



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

ENERGY ELDERS 2017

~ Harvesting Solutions for Tomorrow from the Wisdom of Yesterday ~



SPECIAL REPORT

2020

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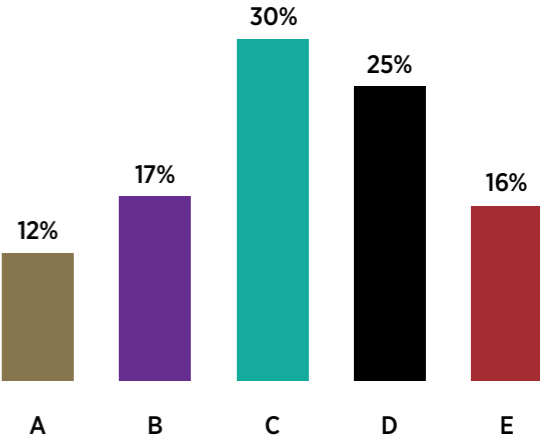
SURVEY RESULTS

ENERGY ELDERS

At the inaugural Energy Elders Forum in Doha in April, 31 esteemed elders shared their view on the key issues facing the global energy markets.

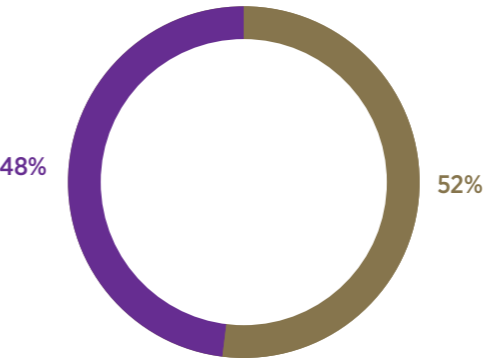
Q1. The OPEC Basket of oil prices – typically priced at a discount to Brent – averaged \$18/bl in the 1990s and tripled in the 2000s to average \$45/bl. If prices stick near current levels until the end of decade, we are on target to average \$75/bl. What do you think will be the average price in the decade of the 2020s?

A. \$40 or below
B. \$50s
C. \$60s
D. \$70s
E. \$80s or above



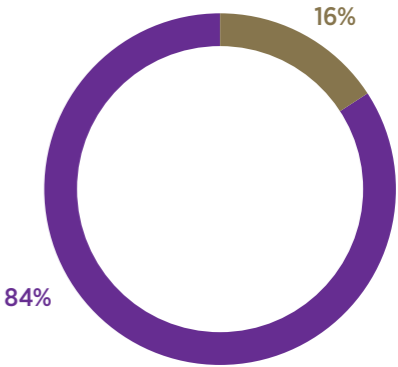
Q2. Following the ratification of the COP 21 Paris Climate Agreement last November, will oil and gas producers eventually have to revise down their reported recoverable reserves due to unburnable carbon limits?

A. Yes
B. No



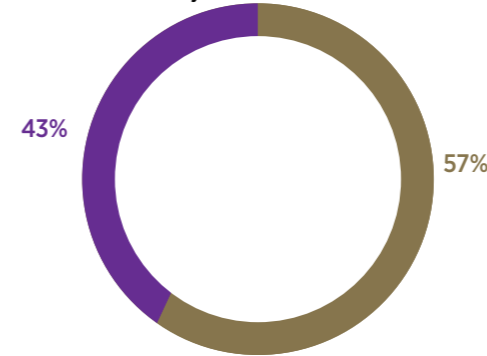
Q3. Technology thought leader James Whittaker, who has the job title of Distinguished Technical Evangelist at Microsoft, says humans should forget STEM education as robots will do all the technical work.

A. Agree
B. Disagree



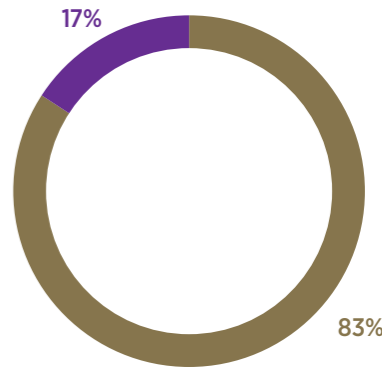
Q4. OPEC has 80% of proven oil reserves and about 40% of the market. The group agreed in November last year to abandon its two-year fight for market share and returned to its historical strategy of managing the market. Should OPEC stick to its role of market manager over the coming decade even if cooperation from non-OPEC states fades away?

A. Yes
B. No



Q5. Should Arab Gulf NOCs transform into globally competitive IOCs like their European peers (BP, Statoil, etc) and Asian Peers (Petroneas, Sinopec, etc) have done in previous decades?

A. Yes
B. No



Knowledge is the Vital Companion on the Road to Success

BY H.E. ABDULLAH BIN HAMAD AL-ATTIYAH

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

We are never too young or too old to learn new information and to think of fresh ideas that push the boundaries of the energy industry's status quo. As the Arab proverb goes: "Seek education from the cradle to the grave."

Our quest for deepening our understanding of the world around us and beyond is what has created the modern civilization that so many of us enjoy today. Digital resources mean we have more opportunities to learn at our fingertips than ever before. But there is a difference between the material that one can quickly get from a Google search and the insight that one gets from wisdom shared by those who have decades of experience and success.

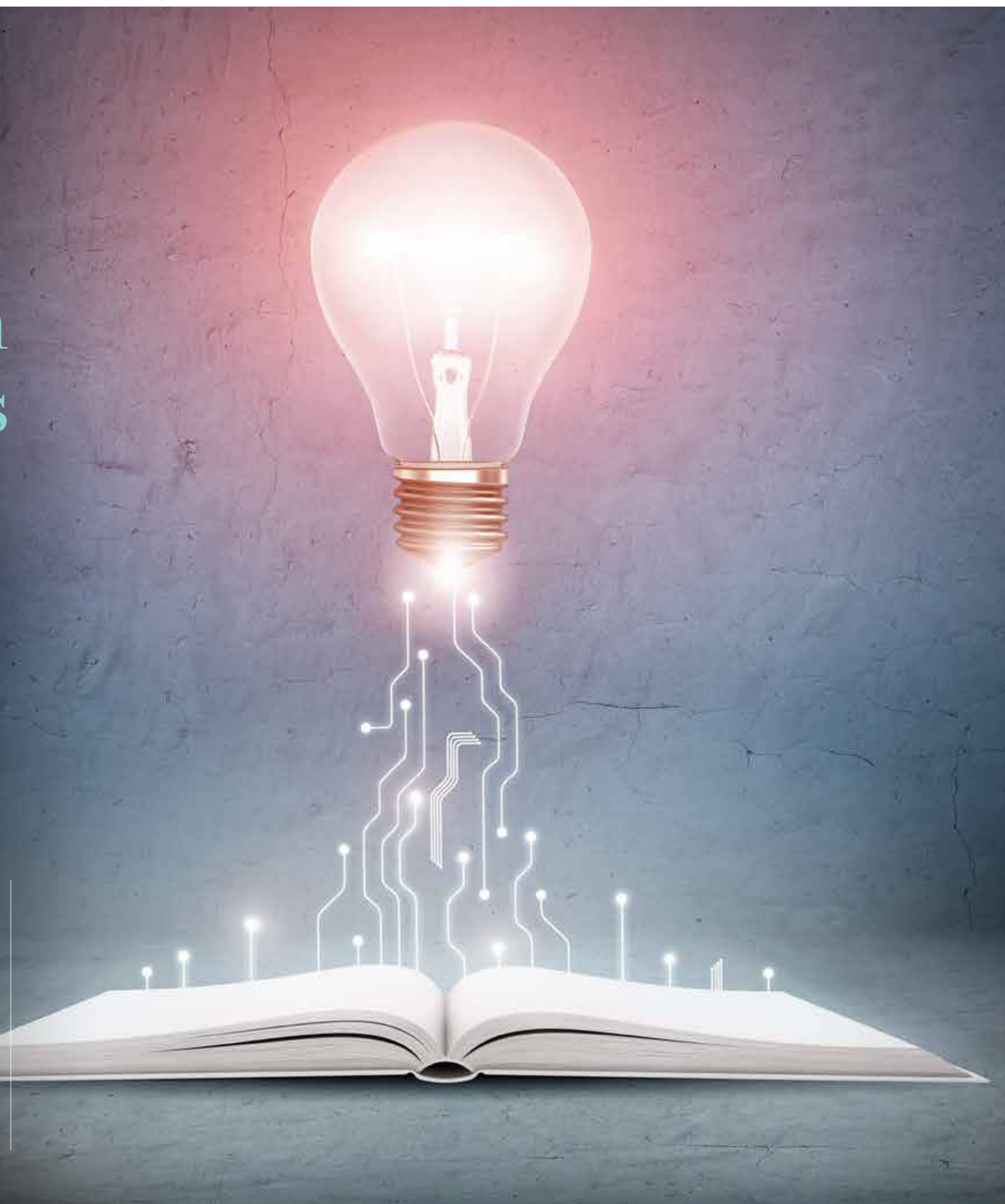
Therein lies the unique value and spirit of the Energy Elders Forum, which aims to harvest solutions for tomorrow from the wisdom of yesterday. Older generations have a personal viewfinder into the changes that have reshaped the energy industry over the last half-century. Even greater change awaits. Oil and gas discoveries in the Middle East revolutionized the global economy in the second half of the 1900s and now the region is emerging as a pioneer in a new and greener energy chapter thanks to widespread political and financial support of renewable energy resources.

Meeting the world's rising energy demand in a safe and cost-efficient manner is a tall order. The UN estimates that the global population will reach

"There is a difference between the material that one can quickly get from a Google search and the insight that one gets from wisdom shared by those who have decades of experience and success."

9.7 billion by 2050 – nearly a 30% rise on today's 7.5 billion people. In the Middle East alone, Qatar's population could swell eight-fold by 2050, Dubai's population could double to 5 million by 2030 and another 500,000 people this year are expected to join the 12 million already resident in Cairo. BP's Energy Outlook forecasts a 49% climb in the Middle East's energy consumption by 2035. Surely there has never been a more crucial time to create a platform that enables older generations to inspire and guide the young and best minds of tomorrow? ●

"This content is derived from the sentiment of a speech given by H.E. Al Attiyah at the inaugural Forum gathering."



Transformation of the Energy Mix?

BY H.E. ALI I. AL-NAIMI

ADVISOR TO THE ROYAL COURT, KINGDOM OF SAUDI ARABIA & FORMER MINISTER OF PETROLEUM & MINERALS

The main lesson from my career is simple. If I, a poverty-stricken Bedouin kid born in a desert, can make it, anyone can. But there is a catch. You must work hard. If one young person is inspired by my career, then I have done a good job. Saudi and all Arab youth – male and female – could use more positive role models. There are many already in

this region, including His Excellency Al-Attiah. My humble hope is that I can be added to the list. This brutal reality comes as a disappointment to some young men and women, but it is true. Success is down to perseverance.

I have seen tremendous progress in my lifetime, but much more hard work is needed to address two

challenges. The first is the real need for investment in new technology and the second is ensuring that the investment is utilized effectively and productively.

The brightest and the best young men and women from around the world are working hard to apply their knowledge and explore new technologies and ideas that will resolve the energy challenges of today and tomorrow, including those at the King Abdullah University of Science & Technology.

I find this investment in the education of our young men and women in Saudi Arabia and throughout the GCC heartening. Young people are the future; we must support, advise, inspire and encourage them. We must keep reminding them that their studies and hard work will pay off in the end.

Fossil fuels from this region have transformed the world's economy and improved the lives of billions of people. Our energy quest today must be to utilize solar and other renewable forms of energy. Scientists say that earth is 4.5 billion years old, with the planet effectively running on solar power. It is the only reason we are all here today; it is a constant, reliable and free source of energy. I have no doubt that fossil fuels will retain a vital role in the global energy mix, but all forms of energy will be required to meet demand as we go forward. I hope today's youth apply their knowledge and expertise in renewable energy to create a better world for mankind for centuries to come. ●



FEATURE INTERVIEW

US PRESIDENT TRUMP'S FIRST 100 DAYS

What Does It Reveal About the Outlook for the Middle East Through to 2020?

H.E. FOUAD SINIORA, FORMER PRIME MINISTER OF LEBANON & HEAD OF PARLIAMENT MAJORITY BLOC

MODERATOR: SEAN EVERS, MANAGING PARTNER, GULF INTELLIGENCE

Sean Evers: *US President Trump has so far taken on a more realist policy posture towards this region than perhaps expected. Is that a positive development? Would that give him a tick from your point of view?*

H.E. Fouad Siniora: It is positive. It is not possible for a President of the US, with all the responsibilities of a super power, to continue dealing with matters from the point of view of a businessman or as someone who is not aware of the various factors required to create real policy. The President still must feel his own way to understand what faults were made by his predecessors, while realizing that ultimately there has been a major change in the region. The matter also must be looked at from the perspective of time and to find permanent solutions instead of simply putting out fires here and there. Otherwise, it will end up by increasing problems in the region. The Middle East suffers from a lack of real reform, which should have been done over a long period of time. Proportionally, the region has a very large young population, which is looking for real solutions to address real problems, such as employment. If these matters are not dealt with, there will be more anger and more marginalization of young people. And instead of expressing their views in a moderate and constructive manner, they could express them in a more negative and violent way.

Sean Evers: *The former administration of President Obama was generally criticized for being 'non-engaged'. As part of your 'message in a bottle' to President Trump, would you suggest that America engages in a much more significant way? And what would be the consequence if they don't?*

H.E. Fouad Siniora: I would recommend that. The world is becoming a small village and it is in

the interests of countries like the US to identify what is in their long-term interest. This includes finding real solutions to hotspots, rather than leave them to brew and to spread and infect other areas. If we take Europe as an example, it is suffering from the continuous influx of refugees crossing the Mediterranean. Managing this problem by closing borders is not the solution. It is impossible to do this anymore. One must find permanent solutions rather than short-term fixes.

Sean Evers: *Do you believe that to engage in the region and find permanent solutions, common narratives must be found? There do seem to be a lot of contradictory narratives in different countries. How does an American administration tackle what has become a more complicated geography than it was a decade ago? Should and could it be communicating with moderate Arab voices for one continuous narrative across many countries, for example?*

H.E. Fouad Siniora: In this region, I consider the Arab-Israeli conflict to be the 'mother' of most issues. This has been dwarfed by what's happening

“The world is becoming a small village and it is in the interests of countries like the US to identify what is in their long-term interest. This includes finding real solutions to hotspots, rather than leave them to brew and spread and infect other areas.”



H.E. Fouad Siniora, Former Prime Minister of Lebanon & Head of Parliament Majority Bloc

in Syria, a country of 25 million people where over 500,000 people have died and a minimum of 1.5 million have been injured and incapacitated over the last six years. We now have 50% of the population of Syria as refugees within or outside of their country. There is another statistic that's very frightening – the Arab world encompasses about 5% of the world's population, but we constitute more than 55% of global refugees. That is the extent of the problems that we are facing and we really need to address them. The Syrian situation is also affecting neighbouring countries and this is a problem that must be handled. The other area of concern is the situation between the Arab world and Iran. This is increasingly affecting the region because of the interventionist policies being adopted by the Iranian regime, without really respecting the sovereignty of other states. This leads to further instability.

Sean Evers: *In terms of those two issues you mentioned, Israeli-Arab and Arab-Iranian relations, are they on par over the coming decade? If Trump had only one to choose for alignment, which of those two would you recommend?*

H.E. Fouad Siniora: You cannot pick one issue and think that you can keep the other one unchanged. You've got to address these issues based on real assessments of what must be done. It is not possible

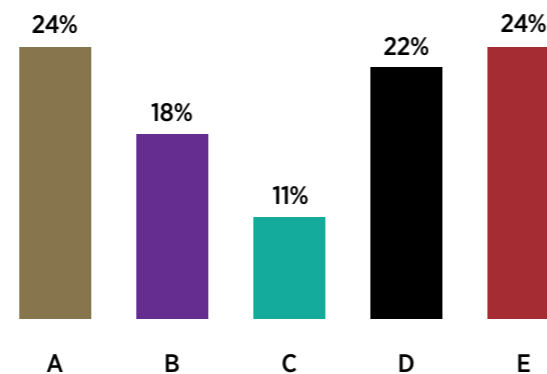
to continue having a situation like the Arab-Israeli conflict, where Israel is increasing the number of settlements and clearly adopting an apartheid policy, without addressing the situation. At the same time, Syria is another hotspot that must be handled. If not, it will adversely affect so many other countries. I would consider that the US must have a more proactive policy in this respect and try to find real solutions that can ultimately put an end to the alarming situation in the region.

Sean Evers: *If you take that recommendation and put it in the context of what we've seen many American administrations do in the past – which is to get caught in the vortex of the nearly unsolvable, very complicated issues – does that not run the risk of consuming all the diplomatic oxygen that perhaps the rest of the region needs right now? For example, focusing on a Syrian grand plan of recovery, or Libya, and Yemen? There are many theatres that need engagement with the world's superpowers. If the Israel-Arab conflict becomes the principle gateway, would that not hinder the new administration's ability to tackle other significant problems?*

H.E. Fouad Siniora: Let us not forget that the interest of the new US administration is not restricted to our region; they have many other issues to address. But the problems of this region

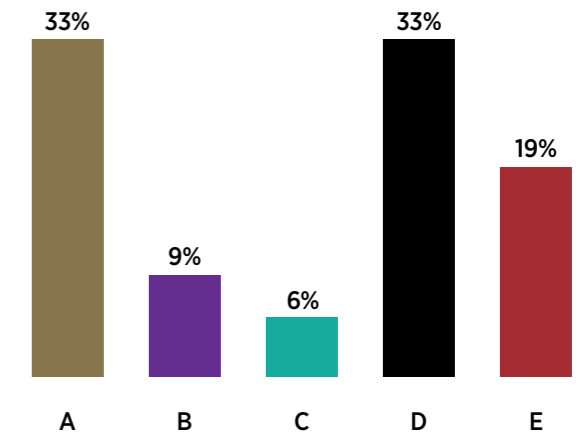
Q1. Lebanon's Former Prime Minister Fouad Siniora has recommended to the Trump Administration that they adopt these five issues as priority policies for the Arab region. Which do you think is the most pressing?

- A.** Founding permanent rather than transitory solutions to the festering problems of the region
- B.** Recognizing that extremism on one side cannot be permanently defeated by extremism by the other side
- C.** Strengthening and empowering Arab moderates
- D.** Recognizing that it would be in America's national interest, as well as the interest of the region, for the US to invest in the social and economic development of the Arab region
- E.** Pursuing an even-handed policy regarding the Arab-Israeli conflict



Q2. The Eurasia Group said in January that 2017 marks the world's most volatile political risk environment since World War Two. As we enter an era of G-ZERO - no nation or one group of nations ruling the world – which of the top five geopolitical risks identified by Eurasia bears the greatest consequences for the Middle East?

- A.** Trump's 'America First' protectionist philosophy
- B.** China overreacts to geopolitical challenges
- C.** A weaker Merkel re-elected into a fractured and growing anti-EU Europe
- D.** Political officials in both developed and emerging economies avoid structural reform
- E.** Technology, a force for economic growth and efficiency, also exacerbates political instability



are very much intertwined and you cannot really address the situation in Syria without, for example, looking at what's happening with Iran and its interventionist policy. It is not expected that the US will put boots on the ground everywhere. Rather, it should seek to empower the states in the region, particularly the moderate states. Be it through its relationship with Egypt, or with the Gulf States, the US could help develop a real effort together with select countries and start creating safe zones in Syria, for example. At the same time, the US should strive to create a force that can ultimately find some sort of way of intervening in the situation in Syria to force a peaceful solution.

Engaging Iran at the end of the day is also important. After all, there are plenty of common interests between the Arab world and Iran, including domestic economic challenges. The Iranian leadership cannot afford to continue allocating substantial resources to politics and away from the real needs and interests of its people. In that regard, while we need to defend our interests, we would should ideally be able to extend a hand towards Iran. It is pointless to continue to waste and deplete resources in the region on something that is not going to be of benefit to anyone.

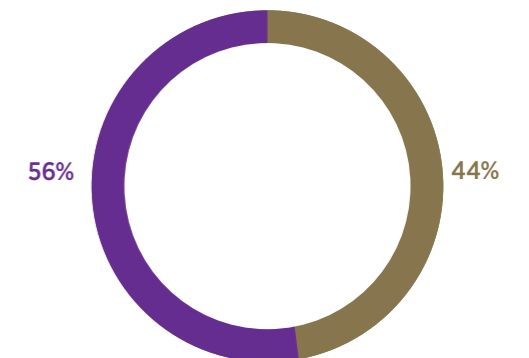
Sean Evers: *President Trump is starting his first overseas trip in this region with a visit to Saudi Arabia. How should we interpret that and what do you hope the trip will deliver? What signals would you like to see come out of it and what would give you hope regarding some of the narratives that you have mentioned?*

H.E. Fouad Siniora: President Trump is sending a real message by making this region his first stop, even ahead of meeting the group of G7 and other European leaders. He is coming to Saudi Arabia and meeting the leaders of the Gulf region, showing that he is interested and willing to engage this part of the world and that something must be done and soon. ●

**This is an edited transcript.*

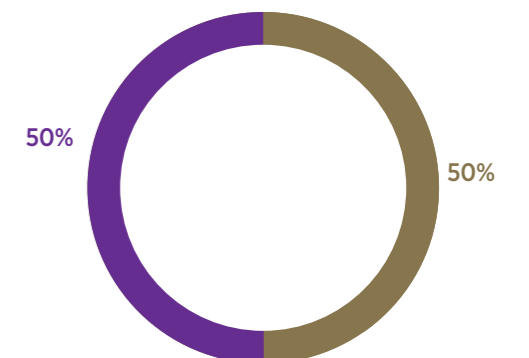
Q3. The dominoes may still be falling from the Arab Spring. But from the point of view of disruptions to oil and gas production and exports, is the worst over?

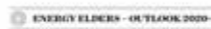
- A.** Yes
- B.** No



Q4. India's ties with the Arab Gulf states, dominated for decades by energy and labor, are expanding. Meanwhile, China remains the dominant market for Gulf energy exporters. Which will emerge as the most important Asian partner for the Gulf by 2030?

- A.** China
- B.** India





STILLBORN **MURDER**

LIFETIME ACHIEVEMENT AWARD FOR THE ATTAINMENT OF SIGNIFICANT ACHIEVEMENTS (2000-2004)

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 resulting as a consequence of energy efficiency gains and renewables policies.

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

If scientists and engineers however fail to provide safe, large, cost-effective storage products, space heating and transportation will remain the dominant choice for fossil fuels. Does that mean that we should abandon any hope to limit global warming in the short run? Not necessarily, but the odds become more diverse and more difficult to implement.

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or district heating with CO₂, and second on this generation funds for transportation. Another task is general implementation of CO₂, 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-incubated CO₂).

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 spur all energy subsidies and give a priority 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 goals for that purpose should be technology neutral. ■



Claude Mandil served from 1999-2002 as Director of the International Energy Agency. He has worked for international organizations in parallel with his career as a diplomat. Before joining the IEA, Claude was Co-Chairman. Earlier posts have included Director of the Ministry of Economics and Finance and Minister of External Affairs. Claude is a graduate of Princeton and Ecole des Mines. His activities were concentrated on Energy Policy.



Charles Wessell moved from his 2001-2002 Director of the International Energy Agency to his current role as International Vice President with his former employer, the U.S. State Dept. Earlier this month he was inducted into the University of Wisconsin's Energy Hall of Fame and received his Ph.D. in Energy Policy. Charles is a graduate of Princeton and holds two Ph.D.s, the highest academic degrees in Energy Policy.



BY NICHOLAS WOOD

LIFETIME ACHIEVEMENT AWARD FOR THE ACHIEVEMENT OF PRODUCTS-CONSUMER SATISFACTION

Many more countries are discovering that the safest and the cleanest power plant is the one that produces waste in all but the name of higher efficiency. Whether energy policy has been traditionally dominated by the supply side (how do we produce more oil, and supply side has) makes increasingly irrelevant that the policy 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 energy use has increased substantially. But efficiency has not improved, though energy demand in R.E. countries has been 12% higher in 2003 than it actually was. And in fact, the annual savings from higher energy efficiency are almost the country's renewables supply. One reason why demand side policies tend to be underfunded is that energy efficiency is generally politically less

Having said this, the important efficiency gains that we have experienced in the last decades have been driven by stronger policies. Today, 50% of the world's energy consumption is covered by mandatory standards and regulations, up from only 15% in 2000. Significant progress has been made in activities in the area of lighting, as well as cars and space heating and to a lesser extent in appliances.

However, the world is still a lot of spread 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 applications such as fans, compressors, pumps, vehicles and refrigerators. In air conditioning, 50% of energy consumption has no minimum efficiency standards - applying average efficiency standards would reduce energy needs by 30%. Mandatory standards are a critical policy instrument to maintain the long-term drive to

The Abdulhadiyu Ahmed Al-Sayid International Foundation for

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, France 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 12% in 2003, as half the global energy 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 by 1.8%, three times the annual average of the last decade. In the same year, global investment in energy efficiency increased by 6% to \$220 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 as 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". ☺

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BY DR. MARK H. WEICHOLD

Halliburton Engineering Global Programs Professor and Associate Dean for Academic Affairs, Texas A&M University, USA

But, most importantly, the publication is a platform for a unique and distinguished group – whose cumulative professional experiences near 1,000 years – to develop effective and long-term solutions to burning questions. For example, the Middle East’s energy consumption is forecast to climb by 49% by 2035 – what is being done today

Each Elder is a recipient of the Abdullah bin Hamad Al-Attiyah International Foundation's International Energy Awards for Lifetime Achievement and has worked in the field of energy, be it in industry, business, government, academia or media, for example. Each Elder was selected due to the longevity and positive impact of their leadership, innovation and vision. The Elders have a global voice; they originate from Africa, Europe, the US and the Middle East. They are not bound by interests driven by any one nation, organization or institution. Such openness is rare. ●

DOI: 10.1002/for

100% Achievement Award

GCC economies remain highly dependent on oil and gas revenues. Despite more than half a century of diverse 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 sustainable path for continued growth and sustainability. The urgency of the task for services sectors is acute across the region and no clearer than the bold "Vision 2030" announced by the Kingdom of Saudi Arabia, championed and articulated by the rising Deputy Crown Prince, Mohammed Bin Salman.

One of the most serious mistakes that governments make in such plans and visions is subsidize and the critical need to reform and rationalize them. Subsidies have



Oil and gas
socioeconomic
infrastructure
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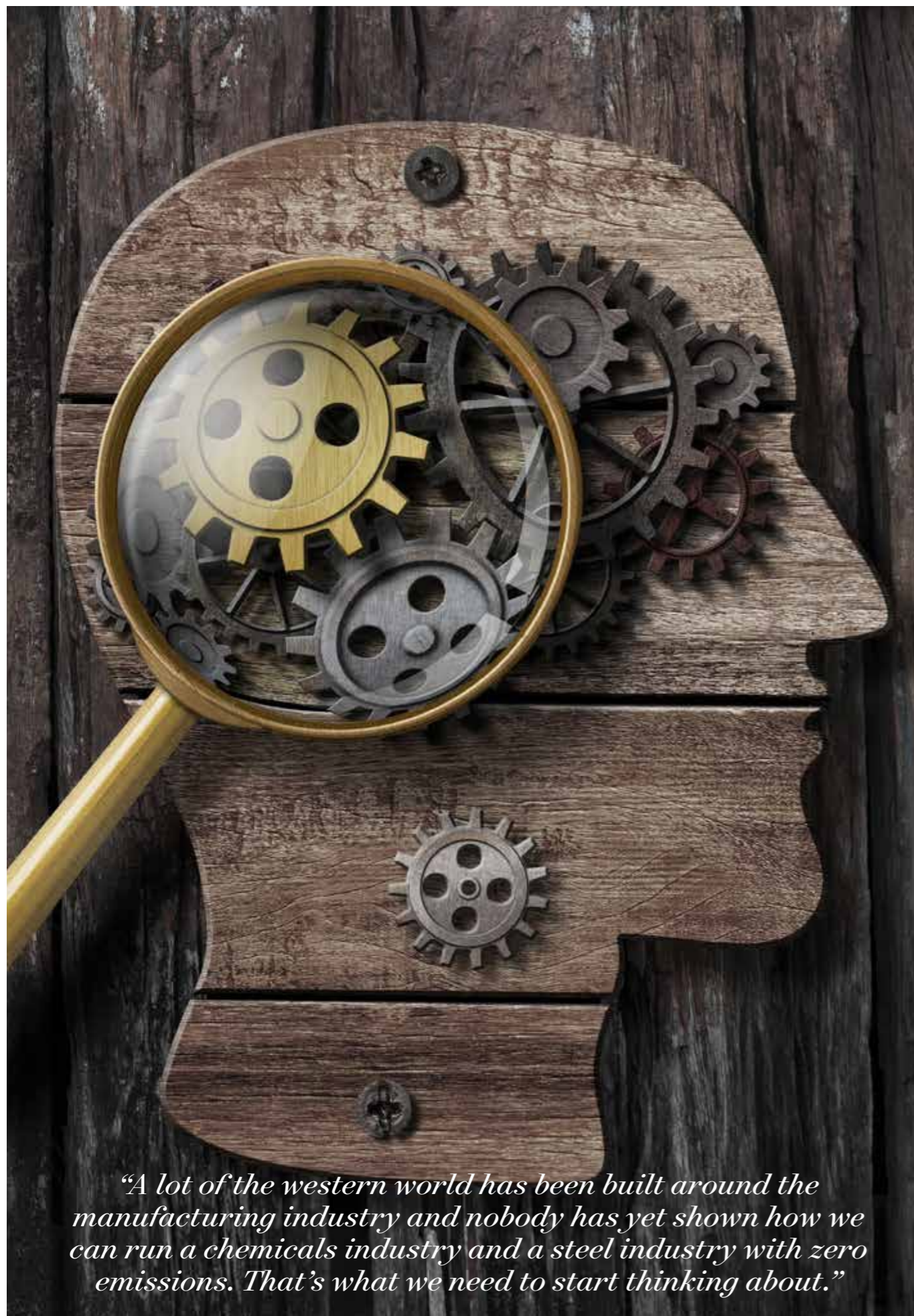
With increasingly fast and the rise of v would be easy to demand is set to fall. But this ign potential the growth in emerge from these sectors outside of p that will continue to rely heavil on our respect to see continued g for many years to come.

2006, oil demand grew by a million barrels per day (b/d), down 20% - the largest year-on-year percentage post financial crisis.

2009, The IEA's latest market demand to continue to rise in the coming years, with the symbolic 100 m b/d being reached about 2014, as b/d by 2020. This would account for all of the global reserves, with about seven out of ten barrels consumed globally. In five years, demand growth will outpace supply.

the medium term, much of this is driven by gasoline, and low prices contributed to growing demand in SUV sales in China to increase sales in the United States, there are numerous sources taking advantage of these

[illegible]



“A lot of the western world has been built around the manufacturing industry and nobody has yet shown how we can run a chemicals industry and a steel industry with zero emissions. That’s what we need to start thinking about.”

INTERNATIONAL ENERGY ELDERS PANEL

Pearls of Wisdom on Understanding the Dynamics of Tomorrow Better than Yesterday?

- H.E. DR. IBRAHIM, ECONOMIC ADVISOR TO H.H. THE EMIR OF QATAR
- NOÉ VAN HULST, AMBASSADOR OF THE NETHERLANDS TO THE OECD & CHAIRMAN, IEA GOVERNING BOARD
- WALID KHADDURI, FORMER EDITOR-IN-CHIEF, MIDDLE EAST ECONOMIC SURVEY (MEES)
- MARWAN MASRI, FORMER PRESIDENT & CEO, CANADIAN ENERGY RESEARCH INSTITUTE (CERI)
- DR. MARK H. WEICHOLD, HALLIBURTON ENGINEERING GLOBAL PROGRAMS PROFESSOR AND ASSOCIATE DEAN FOR ACADEMIC AFFAIRS, TEXAS A&M UNIVERSITY, USA
- MODERATOR: JOHN DEFTERIOS, EMERGING MARKETS EDITOR & ANCHOR, CNNMONEY

John Defterios: *We are at a key point when it comes to the transition that is happening in the energy sector. Technology is developing so quickly, both in traditional markets and new hydrocarbon markets like the US shale and renewables. What are your thoughts on the pace of this transition?*

Dr. Ibrahim: Fossil fuels will remain the dominant energy source for the foreseeable future – they represented 86% of the energy mix in 1973 and now they are at about 81%. Most of the decline has not come from the introduction of low carbon energy resources, but rather from nuclear. From that angle, I would not say that there has been a revolutionary transition, but it is coming and we hope it comes soon.

John Defterios: *Marwan – you have worked in the renewables sector in California. Are the billions of dollars going into the renewables sector a lead indicator that we’re going to get a much more rapid change in the overall energy mix?*

Marwan Masri: Energy transitions are not new. We’ve done wood and then coal, oil and gas. And now renewables are beginning to come to the market. Past transitions took a century or more to move from one fuel to another. The pace of change is getting quicker now, but the missing element is the role of policy. Transition does not happen on its own; it is driven and influenced by government policy and by incentives that are administered and used effectively. It has taken a 40-year effort to bring solar into its relatively competitive position today with other fuels. Although the market is still growing, it’s a very small fraction of global renewable energy. I believe that in 30 years, we will still have fossil fuels as a dominant energy source. New fuels coming in still

have issues that need a lot of work before they can become mainstream and replace fossil fuel energy.

John Defterios: *What maintains the dominant role of fossil fuels? Is it heavy industry and transportation?*

Noé Van Hulst: Renewables have become mainstream; something really has changed. If you had asked me ten years ago, I would have been much more skeptical. But now, I see it happening – both in government policy, in industry and in cities. Everyone wants a cleaner future with less pollution. It’s what the young people want and they are right to ask for it. Is it going to be as quick and fast as some people would like? Probably not. It’s going to take time, because it’s a huge challenge. It’s good that there are targets, but there will still be bumps in the road. You will have the problem of heavy trucks, of petrochemicals, for example. A lot of the western world has been built around the manufacturing industry and nobody has yet shown how we can run a chemicals industry and a steel industry with zero emissions. That’s what we need to start thinking about. A lot of R&D is still needed to make that happen and to crack the nuts that haven’t yet been cracked. And let’s not forget about energy efficiency. The demand side is incredibly important and we need to get a much better handle on that in this region.

John Defterios: *We have seen demand growth hold strongly between 1.1 million and 1.4 million barrels a day in the last two years or so. Does that equation start to change when efficiency kicks in?*

Walid Khadduri: What concerns me is the fact that we’re in an era now where, because of

1973

Fossil fuels accounted for 86% of the energy mix 44 years ago and are now at 81%.

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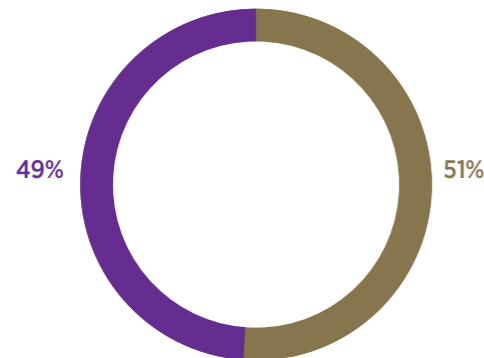
It has taken around four decades for solar power to have widespread success in commercial markets. Previously, the R&D costs meant solar primarily lost out to hydrocarbons.

1.5

Saudi Arabia’s 2030 Vision employment targets have suggested 1.5 million jobs to be created by 2020. Saudi Arabia currently generates 15,000 to 25,000 new jobs a year. How will this gap be filled?

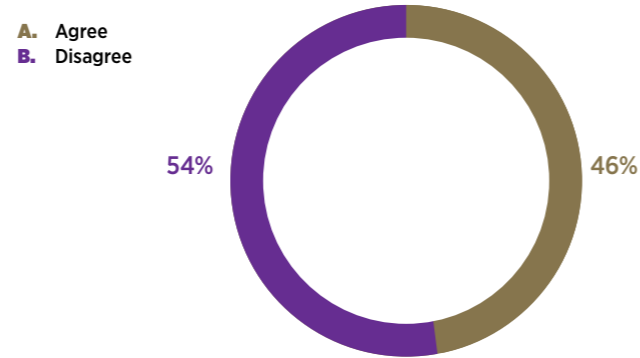
Q1. Tesla's market capitalization recently made it the largest US-based automaker by that metric, at \$51 billion. Oil and gas producers should view this as a:

- A. Good news story
B. Bad news story



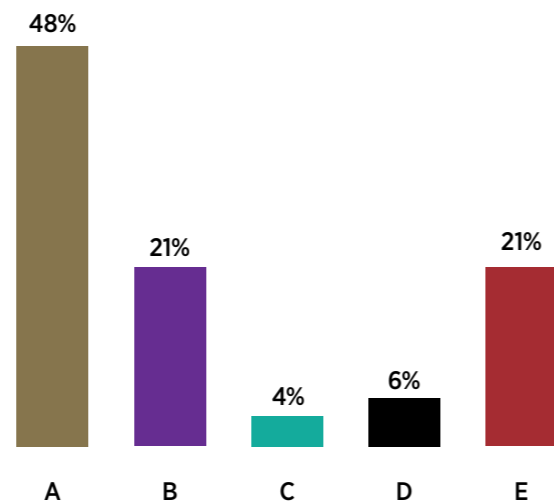
Q2. Disruptive Technologies – big data, automation, artificial intelligence, for example – are set to accelerate the transformation of the oil industry over the next decade. This could make it difficult for Gulf NOCs to maintain current employment levels. Can NOCs maintain their dual responsibility of revenue generation and the social contract of national employment?

- A. Agree
B. Disagree



Q3. Which of the following macroeconomic trends could have the greatest impact – directly or indirectly – on the Middle East's oil industry up to 2020?

- A. Gulf States' continuing budget deficits
B. China's slowing GDP growth
C. Rising interest rates across OECD – returning to historic averages
D. Trump's 'America First' policies
E. India's emergence as world's 3rd largest energy consumer



shale oil, there is a cap on prices. How are the oil producing countries in the region going to deal with that? Will we go over \$50/bl or \$60/bl? It doesn't look like it for now. Global demand overall is rising because of ever-increasing populations and rising standards of living, but there is overall stability in demand. Again, the question for us here in the Middle East is can we really manage and diversify our economies to live with a lower oil price for the foreseeable future?

Dr. Ibrahim: Gulf economies should detach their energy policy from their other economic development requirements – the two should almost develop separately.

Dr. Mark H. Weichold: The beauty of hydrocarbons is that the production and distribution of the energy is very well known and almost routine. The other aspect is that the storage of the energy is almost natural - you've got a tank that contains oil and a cylinder that contains

compressed gas. It's relatively straightforward. The equivalent for short electrical energy is not at that stage. I think the critical piece in making renewable energy successful, be it wind, solar or others, is a mechanism to store that energy. We can produce and distribute electricity, but to store it in an efficient way is more complex.

John Defterios: *Could we have a breakthrough on electric power storage in the next five years? Technology and disruptions are happening much faster now than they did 15 years ago.*

Dr. Mark H. Weichold: I believe we could. There are some remarkable things happening now in materials research and nanotechnologies hold a lot of promise. We're gaining a lot of knowledge about the various types of non-traditional batteries and I think we're on the verge of something, perhaps within the next five years.

Marwan Masri: Work on storage has been going



“There are some remarkable things happening now in materials research and nanotechnologies hold a lot of promise. We're gaining a lot of knowledge about the various types of non-traditional batteries and I think we're on the verge of something, perhaps within the next five years.”

on for a very long time. The previous Secretary of Energy in the US, Ernest Moniz, set energy storage as a priority when he came to office and the US is still not there. It is technically a very difficult thing to do, but also the resources and policy needed to bring it into market are just not there. But looking out ten years to 2030, it would be more likely that storage will be here. Everybody knows what the payoff will be once it is. It will make renewables mainstream and perhaps even speed up the transition to that source of fuel.

Noé Van Hulst: A lot of countries are pooling their resources and doubling their R&D efforts to find innovative storage solutions for renewable energy. Nobody really knows when it's going to happen, but we are trying very hard to push that frontier.

John Defterios: *If we look at one of the GI Industry Survey questions: “Disruptive technology like big data, automation and artificial intelligence are said to accelerate the transformation of the oil industry over the next decade and will therefore make it difficult for the Gulf NOCs to maintain current employment levels. Can NOCs maintain their dual responsibly of revenue generation and the social contract of national employment?”*

In the context of this question, are Saudi Arabia's 2030 Vision employment targets realistic, for example? They have suggested 1.5 million jobs to be created by 2020. Saudi Arabia currently generates anywhere from 15,000 to 25,000 new jobs a year. So, that is well off that 1.5 million mark.

Dr. Ibrahim: We started economic diversification and transformation way before the oil price build-ups. We started it with our Qatar National Vision 2008 – earlier than Saudi Arabia. There was a lot of ambition; we had the National Development Strategy, which addressed economics, environment, social problems and employment. The objectives were there, but we did not start right away. We

need a comprehensive and transparent policy. The people should know what we are doing – we should say this is what we have and this is what we can do and you should be with us. Again, it must be a transition. It must be a target, but the speed should be steady.

Marwan Masri: It is also important that employment targets are tied to a set of policy tools designed to get to a certain point. Some industries are labor intensive, while others like the hydrocarbons industry are more capital intensive. Whether the target is reached or not depends on whether there are actions taken to diversify the economy and create other industries that are more labor-intensive than hydrocarbons.

John Defterios: *A second GI Industry Survey question: “Which of the following macroeconomic trends could have the greatest impact directly or indirectly on the Middle East's oil industry through to 2020?” Is it Gulf states' continuing budget deficits, China's slowing GDP growth, rising interest rates in the Organization for Economic Co-operation and Development (OECD), Trump's America First policies or India's emergence as the world's third largest energy consumer?*

Walid Khadduri: My main concern is the fact that the region is not stable. We already have problems in Iraq, Syria and Libya – countries that are being devastated. And they have emigration in the millions that we must support somehow. This could really devastate any possibility of reform in the way that the military complexes are taking place in the region, and would also be a financial and political burden for the other countries in the region. This is something we really should think about. Algeria, Sudan and Yemen are also weak. It is going to take many, many years to rebuild these countries – not a year or two. ●

**This is an edited transcript.*



ENERGY MEDIA LANDSCAPE

Reversing the Unflattering Image of Oil and Gas

BY H.E. FOUAD SINIORA

Former Prime Minister of Lebanon & Head of Lebanese Parliament Majority Bloc

More than 150 years after the first oil well was drilled, the global reputation of the commodity and its fellow hydrocarbon, gas, is still perceived negatively. The narrative of the oil and gas industry has been written by those who rarely understand the nuts and bolts involved, which in turn is largely down to a lack of clarity and information. Journalists are typically open-minded truth seekers, but they must have the tools they need to do the job professionally. Transparency is essential.

Media is the vital glue to resolve the disconnect between industry and consumers. Consumers, especially millennials, berate industry for its

‘dirty’ image and environmental damage, yet the same generation enjoys the cool of their air conditioning, mobile and plastic gadgets and flying regularly around the globe. The lack of understanding as to how the oil and gas industry is woven into the day-to-day fabric of public life is widespread. A responsible media is integral to fixing the misleading narrative.

Industry needs to proactively seek collaboration with the media to help reshape and distribute a more positive story that sheds the view that the sector is an archaic, slow and male dominated industry. It must leverage decades of examples to illustrate to the media and wider public that it is

“Consumers, especially millennials, berate industry for its ‘dirty’ image and environmental damage, yet the same generation enjoys the cool of their air conditioning, mobile and plastic gadgets and flying regularly around the globe. Media is the vital glue to resolve the disconnect between industry and consumers.”

underpinned by an innovative spirit, technological excellence and one of the first explorers of today’s new environmentally-friendly rule book.

Industry must also have a greater appreciation about the power of media and share information in a way that allows complex messages to be simplified for broader audiences. Drowning conversations in technical terminology only confuses the media, which already faces tight deadlines, restricted resources and broad reporting patches. Companies also need to avoid data-dumps, such as suddenly releasing reams of statistical information in an attempt to distract the media from the real story. In short, companies must keep pace with the international standards of transparency if they want to widen their global footprint. It is a different league with different rules.

Equally, the media should take advantage of the technical and scientific knowledge of those in industry, which could enable journalists to write with authority and accuracy. Journalists must be willing to broaden their reporting patches and flex their own intellectual and research muscle to keep up-to-date with emerging markets, such as renewables and green finance. Most importantly, if the story is not underpinned by thorough fact-checking and reliable sources, it should not go to press. Speed can never supersede accuracy. This is especially important to counter the oft-roguish impact of citizen journalism; a tweet, regardless of its truth, can add or swipe millions from a company’s share price in minutes. This does little to improve trust in the nexus of industry-media-public.

Industry and media must help the public understand the ABCs of the energy sector. When drivers go to the pump to fill their tanks, very few understand the basics of how the product was



extracted, refined, marketed and transported. Considering the massive impact that oil and gas has on every one of the world’s 7.6 billion people, there should at least be a basic level of awareness. Utilizing digital fluency, especially amongst millennials, should make this education process easier than ever. Still, as the human ability for technological excellence gains pace, industry cannot rely solely on screens and typed text to share its story.

There is no substitute for actively engaging with media, facilitating field visits, attending school and college seminars and listening to the concerns of communities located near operational sites. Making this effort – and collaborating with the media to ensure such activities are reported – will help shift the industry’s public image to that of a national champion. ●

TOP 3 RECOMMENDATIONS

EDUCATION, EDUCATION, EDUCATION

Improving the quality and frequency of knowledge sharing within and between the industry and media will ensure the public receive a more accurate picture. Removing the shrouds of confusion – the birthplace of stereotypes – will also make it more difficult for irresponsible and incorrect information by citizen journalists to gain traction.

INCREASE TRANSPARENCY

A steady flow of clear and accurate information is essential to all aspects of the information chain. This will also improve the media’s faith that the messages and data they are communicating are true. Media has equal responsibility to support transparency with solid sources and fact-checking.

SOCIAL CONSCIENCE

Industry needs to guide the media’s spotlight to its positive socio-economic efforts. Much is being done to improve dialogue with local communities, including talent creation and environmental awareness, yet this rarely features in the headlines. The media needs to diversify from the dominant market narrative of oil prices and report more regularly on industry’s wider activities.



THE EVOLUTION OF ENERGY EDUCATION

Competing with Silicon Valley for 21st Century STEM Talent

BY H.E. DR. IBRAHIM IBRAHIM

Economic Advisor to H.H. the Emir of Qatar

Silicon Valley is viewed as a pioneering hub of positive change by science, technology, engineering and mathematics (STEM) talent. Comparatively, the hydrocarbons industry is typically perceived as a problem-maker rather than an innovative solution-provider. Of course, the latter is false. Without successful oil and gas markets, the global economy and the high-quality lifestyles that billions of people enjoy today would not be possible. But it is true that the reputation of the industry is suffering, that it deters STEM talent and that it needs to sharpen its game to match the cutting-edge approach to business that is part of the daily routine in Silicon Valley-esque environments.

The prominence of the hydrocarbon industry

in the public consciousness – which includes budding STEM talent – has been superseded by the extraordinary growth of major technology companies in the last decade. An average member of the public can positively discuss how Google, Amazon and Apple influence daily life, yet there are largely blank looks when it comes to the nuts and bolts of the oil and gas industry. When discussed, the industry is often described as archaic, dirty and male-dominated with a slow response time to digital fluency.

This is not a new problem, but it is now one that urgently needs solutions. Many senior professionals in the energy sector are set to retire. Half of the world's petroleum engineers will leave the industry in the coming decade, for example. As

the industry's talent gap widens, potential STEM professionals are often tempted by IT and finance jobs in innovative sectors and environments that promise to quench millennials' thirst for entrepreneurship and instant gratification.

Financial rewards also tend to be higher and the timeline to empowerment is shorter. Newly-graduated engineers may have up to five years of extensive on-the-job training before getting the energy job they desire, with this shortening to two years in the most proactive companies. Yet in a typical Silicon Valley start-up, employees are empowered from day one and often promoted on merit rather than age. Of course, the safety requirements of the two worlds are entirely different, but industry cannot ignore that this accelerated rate of progress is gold dust to attracting millennial talent.

In the late 20th century, the space race between the US and Russia inspired a new generation of STEM students. The oil and gas industry needs to figure out a modern-day trigger, which in part comes from better advertisements of its major achievements. Getting millennials to recruit millennials is also far more credible than adverts for energy careers shared by industry and academia.

The Arabian Gulf countries also need to deepen their pool of homegrown STEM talent, which will eventually reduce the volume of imported talent and support their bid to transform into knowledge-based economies. Industry needs to engage with STEM talent across the academic chain, from school, to college and university. A toddler playing with Lego blocks could one day use the same skills to help design drill bits for extraordinarily challenging oil wells, with such knowledge exported to explore challenging sites in other oil-producing nations, for example. Providing a fresh viewfinder of how STEM in oil and gas fits into the global ecosystem of energy and economics will

“A toddler playing with Lego blocks could one day use the same skills to help design drill bits for extraordinarily challenging oil wells, with such knowledge exported to explore challenging sites in other oil-producing nations.”

“Industry and academia must jointly make oil and gas more attractive to STEM students, but such talent must also roll up their sleeves and work hard. Scientific careers are intellectual assault courses that demand hard work.”

whet millennials' appetite to be part of a narrative that is constantly changing.

Linear careers that focus on just one aspect of energy production need no longer be the norm. The energy outlook to 2020 and beyond encompasses energy efficiency, climate change, renewables, nuclear technologies, carbon capture and storage (CCS) and much more. Industry needs to shed its 'cookie-cutter' approach to hiring talent for specific jobs and instead broaden STEM professionals' horizons by encouraging a range of specializations and the ability to move offices and explore new geographies. A more dynamic work environment will attract more recruits and will create a workforce full of fresh perspectives and ideas, which is the accelerant needed for knowledge-based economies.

Industry and academia must jointly make oil and gas more attractive to STEM students, but such talent must also roll up their sleeves and work hard. Scientific careers are intellectual assault courses that demand hard work. Silicon Valley inspires such dedication – now we must too. ●

TOP 3 RECOMMENDATIONS

REBRAND 'OIL AND GAS' TO 'ENERGY'

Create a holistic and inclusive environment that encompasses all energy types – hydrocarbons and renewables – to retain and inspire top-level STEM talent in the millennial generation. Regular classes can be organized to dispel the negative stereotypes surrounding the energy industry and thus whet the appetite of STEM enthusiasts, including professionals already in government, industry, academia and media. Greater understanding will create a more attractive job market.

INDUSTRY APPRENTICESHIPS FOR GRADUATES

Expanding graduates' exposure to the exciting job opportunities will increase the chances that they will pursue long-term careers in energy, rather than the jobs typically associated with Silicon Valley. Industry can engage with academia to carve out industry-appropriate curricula to create and nurture STEM talent. This will also ensure that STEM graduates have the skills that local industry requires.

PROMOTE MULTI-DISCIPLINARY ENERGY EDUCATION

STEM education and careers in the oil and gas industry cannot be siloed and must instead interconnect with the wider energy ecosystem, especially as renewable energy rapidly gains traction in the Gulf. Millennial talent is typically restless and a range of learning options will ensure their appetite for knowledge is satisfied, which extends to learning about policy-making and humanities. Developing a wider range of skills may also help industry shorten the timeline to empowerment.



OPEC

The Next Steps to a Unified Future

BY NASSER AL JAIDAH
Board Member, Qatar Petroleum

It is not the first time since OPEC was founded in 1960 that many question marks surround its future. But for the first time in more than half a century, the cornerstones of OPEC's narrative are shifting. Yes, oil, gas and coal remain the dominant sources of energy powering the world economy and will account for more than three-quarters of total energy supplies in 2035. But this is down from the 85% in 2015, according to BP's Energy Outlook. And half of the additional energy required through to 2035 will be provided by renewables, including nuclear and hydroelectric power. Renewables are the fastest growing fuel source, quadrupling over the next 20 years thanks to the downward trajectory in research and development (R&D) costs and application.

OPEC must re-examine how it interconnects –

not dominates – the global energy conversation and how to quell its internal politics and speak with one voice. A united front will ensure clear communication within OPEC, with other oil producers and with the media, including the 300 journalists who descend on the meetings of the OPEC Secretariat in Vienna twice a year. Publicizing different agendas within the OPEC camp will only spell trouble.

Knowledge is power and OPEC needs to brush up on its homework that all its members are on the same page. It must examine the details behind the headlines. Most of the world's oil producers, including OPEC, have been taken by surprise by the speed of the US shale oil industry's growth over the past four years. Brainstorming how to navigate the future impact of shale oil volumes

on the market will be an ongoing activity, with the International Energy Agency (IEA) expecting US shale output to increase by nearly 800,000 b/d this year alone. OPEC needs to be leading the charge in the global oil markets, rather than just reacting; its 14 members cannot afford the reputational damage of being caught off-guard again. China for example, is home to one of the largest shale oil reserves in the world – what proactive step could OPEC take to hedge against this inevitable addition to the global market and are there any other sweet, or trouble spots to keep an eye on?

The impact of US president Trump's 'America First' energy plan is a good example. How will it impact OPEC members' ability to lock in new markets, including US assets? OPEC linchpin Saudi Arabia recently took full ownership of the US' largest refinery, Port Arthur, for example. The same inquisitive approach needs to be applied to gauging the long-term impact of today's social and political momentum behind the electric vehicles market. Toyota says most of its cars will be emissions free by 2050, while Volkswagen wants to sell one million electric cars per year by 2025.

OPEC's signing of the Vienna Agreement last November with non-OPEC – the first deal between the two camps to cut supply since 2001 – gave OPEC a gold star for diplomacy. And the decision by OPEC and non-OPEC in May of this year to extend the supply cuts for another nine months reaffirms that the new power dynamic has OPEC's stamp of approval. Oil producers agree on one point; collaboration breeds success in balancing the market. OPEC's understanding of market functions has undoubtedly matured and there is more trust within OPEC and with other producers than there has ever been.

Faith in the organization as a coordinated group was also enhanced by its collaboration with the UAE Energy Ministry to unveil a new Smart App version for the OPEC Annual Statistics Bulletin (ASB) last November. This will help the Gulf develop a comprehensive, easy-to-use and multi-dimensional understanding of oil and gas

“OPEC must re-examine how it interconnects – not dominates – the global energy conversation and how to quell its internal politics and speak with one voice.”



“China is home to one of the largest shale oil reserves in the world – what proactive step could OPEC take to hedge against this inevitable addition to the global market and are there any other sweet, or trouble spots to keep an eye on?”

information. It also builds on OPEC's support of the Joint Organizations Data Initiative (JODI), which aims to collect approximately 10,000 oil and gas data points from over 100 countries every month. With one voice promoting transparency and collaboration, the energy industry, media and the public are more likely to positively receive the messages that OPEC wants them to hear. ●

TOP 3 RECOMMENDATIONS

STRENGTHEN THE ETHOS OF COLLABORATION

More collaboration with non-OPEC producers and within the OPEC camp will ensure a streamlined message to industry, media and the public. This will be especially valuable as different OPEC members' producing capacity shifts. Iraq plans to ramp up its production to 5 million b/d by December, example. This growth illustrates how members need to be ready to adjust to different influencers within the group.

BROADEN THE REMIT

OPEC can broaden its viewfinder to encompass renewables and petrochemicals, which will help diversify members' overreliance on oil. It will also support the organization's return to its roots as a pioneer in policy-making and market collaboration in emerging energy sectors.

EXPLORE NEW HORIZONS

OPEC can harness the rapidly growing digital toolbox – as it has done with the Annual Statistical Bulletin – to increase transparency and keep up to date with modern methods of communication, such as social media. OPEC can also further explore R&D into innovative technologies. Artificial intelligence, big data, automation and the growth of low-cost but widespread solar and wind projects are just the tip of the iceberg.



GULF NOCS

Success Amidst Shifting Sands?

BY H.E. ABDULLAH BIN HAMAD AL-ATTIYAH

Chairman, Abdullah Bin Hamad Al-Attiyah International Foundation for Energy and Sustainable Development

Get back to basics and ask key questions – that is what the Gulf’s national oil companies (NOCs) must do to find their feet in today’s ever-changing markets. What is your place in today’s global energy transition? Are you going to continue down the traditional hydrocarbons route, or are you going to invest in renewable energy and digital fluency? Those who choose the latter first will have the sharpest competitive edge.

All NOCs need to listen to the alarm bells that are being rung by the International Energy Agency (IEA) that today’s pullback in investment – NOCs, international oil companies and others – will lead to a supply squeeze and potentially trigger a price spike

towards the end of this decade. Global spending on oil and gas fields in 2015 fell by 25% to \$583 billion and by another 24% to \$450 billion in 2016. The downward trajectory looks set to continue this year. Oil demand will pass the symbolic 100 million b/d only threshold in 2019 and reach about 104 million b/d by 2022, estimates the IEA. With rising demand, energy security must be prioritized above all else. NOCs and the whole industry must avoid knee-jerk reactions. Price volatility helps very few.

NOCs have excelled at ramping up their economic efficiency since 2014. The strained finances in today’s low oil price environment have a valuable silver lining; the spirit of innovation in NOCs is truly



“Gulf NOCs need to spread their financial and intellectual wings to soar above the volatility.”

alive. CAPEX has been slashed, payrolls shortened and innovative technologies that cut costs and raise output are getting more attention in boardrooms in the Gulf than ever before.

But success has a habit of fuelling complacency. NOCs must work harder than ever to counter the intensifying competition in the global energy markets, especially as the US shale market is expected to add another 800,000 b/d of production this year alone.

The fundamental concept of good customer service must not be overshadowed by exciting technological trends. NOCs must pay more attention to guide and satisfy expectations in terms of price quality and operational services. This is especially crucial for developing countries, which have booming energy demand outlooks. Many Gulf NOCs already benefit from strong relationships with China and India, the world’s first and third largest energy consumers, respectively. Leveraging this goodwill makes good business sense. Developing countries account for all the growth in oil demand up to 2022. Asia dominates the demand profile at around seven out of every 10 extra barrels consumed globally, while India’s oil demand growth will outpace China within the same period, according to the IEA.

Having an integrated supply chain that cuts out as many middle-men as possible also pays off. Qatar launched its liquefied natural gas (LNG) industry against a wave of cynicism in the 1980s. Many expected the product’s high capital costs to be a black mark on Qatar’s economic scorecard. Instead, LNG revolutionized the country’s economy and put it front and centre on the global energy stage. LNG, natural gas and oil approximately account for 70% of government income and 85% of export revenue, giving Qatar 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. All of Qatar’s customers trust its supply chain; India, Taiwan, China, Italy, UK and many others know that it will deliver on its promise. This is the hallmark of a successful NOC with global aspirations. By fostering this level of trust and respect in the market, it has the platform to explore new geographies and allies. Gulf NOCs need to spread their financial and intellectual wings to soar above the volatility. ●

2019

The year in which oil demand will pass the 100m b/d threshold.

7

Out of every ten barrels consumed globally, seven will be consumed by Asia.

TOP 3 RECOMMENDATIONS

CLARIFY THE MISSION STATEMENT

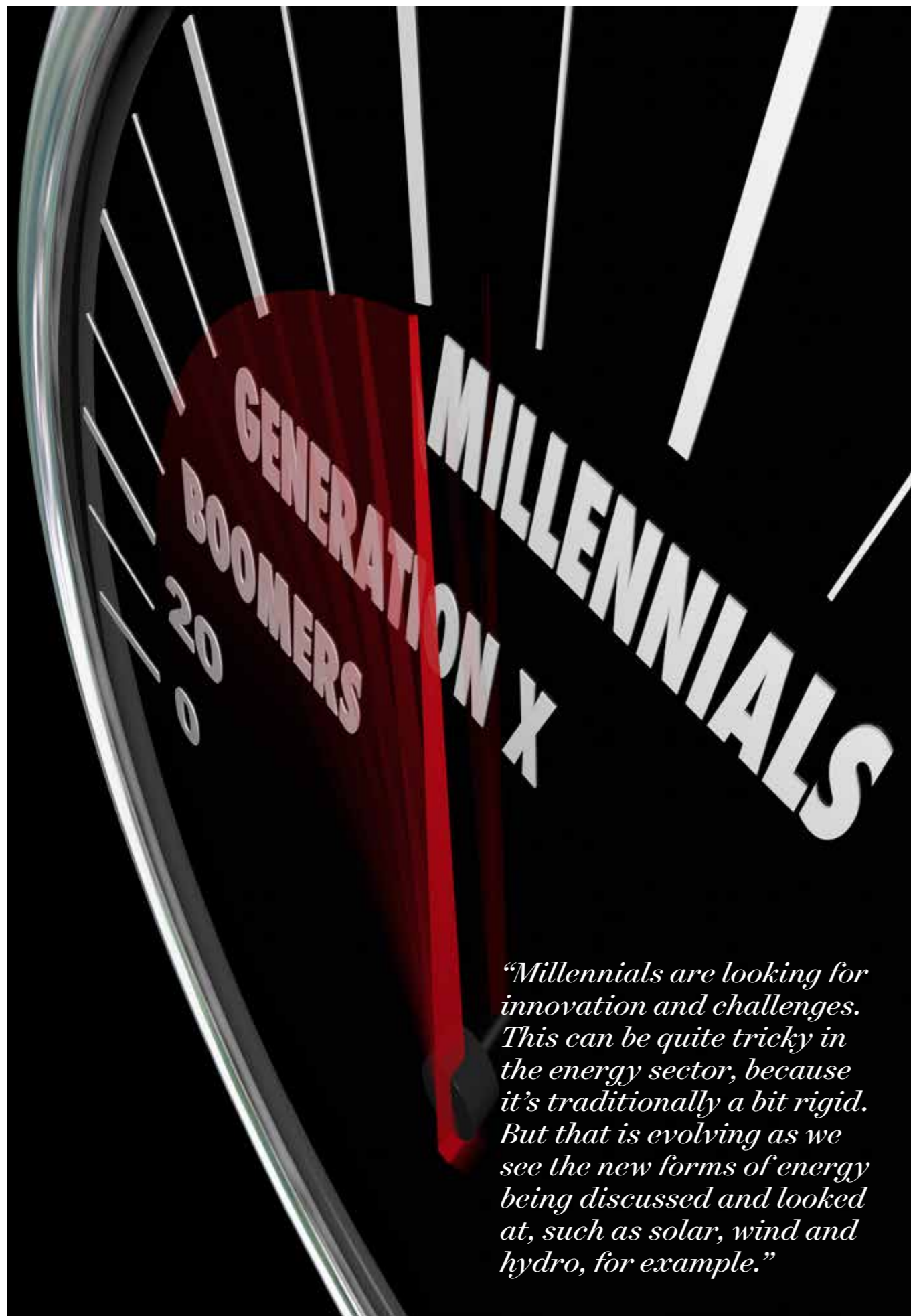
Sustainable efficiency is key to hedging against volatility and maintaining a healthy status quo is only possible when everyone in the NOC – from the CEO to those operating the fields – are on the same page. Re-examine the basics and make sure every facet of the company understands the ABCs of the mission statement. Confusion flourishes during periods of change.

THINK OUT OF THE BOX

Innovation is integral to learning how to keep costs down and maintain energy security – two cornerstones of NOCs’ operations. Thinking out of the box includes exploring new technological trends that can cut costs – big data, automation, artificial intelligence, for example – instead of waiting for technology companies to bang on the door. NOCs must also explore hybrid solutions that use crossover technologies – tools from other industries that can be applied to energy markets – to slash outgoings, increase output and improve safety standards. Brainstorming strategies to intergate renewables into long-term energy portfolios should be done as quickly as possible to get a head start on what will be a competitive curve.

UPGRADE CUSTOMER SERVICE

Gulf NOCs enjoy a large share of the global market thanks to their careful assessments of pricing, attention to detail and complaints and fair compensation. Ensuring that this end-to-end corporate service along the whole supply chain – from the extraction of oil to its use in industrial and retail markets – is continually improved is crucial.



“Millennials are looking for innovation and challenges. This can be quite tricky in the energy sector, because it’s traditionally a bit rigid. But that is evolving as we see the new forms of energy being discussed and looked at, such as solar, wind and hydro, for example.”

FEATURE INTERVIEW

Are Millennials Ready to Take Over the Oil & Gas Industry from the Baby Boomers?

- DR. CÉSAR MALAVÉ, DEAN & CEO, TEXAS A&M AT QATAR
- YOUSEF AL-JABER, DEPUTY DIRECTOR TOTAL RESEARCH CENTRE AT QATAR & RECIPIENT OF THE 3RD ORYX GTL STUDENT AWARDS FOR ADVANCEMENT OF POST GRADUATE EDUCATION
- MODERATOR: SEAN EVERS, MANAGING PARTNER, GULF INTELLIGENCE

Sean Evers: Are millennials ready to take the helm of the energy industry? How can they take over a very complicated technical industry with only ten years maximum of experience?

Dr. César Malavé: Millennials are students who have grown up with technology, who have a tremendous sense of patriotism and who believe that they can have an impact on the world and can make a difference. These are students that have gone through an educational system quite different from the one that I went through, which was based on maths and science. Their system has given them opportunities, such as internships and studying abroad. These are students that know how to work in teams, so I believe that they have the proper training and the proper attitude to take over the industry.

Yousef Al-Jaber: The work ethic of the new generation has changed and evolved over the years. They are looking for innovation and challenges. This can be quite tricky in the energy sector, because it’s traditionally a bit rigid. But that is evolving as we see the new forms of energy being discussed and looked at, such as solar, wind and hydro, for example.

Sean Evers: But the millennial generation is coming into a position of leadership at a time when we’re looking at a major transformation in the energy mix and we are on a very significant price point in the cycle. There are a lot of challenges. Where can you garner the confidence and experience to navigate through this period?

Yousef Al-Jaber: We have work shadowing programs, development programs, on the job training – all of which help to navigate any challenges.

Sean Evers: One of the reasons we’re facing the challenge of the baby boomer generation handing over to the millennials is because my generation – in-between millennials and baby boomers and known as Generation X – was squeezed out of the industry in the late 1980s in an economic cycle similar to the one we’re experiencing today. What are you seeing in education in terms of where young people are looking to go to? What is the competition? How do we compete with Silicon Valley and other employment options?

Dr. César Malavé: Silicon Valley is so attractive to millennials. They think they can create something that will change people’s lives, so we also must communicate a similar message from the energy sector.

Sean Evers: How is the energy sector performing in front of that body of students in your hallways, here at Texas A&M in Qatar, but also back in College Station in the US? Your university delivers one of the largest engineering faculties in the world.

Dr. César Malavé: Some of them are scared of the cycles of the energy sector. They believe that when they get a college degree, they will not have a job. We need them to understand how these cycles work. If you go back five years, I was in College Station and

“Can robots teach themselves to adapt to new technologies, or can we use computer modelling? No, because you have stages in technology innovation that require human interaction. Robots don’t necessarily create. It is the human mind that creates. We design, we create, we innovate.”

at that time, every single young kid wanted to be a petroleum engineer. Today, they don’t due to the cycles of the industry.

Sean Evers: *In terms of the skill set and compatibility and familiarity that your generation has with technology, some of which is transforming and disrupting the energy sector, do you really have the technical qualifications to lead what is a complex sector? Yes, you’ve all had iPads since you were five, but is that a skill set that warrants boasting about?*

Yousef Al-Jaber: Today, the industry is using robotics in operations, digitalization and so on. For the older generation, they have never dealt with these kinds of devices, so it’s a very difficult adjustment for them to accept the idea of controlling robots and drones to go and check on offshore locations. Now look at the other side with the new generation. My kids have played with a drone at home and when they go to work one day, it will be like being back in their childhood. So, it’s a different perspective. The ecosystem has changed. The involvement of work has changed. The challenges have changed. Millennials are not overselling the idea of having a new set of skills.

Sean Evers: *I suppose in some ways the tool box that your generation and those coming after you will be using may be applicable to multiple sectors. The crossover could be a lot easier than previous generations, who tended to have only petroleum engineering skills, for example.*

Yousef Al-Jaber: When IT first started back at the end of the 1980s, they were hiring people from other sectors to come and innovate in their sector. Today, it’s the opposite way with Silicon Valley exporting innovation. There are also some soft skills that can be applied from one sector to another. For example, the oil and gas industry adopted TRL –

Technology Readiness Level – which was developed in the space industry. We have a whole new mindset in the business now, which gives us a new way of doing things that could develop into a competitive advantage.

Sean Evers: *Is education keeping up with these changes? Is there a drone class at Texas A&M at Qatar, for example?*

Dr. César Malavé: Education has generally been very slow in listening to the industry’s needs. We are slow at making sure that we understand the needs of the people that we serve. But we’re working on it. We have science projects and, for example, accreditation requires that every student engages in a campus design. Many departments are engaging with the industry.

Sean Evers: *If you could design the perfect program, what would that look like for what you think is the need into the sector? How would you make that disruptive change in education?*

Dr. César Malavé: I would suggest teaching all the courses in a project-based format, which would be sponsored by industry. Some colleges are already doing that. Projects that start in your freshman year can go all the way to the senior year. Then you add the different tools that you need as the complexity of the project increases. We know that there are ways to educate engineers better than how we do it now. We’re moving in that direction – but slowly.

Sean Evers: *What about the idea that we should abandon science, technology, engineering and mathematics (STEM) subjects and focus on creativity because ultimately human STEM skills will be replaced by robots?*

Yousef Al-Jaber: Any technology must be adapted for certain operations. Can robots teach themselves to adapt to new technologies, or can we use computer modelling? No, because you have stages in technology innovation that require human interaction. Robots don’t necessarily create. It is the human mind that creates. We design, we create, we innovate.

Sean Evers: *How is education adapting to this question regarding robots, artificial intelligence and STEM?*

Dr. César Malavé: I did my PhD 30 years ago on the application of artificial intelligence to robotics and what I’ve seen since then is not enough. Sometimes



Left to Right: Yousef Al-Jaber, Deputy Director Total Research Centre at Qatar & Recipient of the 3rd ORYX GTL Student Awards for Advancement of Post Graduate Education and Dr. César Malavé, Dean & CEO, Texas A&M at Qatar

we tend to oversell these technologies, so I believe that humans will always be part of that. I’d like to believe that it will be human-assisted technology. And the way that we adopt that in academia is to bring it into student projects. Our students can also go and work with these technologies in industry internships. A common challenge is that industry has technologies that are more advanced than what we can afford in a university, which is why partnership is key.

Sean Evers: *What about the challenge of attracting people to work in the sector? Are you a role model? How do you convince others that there is still life in this industry? Your generation has lots of choices after all.*

Yousef Al-Jaber: When we look at work options, there are many in this sector, but there are also other sectors that are paying well for non-engineers. It can be very hard to convince someone to put the extra effort in to do engineering and science degrees.

Sean Evers: *Are you introducing a diversified range of complementary subjects outside of engineering at the undergraduate level? Encouraging students away from the core subjects?*

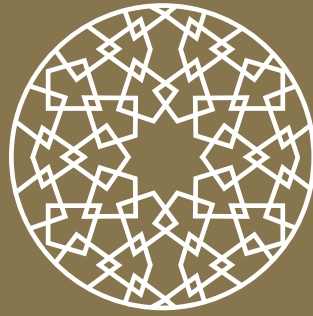
Dr. César Malavé: As engineers, we provide courses in business, for example. But interestingly, one of the hottest areas for engineers today is healthcare. We see some universities combining colleges of medicine with colleges of engineering. Subjects that we used to see only at the graduate level are making their way to the undergraduate level. We have an issue, which is that we do not have enough credit of knowledge

subjects to put in an engineering curriculum. But you do it through other means, such as extra-curricular activities, undergraduate research, internships with students and competitions where students learn teamwork skills.

Sean Evers: *What are the challenges and opportunities for the millennial generation? Will they have multiple careers? Are jobs for life no longer part of the equation?*

Yousef Al-Jaber: My generation is looking for more liquidity, more cross-functionality and more transitory opportunities to move from technical to non-technical sectors or departments within a company. That way, they can look to try and stay with one company for a longer period. You don’t find this liquidity in most of the NOCs in the region. If you start as an engineer, you should retire as an engineer. It’s rather linear and it’s very hard to progress. With IOCs, you have more opportunities to move around. I started as an engineer with an NOC in this region and then I moved to sustainability and to renewable energy. When I joined an international company, it was as head of CSR, which is not technical. After three years, I got the chance to become Deputy Director of Research, which took me back to the technical side. This is an opportunity for me to bring in new ideas, have a positive impact on operations and bring a fresh perspective on innovation to the company and different departments. We don’t always need to bring someone from outside the sector to innovate; the best innovator sometimes exists in the sector and in the company. ●

**This is an edited transcript.*



The Forum of
ENERGY ELDERS

~ Harvesting Solutions for Tomorrow from the Wisdom of Yesterday ~



**The Abdullah Bin Hamad Al-Attiyah International Foundation
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