 1 January 2007 to 31 July 2016, the longest tenure in the history of the Organization. In 2010, Forbes named him on its list of 'The World's Most Powerful People', and in 2014 he was on the Gulf Business list of the 'Top 100 Powerful Arabs'. In 2013 he was awarded The Abdullah Bin Hamad Al-Attiah International Energy Award for the Lifetime Achievement for the Contribution to the Advancement of OPEC. And in 2016 he was honoured at the Platts Global Energy Awards in the 'Lifetime Achievement' category.



CHALLENGE: NUCLEAR FUTURE AFTER FUKUSHIMA & TRUMP

Recommendation: Sustainable Nuclear Technology

BY NOBUO TANAKA

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF PRODUCER-CONSUMER DIALOGUE 2014

The Trump administration's "America First" policies cause enormous uncertainty for the global community, especially in the security and trade arena. Energy may not be an exception. Thanks to the shale revolution, the US has significantly increased competitiveness of oil and gas production and President Trump will further strengthen the trend by deregulation to achieve so-called "energy independence" from the Middle East. But Asian importers continue to rely on oil and gas flows from this region. In fact, the International Energy Agency (IEA) forecasts 90% of oil from the Middle East will go to Asia by 2040. Energy security of the Asian countries hinges on the stability of the Middle East. The important question here is if President Trump's Middle East policy stabilizes or destabilizes the region. His

priority seems to be to suppress IS by arranging alliances with Russia that may stabilize the Middle East while his tough position against the Iran nuclear deal may destabilize it.

The current low price of oil is a serious threat for producers but it is also a risk for importers because future supply could be jeopardized by a shortage of investment. Asian importers' reliance on Middle Eastern suppliers may also increase as non-OPEC higher cost producers are the first to cut investments. At the same time, Gulf oil producers may become less reliable if domestic social instabilities worsen on the back of lower government revenues. President Trump's foreign policy may further increase uncertainty.

Nuclear power has been considered as a trump card for energy security for many Asian countries



i.e. Japan, South Korea, China and India. In the US, however, the shale revolution made natural gas so cheap that constructing a new nuclear power plant has become much less economically viable. Additional costs of licensing with back-fitting of severe safety standards after the Fukushima accident in Japan have worsened the situation. The second issue is public acceptance with more than half of the population still against restarting nuclear power plants. Almost six years have passed since the Fukushima accident and only three out of 48 shut down reactors have restarted. It is costing trillions of Yen for Japan to fill the gap by importing oil, gas and coal. Recently, Toshiba announced that its subsidiary, Westinghouse Electric, would incur a \$7 billion additional loss due to the delay of its AP1000 construction in the US. France's Areva also faces serious delays and cost overruns for its nuclear reactors (EPRs). China and Russia will continue building new Light Water Reactors but it may no longer be commercially viable in market economies. We are probably facing a global nuclear industrial crisis.

To cope with this, governments should intervene with a clear vision for the nuclear industry rather than leaving it to market mechanisms. Nuclear power is not only essential to increase energy security but also to address global climate change mitigation. Here is another uncertainty; President Trump's nuclear policy is not yet clear. He may think a strong America needs to be a leader in nuclear technology, while early indications are that he is not so serious about CO2 emission reduction.

The US has long been a leader of the peaceful use of nuclear power since Dwight Eisenhower's famous "Atoms for Peace" speech in 1953. Now

after Fukushima, there is not only fear of nuclear weaponization, but safety is also the number 1 issue for the public. We have to manage high level radioactive waste, regain public confidence and develop truly "sustainable" nuclear technology. In fact, the US already has the dream technology in the Integral Fast Reactor (IFR) system developed and experimented at the Argonne National Laboratory since the 1960s. In 1986, EPR2, the experimental reactor of IFR, experimented with a total plant blackout very similar to the Fukushima accident. The reactor safely stopped without human intervention. A combination of pyro-processing, metal fuel and small modular fast reactors can achieve passive safety, avoid nuclear weaponization and thirdly, reduce radio toxicity of waste from 300,000 years to 300 years. It is applicable to the meltdown debris at the Fukushima Daiichi NPS. Japanese-US partnership in IFR may pave the way for a truly sustainable nuclear future and provide a clear vision with which the nuclear industry can develop a new business model. ●



Nobuo Tanaka is Chairman of The Sasakawa Peace Foundation. As Executive Director of the International Energy Agency (IEA) from 2007 to 2011, he initiated a collective release of oil stocks in June 2011. He also played a crucial and personal role in the strengthening of ties with major non-Member energy players, including China and India. He began his career in 1973 in the Ministry of Economy, Trade and Industry (METI), and has served in a number of high-ranking positions, including Director-General of the Multilateral Trade System Department. He was deeply engaged in bilateral trade issues with the US as Minister for Industry, Trade and Energy at the Embassy of Japan, Washington DC. He has also served twice as Director for Science, Technology and Industry (DSTI) of the Paris-based international organization, OECD.



OIL PRICE & DIVERSIFICATION CHALLENGES IN THE GCC

BY H.E. DR. MAJID AL-MONEEF

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF THE ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES 2016

The oil price collapse of 2014 and its impact on the economies of oil producing countries of the Gulf Cooperation Council (GCC) reminded governments, citizens and the private sector of their vulnerability to oil market cycles. The decade preceding 2014 was characterized by high oil prices and revenue, enabling governments to extend their welfare systems to unsustainable levels; this came to an end two years ago and along with it, the very foundation of their growth and development model.

Realizing that the oil price downturn might not be transitory and that it would be structural and longer term, GCC governments have started to enact reforms, including aligning the oil price with its opportunity cost, implementing fiscal

consolidation measures, and structural and institutional reforms. Several foundations of the rentier state have come under review, including the very role of oil in the economy, rent allocation mechanisms and education and labor market frameworks. The future of the social contract between government and citizens - which has contributed to their economic prosperity, political stability and remarkable social achievements - is in question.

Since the oil price collapse in 2014, fiscal and external balances have been deteriorating in most GCC countries, despite consolidation measures, a drawdown of foreign reserves and tapping into global credit markets. The oil sector has been the main driver of growth in all GCC countries. Until

“Needless to say, best practices in resource dependent countries have shown that the path to more diversified economies is largely dependent on human development, knowledge and innovation.”

recently, it constituted 85% of exports and 40-60% of GDP. So, reigning in government capital and current expenditure, addressing energy subsidies, diversifying government revenues, and restructuring the economy, have become cornerstones of their fiscal and macroeconomic adjustments.

Previous to the 2014 oil price collapse, attempts by GCC governments to diversify the economic base away from oil had been dismal. According to the IMF, the growth model and development strategies pursued were driven by opening the door to an unskilled and semi-skilled expatriate workforce, and by physical capital accumulation. This resulted in an expansion of low productivity sectors such as construction, real estate and other services which did not provide attractive jobs for nationals in the private sector, leading the government to step in and assume the role of employer of last resort into an already bloated civil service.

Sustainable growth and the capacity of economies to create jobs has required a major rethink of development strategies in the GCC. The latest episode of declining oil prices has been widely accepted, especially among GCC countries, as a new reality and accordingly they have decided to either embark on more ambitious diversification plans or revise existing ones.

Last year, Saudi Arabia announced its ambitious “Vision 2030” which seeks to redefine the roles of the state and the private sector, as well as their relationship. The state is to function as regulator rather than provider, and the private sector to be less dependent on the state and its spending. This takes different forms and initiatives, from streamlining laws and regulations, institutional reforms, restructuring the incentives systems, deepening the financial market and broadening and activating the privatization process. This last one includes Aramco’s partial IPO, and the privatization of utilities, ports, airports, railroad, health care and many other sectors until recently owned or operated by the state. Restructuring the Public Investment Fund (PIF) to become a vehicle for long-term saving and development is another cornerstone to this diversification.

Likewise, the UAE has announced its post-oil era initiative which aims at prioritizing human capital development and building a knowledge-based

economy in addition to continued improvements in government policies to enhance the business environment. In both countries, diversifying the domestic energy portfolio by promoting renewables, adjusting oil, gas and electricity prices, strengthening the oil sector’s supply chain linkages and investing in energy efficiency, are all cornerstones of the adjustment process.

Needless to say, best practices in resource dependent countries have shown that the path to more diversified economies is largely dependent on human development, knowledge and innovation. This includes aligning education and vocational outcomes with market needs, ending the government’s role as employer of last resort, increasing the female labour participation rate and addressing labour productivity.

There is no doubt of the urgency now shared by governments and nationals of the GCC that the global oil market downturn needs to and has already accelerated the process of economic transition. While experience shows that such reform ambitions tend to resonate strongly during periods of low oil prices, before this urgency possibly fades away, policymakers should be aware that volatility is an inherent feature of the oil market. Their economies have to be put on a more sustainable growth path that requires economic, social and institutional adjustments, to build on accomplishments thus far and to avoid the “oil curse” or otherwise known “Dutch Disease” symptoms that many resource rich economies have suffered from. ●



H.E. Dr. Majid Al-Moneef is an advisor to the Royal Court of the Kingdom of Saudi Arabia and a member of Saudi Aramco Board of directors. Previously he was the Secretary General and a member of the Supreme Economic Council of Saudi Arabia and served as Saudi Arabia’s Governor to OPEC and its representative to the organization’s Economic Commission Board. He was a member of the Economic and Energy Committee of the Majlis Ash Shura (Consultative Assembly), the Chairman of the Gulf Cooperation Council (GCC) Energy Team, president of the Arab Energy Forum and of the Saudi Economic Association, and professor of economics at King Saud University in Saudi Arabia. Dr. Al-Moneef is a member of Saudi Aramco’s Board of Directors, the International Advisory Group of King Abdullah Petroleum Studies and Research Center (KAPSARC), the Oxford Energy Policy Club and the Advisory Council of the Emirates Center for Strategic Studies and Research (ECSSR).



GULF STATES' RISING ENERGY CONSUMPTION

BY MARWAN MASRI

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF RENEWABLE ENERGY 2017

Energy is the lifeblood of economic systems. The availability of affordable and secure energy is essential to facilitate economic growth and rising living standards.

Economic growth and demography drive energy consumption. In mature economies, stagnating population growth and the introduction of policy actions aimed at supporting energy efficiency have dampened the growth of energy consumption. However, in emerging and developing economies, the growth of income and population continue their inexorable rise, pulling consumption along with it.

The GCC countries have relatively high population and income growth, contributing to one of the highest per capita and rates of growth

of energy consumption in the world [World Bank, 2013 data.] In addition to demography and income factors, consumption is also driven by the region's harsh climatic conditions which require year round cooling that dominate buildings' energy loads. For example, cooling accounted for 58% of electricity use in a typical building in Abu Dhabi in 2010. [IRENA, Renewable Energy Market Analysis, 2016.]

Rising energy consumption anywhere presents policy makers with formidable challenges of meeting the growing demand in a secure, affordable and environmentally responsible manner. For GCC countries, these challenges have an added dimension as their energy systems

“Increasing the diversity of the economic base to broaden it beyond oil and gas reduces the vulnerability of the economy to external shocks emanating from price volatility of oil and gas exports.”

are hydrocarbon based. They are endowed with abundant and precious oil and gas resources that form the basis for their export-led economic growth. Given the level of production, the higher the domestic consumption of oil and gas the lower the volume available for export – a high opportunity cost. This is akin to an industry consuming its own capital resources or a farmer eating his seed corn. But, every problem has in it the seeds of its own solution; to quote Paul Romer, “a crisis is a terrible thing to waste”. The combination of falling oil revenues and rising energy consumption in the GCC countries presents a turning point for energy and economic policy realignment.

The policy challenges arising from high and growing energy consumption in the GCC present opportunities to transform the energy system to become more diverse, clean, more efficient, secure and sustainable for current and future generations. Increasing the diversity of the economic base to broaden it beyond oil and gas reduces the vulnerability of the economy to external shocks emanating from price volatility of oil and gas exports.

A possible strategy to capture this opportunity is three fold:

1. Optimizing energy demand by identifying and capturing potential energy efficiency measures that are cost effective from society's perspective.

2. Decarbonize the energy supply sources by accelerating the development of renewable energy markets and the installation of renewable energy technologies.

3. The deployment of efficient natural gas generation (as a transitional fuel) and combined heat and power to meet optimized peak demand and support intermittent renewable generation.

To be effective, programs to support the development of renewable energy markets would benefit from the following features:

• **Comprehensiveness** – The support program needs to cover the demand and supply sides of the market.

• **Recognition that renewables are not a homogenous group of technologies** – Renewable technologies differ in potential, cost effectiveness, proximity to transmission, development status, scale economies and so on. Support measures need to be tailored to the

specific characteristics of each technology. One size does not fit all.

• **Simplicity and low cost of administration** – To minimize administration cost, the program focus would be on points of leverage rather than each individual market participant.

• **Market based** – For existing renewable central station generation, support would be linked to market price thresholds at which a given technology attains cost effectiveness. Reflecting differences in technology commercial status, the thresholds would be technology specific. For new central station renewable generation, the incentive would be distributed through a reverse auction where project developers bid the minimum incentives per KWH above expected market price they require to bring new plants online.

• **Performance based** – A production incentive is more effective than a capacity or installation based incentive.

• **Durable and consistent** – Support programs that are of short duration and change unpredictably and often are detrimental to long term investment required for capital intensive renewable projects

• **Efficiency forcing** – Incentives tied to market price thresholds which decline in a transparent way over time puts pressure on producers to reduce cost and become more efficient as the incentives are squeezed.

• **Flexible** – Incorporating flexibility into program design allows for better responsiveness to unanticipated market conditions.

Responding to the challenge of rising energy consumption in the GCC by transforming the energy system as discussed above will also transform the regions' economic systems to be more resilient, robust and secure. ●



Marwan Masri retired in 2010 as President and CEO of the Canadian Energy Research Institute. Prior to becoming President, he served as Vice President, Research directing an interdisciplinary team in conducting major research projects on energy, economics and the environment. Prior to joining CERI, Mr. Masri had a long and distinguished career with the California Energy Commission, where he joined the Commission at the entry level in 1976. He retired from the CEC in 2005 as Deputy Executive Director responsible for R&D and Technology Division. Mr. Masri's landmark achievement at the CEC was building and leading a \$1.9 billion funding program to successfully transition independently owned renewable power projects to competitive markets. Mr. Masri served as a member of the King Abdullah Petroleum Studies and Research Center international Advisory Council and is currently a member of International Advisory Board of the Asia Pacific Energy Research Center, Tokyo, Japan.

THE GCC TRANSITION TO SUSTAINABLE DEVELOPMENT UNDER A LOW OIL PRICE

BY DR. ADNAN SHIHAB-ELDIN

LIFETIME ACHIEVEMENT AWARD FOR THE ADVANCEMENT OF THE ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES 2014

GCC economies remain highly dependent on oil and gas revenues. Despite more than half a century of robust economic growth, plans and policies to diversify away from overdependence on oil have, for the most part, not been successful. The recent sharp drop in oil prices is structural and long lasting and, therefore, is compounding the critical challenges they face going forward in search of a feasible path for continued growth and sustainability. The urgency of the call for serious actions is evident across the region and no clearer than the bold “Vision 2030” announced by the Kingdom of Saudi Arabia, championed and articulated by the young Deputy Crown Prince, Mohammed Bin Salman.

One of the most serious obstacles to delivering on such plans and visions is subsidies and the critical need to reform and rationalize them. Subsidies have

“Oil and gas revenues in the GCC have financed socioeconomic development providing modern infrastructure, decent levels of education, health care and other social services of an advanced welfare state.”

been a dominant feature of all GCC economies since large oil revenues commenced, especially following the first oil price shock of the early seventies. They have grown, in size and scope, becoming a pillar of the “Social Contract” allowing the GCC to enjoy stability and prosperity in a region that continues to suffer from political instability, social struggles and upheaval, armed conflicts and civil wars.

Oil and gas revenues in the GCC have financed socioeconomic development providing modern infrastructure, decent levels of education, health care and other social services of an advanced welfare state. However, combined with inefficient and often irrational wealth sharing policies and measures, this has resulted in large unsustainable subsidies, particularly in energy – leading the region to become one of the highest per capita consumers and triggering massive wastage of this precious oil and gas endowment – while also causing environmental degradation.

The path to serious economic reform, growth and sustainability can be realized in the GCC without energy reforms. Top of the list is the critical need to phase out heavy energy subsidies as part of the social contract. However, subsidies have become an essential component of “sharing-in-the-oil-wealth” and so only win-win energy reform policies and measures have a chance for success without endangering social stability. Energy pricing reforms must therefore be gradual. They must, in one form or another, replace universal subsidies with targeted cash transfers combined with compensation schemes to eligible consumers and sustained long-term public awareness campaigns, ahead of energy price reforms.

Other key elements of energy reform in the GCC need to include policy actions and measures to promote more use of gas for power; involve or enhance the participation of the private sector in power generation; introduce energy efficiency and conservation measures in buildings and transportation sectors; speed-up measures to improve the efficiency of electricity and water production; and expedite the promotion of renewables to accelerate their deployment, in particular solar and including rooftop Photovoltaic (RTPV) wherever possible. Furthermore, the GCC should invest in Research & Development (R&D) for

cleaner technologies to lower the carbon footprint from the consumption of oil and gas, including Carbon Capture and Storage (CCS).

In parallel, the GCC must continue to pursue policies and measures to maintain leadership of and influence on other oil and gas exporters, and the sector in general. The GCC must in particular avoid repeating the mistakes made by OPEC over the last two decades – of allowing oil prices to rise sharply and unsustainably. This has resulted in strong demand destruction, the rise of other low cost oil supply – mainly shale from the USA – and in general, made possible the speeding up of the development and deployment of alternative energy technologies, even in places where economics and physics would have otherwise constituted an insurmountable obstacle. Case in point: Solar RTPV in northern Germany!

Such policies and measures would include, amongst others, making sufficient and timely investment to ensure that GCC oil and gas exporters maintain their historical role as a reliable supplier of crude to the global market, while retaining ample spare capacity to prevent sharp rises in the oil price, which would result in further demand destruction and faster development and deployment of alternative energy supply technologies. The maintenance of moderate price levels would also limit expansion of higher cost oil and slow down technology development to bring new oil to market.

Finally, investment should also cover CCS R&D to make the region’s crude oil more attractive to net importing countries. In fact, GCC countries should take a leading global role in developing and deploying CCS technologies – they have the most to gain if they do and the most to lose if they don’t. ●



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LNG MARKET OUTLOOK: The Evolution of LNG Gains Pace

BY THE ABDULLAH BIN HAMAD AL-ATTIYAH INTERNATIONAL FOUNDATION FOR ENERGY AND SUSTAINABLE DEVELOPMENT

Since the seeds of a concept that ripened into LNG were sown by chemist Richard Doyle in the 1600s, the narrative of the market has undergone several rewrites. In today's new chapter, stakeholders are trying to navigate a supply glut that has currently given buyers more power at the negotiating table than ever before. One skill is paramount in the rulebook of what is now the world's second most traded commodity – flexibility.



The LNG market is in the midst of a perfect storm. Global LNG production volumes climbed by 4 million metric tons on 2014 to 250 million tons in 2015, with an additional 125 million tons of LNG under development likely to come to market in 2017, according to consultants Wood Mackenzie. Yet, demand is weakening, with the International Energy Agency (IEA) expecting natural gas demand to grow by 1.5% annually up to 2021 compared to the 2.2% annual growth reported over the last five years. Asia's appetite for LNG, which typically accounts for 70% of global demand, has particularly weakened. Plus, oil prices – oil-indexed LNG prices mean the market shadows oil price movements – are unlikely to climb above \$50 a barrel until at least mid-2017. Combined, these market pressures mean LNG prices could remain low until the early 2020s.

QATAR'S PIONEERING SPIRIT

Qatar's appetite to explore untrodden energy paths has spearheaded the growth of the global LNG market since Qatargas, now the world's biggest LNG exporter, was established in 1983. Qatar launched its LNG industry against a wave of cynicism that expected the product's high capital costs to be a black mark on Qatar's economic scorecard. Instead, LNG revolutionized Qatar's economy and put the country front and center on the global energy stage. LNG, natural gas and oil revenues account for 70% of government revenues and 85% of export revenues in Qatar, which has one of the world's highest rates of GDP per capita. Qatar's coveted niche in the global LNG export market can primarily be sourced to its unique ability to provide the entire value chain – from production through to shipping – and never failing to deliver a cargo. Qatar's strategic position on the doorstep of the world's booming energy economies has helped, such as easy access to Asia, the Middle East and East Africa. An ability to adapt will safeguard Qatar's bullish track record, as illustrated by Doha's ability to immediately divert every possible ton of LNG to support long-time ally Japan following the Fukushima nuclear crisis in 2011.

NEW EXPORTERS TO RESHAPE MARKET BY 2020

Emerging LNG exporters, as well as existing providers looking to expand their market share, are reshaping the global energy map. The combined volume from the US and Australia alone could account for more than 90% of new LNG exports by 2020, with the two countries representing the majority of a 45% increase in liquefaction capacity between 2015 and 2021.

The US' first LNG export from the country's Sabine Pass on the Gulf of Mexico in February through the newly-widened Panama Canal marked a game changer that influences every aspect of the global LNG ecosystem. The US' share of global export capacity will jump to 14% percent by 2020 from base zero today, according to consultancy Energy Aspects, thus leveraging the country's access to buyers in the Pacific and Atlantic basins.

\$50

Oil-indexed LNG prices to remain under pressure as the IEA expects oil to remain within the \$50 a barrel range till mid-2017.

4

Global LNG production volumes rose by 4 million tons on 2014 to 250 million tonnes in 2015, according to Wood Mackenzie.

120

LNG was the world's second most traded commodity in 2015 with a total value of \$120 billion.



Australia is also on track to become one of the world's biggest LNG exporters thanks to a \$200 billion investment into the country's LNG industry over the last decade and the country's strategic position in Asia. But, the journey has not been entirely smooth. Japan's appetite for LNG imports, which accounts for 70% of Australia's export portfolio, has dipped this year to the lowest point since the Fukushima nuclear disaster in 2011. In addition, the country's strategy to leverage its multi-billion dollar infrastructure projects to get a head start on the emergence of the US' rapidly expanding market has often faltered.

Australia's infrastructure projects are hampered by delays, bickering contractors and soaring costs, which are exacerbated by generous compensation packages. Australian workers typically take home up to 35% more than their US counterparts.

The initial optimism associated with the \$34 billion joint-venture Ichthys LNG project near Darwin in Australia's northern territory – one of the world's most expensive such projects – has been diluted by constant setbacks. Slipped schedules and a \$17 billion overspend have also put the industry's spotlight on the Gorgon LNG terminal in Western Australia, which is poised to be a key supplier to Asia with up to 15.6 million tons of LNG per year over four decades.

In Iran, it was unclear whether the lifting of the majority of the Western-imposed sanctions on the 17th January would mark the emergence of a new LNG juggernaut, or encourage the development of a medium-sized supplier. In less than a year, energy stakeholders have surmised that the country's economic and political hurdles mean the short-term outlook is more likely to be the latter. Iran has struggled, even pre-sanctions, to achieve the level of market penetration that the country's position as home to the world's second largest natural gas reserves should have enabled it to achieve.

Low oil prices are squeezing Iran's already cash-strapped energy sector – \$200 billion is required to rejuvenate the country's oil industry alone – so it is unlikely that plans for LNG infrastructure projects will be realized quickly.

Plus, remaining sanctions are curtailing foreign investment and questions linger over how reliable a long-term supplier Iran will be considering its large seasonal domestic demand. Local and foreign investors will likely hold off major financings until the country's new political tone emerges after the presidential elections in May next year.

Still, Tehran's financial acumen during the sanctions – subsidies were cut and inflation fell by over 30% from 2013 to 2016 – may reveal a savvy exporter that appreciates today's export market is brimming with more competition than the one it stepped back from over a decade ago.

FRESH BUYING APPETITE EMERGES

A wave of new buyers is expected to soak up a portion of the glut, including the 50 million tons of 'homeless LNG' – product without fixed customers – anticipated by 2020. But, only time will tell how much. Egypt, Jordan, Poland and Pakistan became LNG importers for the first time in 2015. Pakistan signed a 15-year agreement to import up to 3.75 million tons of LNG a year from Qatar in a \$16 billion deal in February, for example. Bahrain, Vietnam, Honduras, South Africa and the Philippines also report rising LNG demand, while Indonesia started imports into its Arun terminal in 2015 after the facilities had been used for production since 1977.

The US' LNG cargoes have already set sail for Argentina, Chile, Brazil, India, Portugal, Dubai and Kuwait. It has been nearly 120 years since the US regularly used the maritime route to transport oil to the Middle East, before the discovery and production of the region's own natural energy reserves reduced traffic. The new dynamic demonstrates that flexibility amongst stakeholders is vital to economic success and energy security; uncertainty is often the only certainty in global commodity markets.

The IEA expects the Middle East's gas demand to almost double by 2040, with a rapid population growth and industrialization over the last four decades showing little sign of easing. The Gulf's LNG exporters secured coveted long-term supply contracts for Asia before the depth of local demand was fully appreciated. Consequently, LNG infrastructure that was built to feed demand in Asia and Europe has increasingly been used since 2012 to help support the GCC region, particularly Kuwait, Oman and the UAE. The region's LNG imports from the US and others are likely to continue as the 230-mile Dolphin gas pipeline from Qatar's North Field to the UAE and Oman remains the Gulf's only transnational submarine pipeline.

Europe's rising LNG demand is well-timed for the US' blooming export market, especially as production in the North Sea dwindles. A surge of US LNG volumes into Europe raises questions over the future

2011

Qatar's flexibility was illustrated when it sent every spare volume of LNG to support Japan following the 2011 Fukushima nuclear disaster.

50

Up to 50 million tons of 'homeless LNG' – product without fixed customers – is anticipated by 2020.

70%

Japan's LNG demand accounts for over two thirds of Australia's export portfolio.

125

Another 125 million tons of LNG is likely to come to market in 2017, according to Wood Mackenzie.

34

The cost of Australia's Ichthys LNG development was one of the world's most expensive such projects at \$34 billion.

200

Australia has invested approximately \$200 billion into its LNG industry over the last decade.



role of Russia's state-backed gas giant, Gazprom. Gazprom has long been Europe's primary, if oft-tempestuous, gas supplier with an established and comprehensive pipeline network. But, intensifying competition could encourage Gazprom to rethink its pricing structure for European exports.

The UK's British Gas owner Centrica will extend its imports from Qatar when the countries' current contract expires in late-2018 with a new £2 billion (\$2.6 billion) deal that will enable the UK to purchase up to 2 million tons of LNG per year from January 2019 to 2023. Qatar also deepened its footprint in continental Europe with a cargo to Poland in June marking the country's first import from the Middle East.

LNG stakeholders' conversations increasingly touch upon the impact of emerging green economies on the oversupplied market, with the product coined as 'the cleanest hydrocarbon'. But, a lack of legislation to bolster the use of gas fire generation and the adoption of LNG bunkering – aside from in northwest Europe – must be tackled by market leaders at the United Nation's Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP 22) in Marrakesh in December to bolster the product's usefulness. LNG stakeholders will need to tread carefully, as the correlation between environmental policy and rising LNG imports is not guaranteed to continue. Japan, for example, plans to cut LNG imports by 30% on 2014 levels to 62 million tons a year by

2030 and fill the supply gap with nuclear power and renewable energy.

BUYERS' INFLUENCE TRIGGERS CHANGE

The perceived switch in power from sellers to buyers caused by the supply glut has created a skittish market. Unexpected windfalls thanks to lower LNG prices would typically be welcomed news for buyers. Yet, there are mixed feelings in Asia and Europe as importers are concerned that less infrastructure investments by cash-strapped suppliers today will squeeze supply and prompt a price rally in the early 2020s. Only one LNG project has reached a final investment decision (FID) this year, cautions the IEA, while investments in gas fell by \$10 billion in 2015 on the previous year. Plus, oil and gas field spending fell by 25% in 2015 to \$583 billion and is set to drop by a further 24% to about \$450 billion in 2016.

For now, buyers are leveraging their revised position at the negotiating table. Some Asian importers are addressing restrictions on selling their excess supply; a point that has gained prominence as buyers' surplus has increased since mid-2014. Japan's Fair Trade Commission is carrying out a preliminary investigation into whether re-sale restrictions on the majority of its surplus volumes are valid. This process mirrors Europe's journey when the European Commission decided in 2004 that such clauses unfairly restricted competition. If Japan is successful, up to \$600 billion worth of deals

2nd

Iran is home to the world's second largest natural gas reserves.

15

Pakistan signed a 15-year agreement to import up to 3.75 million tons of LNG a year from Qatar in February.

1977

Indonesia's Arun terminal, which was used for LNG production for nearly four decades, was converted to accept LNG imports from early 2015.

X2

The Middle East's gas demand is expected to almost double by 2040.

230

The number of miles that the Dolphin pipeline from Qatar's North Field to the UAE and Oman traverses – the Gulf's only transnational submarine pipeline.

1st

Qatar's LNG exports to Poland from June marked the European country's first such imports from the Middle East.

may be adjusted and the volumes of potential resales could position Japan as a quasi LNG hub.

Amidst rapidly shifting market dynamics, flexibility is integral to maintaining good relationships, as highlighted by the renegotiation of a LNG contract between India's Petronet and Qatar's RasGas in late-2015. The countries' initial contract did not reflect a standard LNG deal and an adjustment offered by Qatar in extreme market circumstances – quantified by an elongated period of low prices – was considered a natural step to safeguard the historically strong New Delhi-Doha relationship. The renegotiation will save India \$605 million a year.

Buyers have often voiced a preference to introduce more short-term contracts to complement the long-term deals that have long characterized the LNG market, with the latter being essential to guaranteeing financing to support the high capital costs of LNG infrastructure. Today's supply glut means buyers' demands are gaining traction. Around 28% of the LNG traded in 2015 was on a spot, or short-term basis, versus 18.9% in 2010, according to the International Group of Liquefied Natural Gas Importers. Japan's Jera, the world's biggest single importer of LNG, said in August that it will reduce its long-term imports from the current 34.5 million tons a year by 42% to 20 million tons a year by 2030.

The rise in short-term contracts has been facilitated in part by the development of floating storage regasification units (FSRUs), floating LNG (FLNG) production units and floating import units (FSUs). The capital expenditure for all three will total \$41.6 billion between 2016 and 2022, compared to \$11.4 billion between 2011-2015, according to Douglas Westwood's World FLNG Market Forecast.

FSRUS, for example, are relatively cheap, have quick entry to market and can largely avoid geopolitical and natural hazards, as demonstrated by the off-shore LNG supply to support Yemen's seized southern port city of Aden in 2015.

The growth of spot and short-term contracts, spearheaded by buyers and facilitated by technological developments, is opening the gateway for trading companies like Vitol, Trafigura, Gunvor and Noble Group to expand their activities. LNG was the second-largest commodity traded in 2015 with a total value of \$120 billion, which was also supported by the growing participation of financial institutions and Japanese utilities, such as Osaka Gas, Tokyo Gas, Jera and Shizuoka.

EVOLVING INDEXATION AND BUDDING HUBS

Historically, the embryonic state of the natural gas market meant gas and LNG prices were linked to oil prices. This has remained the status quo, despite the growth of LNG as a standalone market. The 70% fall in oil prices since mid-2014 has intensified calls by



a growing majority of LNG stakeholders to break away from oil-indexed LNG prices and establish a 'true' price that reflects the supply-demand balance in LNG alone. Other market participants argue that shifting away from oil-indexed LNG prices now would be poor timing for a market already undergoing significant change.

Volumes are rising on the JKM benchmark, which is energy pricing agency Platts' LNG price assessment for physical spot cargoes delivered into Japan and South Korea. The JKM could emerge as a stepping stone to establishing a hub index for Asia, be it in China, Japan, or Singapore. Some LNG stakeholders argue that China would be the most viable option as it already imports large quantities of gas from Central Asia and has underutilized regasification facilities. But, Beijing would first need to significantly improve regulation and transparency. While Japan and Singapore have the regulatory sophistication, Japan's market is fragmented and Singapore's small physical volumes means it would be better placed as a hub for the South East Asian market only.

Rising volumes on the Dutch Title Transfer Facility (TTF) and the UK's National Balancing Point (NBP) have established Europe as a pricing hub and expectations of a particularly cold winter will likely prompt a spike in prices. Meanwhile, the US may benefit from taking local pricing structures into account when expanding its export portfolio, as the country's Henry Hub indexation holds less relevance outside the US.

The turbulent nature of global commodity markets means that the narrative of LNG will experience many more twists and turns, but there is no doubt of the weight that this product now holds in terms of energy security and economic value. An ability to flex in line with the LNG market's evolving status quo – new demand, new supply, new hubs – will herald the winners of a market that is rapidly climbing to the top of the global energy hierarchy ●

30%

Japan hopes to reduce its LNG imports by almost a third by 2030.

2030

Japan's Jera, the world's biggest single LNG importer, plans to reduce long-term imports by 42% by 2030.

1

The number of LNG projects that have had a final investment decision this year.

583

Global upstream oil and gas spending fell by 25% last year to \$583 billion.

28%

Nearly one third of LNG traded in 2015 as on a spot, or short-term basis.