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WPC Vision, Mission & Values
WPC Vision, Mission and Values
At the WPC our members are involved in all aspects of the oil and gas industry. This is reflected in this year’s Strategic Review which showcases the diverse range of areas that we are involved in. It is encouraging to see things looking a bit brighter than when we previously published a review, as we see the oil price recovering. The collapse in 2014 triggered a wave of cost cutting and in particular, the upstream sector of the industry lost many people. We have to hope that in doing this we have not lost too much experience, knowledge and skills. On a more positive note, the cost efficiency gains have allowed a number of projects which were deemed too expensive to now operate at breakeven prices of less than US$30 per barrel, the North Sea being a prime example.

Some of the smarter companies planned for sustained profitably during difficult price scenarios and kept the majority of their staff, after all we work in an environment of ups and downs with a traded commodity, so we should not always be surprised with an oil price fall.

Much of the global focus is now on the USA and OPEC and the ground-breaking agreements between OPEC and non-member countries, in particular with Russia. As oil prices recover one of the challenges for oil companies is to hold on to the benefits of cost reduction, and I suspect that some cost escalation will be inevitable in the coming years. That said, the cooperation between OPEC and IEA (with the IEF) has done much to stabilise prices over the years and make the industry more transparent.

In recent years we have also witnessed a reduction in future upstream investment, so we may well see a spike in oil prices due to the lack of investment catching up on us. We will however start to see the benefit of investment in new technologies such as machine learning and artificial intelligence which will enhance all areas of our business.

We know that a growing world population needs energy, and to meet this demand, the petroleum industry is called upon not just to provide effective management of oil and gas reserves, but also to marshal its financial resources and technical capacity. By doing so we further diversify energy sources and delivery options. Energy industries have always evolved to meet people’s changing needs and the energy industry of this and the next century will become more diverse and more dynamic. For the longer term, sustainable economic growth and meeting global energy demands in an environmentally sensible and socially acceptable way, will require the development of entirely new energy technologies and other advanced fuel sources.

Hence the challenge: How do we meet this growing demand for affordable petroleum and natural gas products, while ensuring environmental quality and meeting societal needs? Today business success, in both developed and developing countries, is increasingly linked to strong performance in financial markets, environmental stewardship and community affairs. Businesses also have to deal with changing sets of expectations from a broader range of stakeholders.

The international petroleum industry takes this challenge very seriously. The actual responses to these environmental and social challenges differ among companies and countries. However through the WPC, the international oil industry has a showcase and a forum for communication to define common approaches to global environmental issues, and to share good environmental and social practices for the benefit of the petroleum industry and the community at large. This will be showcased at the 2nd WPC Leadership Conference in Mumbai, India in February next year and later in June 2019 we will be in St Petersburg, Russia for our 6th WPC Youth Forum. The Youth Forum will provide us with the views of potential future leaders, on where the industry and the world are going. Then towards the end of 2019 we will be in Bahrain for the first WPC Downstream Conference, which will focus on the long-term strategy, integration and leadership of the production and management of oil and gas products. Before we know it 2020 will be with us and we will be welcoming you to Houston for the 23rd World Petroleum Congress.
Kazakhstan, being one of the top producers and exporters of oil, gas, coal and uranium, has demonstrated sustained and steady growth in its energy sector for many years. Global changes in energy consumption prompted our country to put in place initiatives that strengthened our position in the regional energy market. This has helped move us from a particularly sensitive zone towards a more comfortable position. Thus, in spite of pricing challenges, oil and gas mega projects have not only been able to sustain the pre-existing rate of production nationwide, but even to increase it in the long-term.

At year-end 2017, crude oil production in Kazakhstan reached 86.2 million tons, which is 10.5 per cent higher than in 2016, and went above the target by 2 per cent. Last year’s production set a record in the entire history of the country’s oil and gas industry. In addition, natural nationwide gas production reached around 53 billion cubic meters – this is an increase of 14 per cent compared to the previous year and 10 per cent higher than the target. Today, the oil sector is the source of crucial support to the consolidated budget of the country, including the movement of funds through the National Fund: in 2017 alone oil revenues increased by 60 per cent, with their share in revenues up to 30 per cent. In 2018, the country is ready to demonstrate to the energy world a new all-time high in the production of hydrocarbons, significantly influencing the balance of forces on the energy map of the region. By 2025, we will be able to reach production levels of 104 million tons of oil per year. Hydrocarbon production in Kazakhstan is growing amidst the current increase in world oil prices, which continues after a long and significant decline.

The landmark decision by OPEC members to ease quotas for oil and gas mega projects have not only been able to sustain the pre-existing rate of production nationwide, but even to increase it in the long-term.

At year-end 2017, crude oil production in Kazakhstan reached 86.2 million tons, which is 10.5 per cent higher than in 2016, and went above the target by 2 per cent. Last year’s production set a record in the entire history of the country’s oil and gas industry. In addition, natural nationwide gas production reached around 53 billion cubic meters – this is an increase of 14 per cent compared to the previous year and 10 per cent higher than the target. Today, the oil sector is the source of crucial support to the consolidated budget of the country, including the movement of funds through the National Fund: in 2017 alone oil revenues increased by 60 per cent, with their share in revenues up to 30 per cent. In 2018, the country is ready to demonstrate to the energy world a new all-time high in the production of hydrocarbons, significantly influencing the balance of forces on the energy map of the region. By 2025, we will be able to reach production levels of 104 million tons of oil per year. Hydrocarbon production in Kazakhstan is growing amidst the current increase in world oil prices, which continues after a long and significant decline.

The current favourable market conditions have allowed the largest oil and gas conglomerates to continue investing in technological and digital modernisation in Kazakhstan. Total investment under the initiatives of the Fuel and Energy Sector for 2017-2025 are projected to surpass 19 trillion tenge (US$51 billion), more than 97 per cent from private commitments. In the hydrocarbon production and export segment, three giant oil and gas fields – Tengiz, Kashagan and Karachaganak – the stronghold of Kazakhstan’s economy, will see billions of US dollars in investment over the next few years. With the expansion of production from these fields, the country will be able to increase oil production by tens of millions of tonnes. This will further strengthen the energy security of not only Kazakhstan, but will also ensure the stability of fuel supplies to global consumers for many years to come.

For many years Kazakhstan has been providing reliable exports of crude oil and natural gas to the west through Russia. A few years ago, in order to diversify and provide alternative supplies, the country invested in the construction and commissioning of a gas pipeline to China, thus enabling the transit of Central Asian gas as well as reliable exports of Kazakhstan’s fuel to the east. The reorientation of gas flows towards China has forced the global energy industry to reappraise Kazakhstan, now as a reliable and efficient export partner capable of supplying fuel directly to consumers, without the need of intermediaries. Planned improvements to gas transportation infrastructure – the modernisation and capacity expansion of the Kazakhstan-China and Beineu-Bozoy-Shymkent gas pipelines, as well as the construction of the new “Saryarka” pipeline – will in the future double export capacity and ensure effective domestic gas supply, including for the country’s northern regions and Astana.

The multi-million dollar investment in upgrading the three largest oil refineries in Atyrau, Shymkent and Pavlodar, as well as the planned construction of a fourth refining facility, will make it possible for the country to be fully supplied with our own high-quality motor fuels in line with Euro-4 and Euro-5 standards. We already cover 85 per cent of the local market with our own fuels, 95 per cent with diesel fuel and 36 per cent with jet fuel. At the same time, our country ranked twelfth in the world for the cheapest gasoline and fifteenth for the cheapest diesel fuel out of 167 countries. These are good positions given the region’s competitive environment. Moreover, the delivery of projects for the production of high-value-added commodities will help develop the petrochemical industry.

Huge investment in energy projects – unique in design and ground-breaking performance-wise – testify to high investor confidence in Kazakhstan.

Legislative changes, corresponding to best global practices, have increased Kazakhstan’s investment attractiveness and the competitiveness of mineral producers. The Code “On Subsoil and Subsoil Use,” signed in late December 2017 by President Nursultan Nazarbayev, is recognised by international experts as one of the most progressive pieces of legislation for investors.

Starting this year, we have simplified the mechanism of issuing subsoil use rights, it is analogous with the Australian model, and operates through the introduction of a “first come first served” licensing order. We have granted guarantees for...
the stability of subsoil use conditions, started the transition to international procedures for stock assessment and availability of geological information, in digital format, as well as ensured the openness of data on subsoil users, subsoil use conditions and final beneficiaries. In addition, we have retained the state’s priority right with respect to strategic hydrocarbon sites operated by the national oil and gas holding KazMunayGas.

The recently updated Code of the Republic of Kazakhstan “On Taxes and Other Mandatory Payments to the Budget”, also signed by the Head of State in late 2017, has abolished the commercial discovery bonus in geological exploration, offering instead an alternative tax on subsoil use for offshore and deep oil and gas deposits.

Once improved, the legislative framework for the management of energy-related emissions and waste made it possible to approve the National Plan for the Allocation of Greenhouse Gas Emission Allowances for 2018-2020, as well as to amend the current Environmental Code.

By the close of 2019, a draft of the new Environmental Code will be submitted to parliament for approval. It will meet the requirements of the OECD and ensure the transition to environmental standards and economic mechanisms for environmental regulation, as well as the improvement of procedures for state environmental control.

The development of clean energy in Kazakhstan will boost the active use of renewable energy sources - for this purpose, the country has created all the necessary conditions at the legislative level.

To continue the legacy of EXPO-2017, 105 foreign and 28 local green technologies have been selected for further development in the country. Nine technologies have already been implemented, and nine more will be implemented by the end of this year. Furthermore, the first international bidding auction for RES projects has taken place. All this demonstrates Kazakhstan’s commitment, while dependent on the extraction of traditional raw materials, to create clean energy for the benefit of the country’s future.

Kazakhstan, which enjoys a positive reputation in the global arena and actively pursues international cooperation with numerous energy and oil companies, including the World Petroleum Council, is open for further partnerships in areas of current interest.

Welcoming the participants of the World Petroleum Council, I would like to emphasise the contribution of the WPC to the development of the energy sector and the global economy. I hope that through discussion in Astana at our meeting on October 1-3 we will continue to promote the use of oil resources for the benefit of our countries and humanity.

We have repeatedly demonstrated to the entire global energy industry that we are a reliable and stable partner to rely on in any circumstances and are ready to responsibly continue to follow this policy, no matter what challenges we encounter.
The future of the Oil Market

By HE Mohammad Sanusi Barkindo
Secretary General, OPEC

The global oil industry has always been considered dynamic, demanding and, at times, complex. Over the recent past, new challenges have emerged, which have required more rigorous analysis, increased pro-active engagement, and broader cooperation among producers and consumers. In fact, over the last ten years, there have been episodes of extreme market volatility, which have posed significant challenges for all stakeholders.

During such episodes, OPEC has consistently risen to the challenge. It has done so by engaging in extensive dialogue and taking collaborative action. As the Organisation has often said, the only response to collective problems in an interdependent world is through collective response.

The most recent example of this was the landmark ‘Declaration of Cooperation’ of December 2016, which was agreed to by 24 (now 25) oil producing countries, both OPEC and non-OPEC. Preceded by the ‘Algiers Accord’ of September 2016, the Declaration reflected OPEC’s steadfast commitment to its mission to strive for market stability by restoring balance to the market – particularly after a severe downturn. The achievement of such a broad coalition was historic and exhibited a renewed spirit of collaboration among all of the participating countries.

Based on the input of the Joint Ministerial Monitoring Committee – the body which was set up to monitor and ensure full and timely conformity with the Declaration – the focus of current and ongoing efforts is on the effective implementation of the decisions. The continuity of this cooperation now needs to be preserved for the good of sustainable oil market stability.

Various challenges, however, continue to underscore the fact that OPEC’s work is never done. Patterns and trends in recent years have emerged which require that we re-think our paradigms – and which need to be assessed in terms of their potential impact on the market. In OPEC’s Monthly Oil Market Report, our analysts regularly scour economic and market data for signs of what may lie in store for the market in the short- to medium-term, and what the impact might be on the world’s producers and consumers.

More important are the findings of OPEC’s annual World Oil Outlook (WOO), of which the 12th and most recent edition was launched in Algiers in September 2018. First published in 2007, the WOO highlights possible future challenges – and opportunities – for the oil industry, and explores the links between various factors affecting supply and demand, among others. It also considers the potential impacts that various worldwide trends may have on the market.

In terms of its longer term perspective, the 2018 WOO includes the following key takeaways:

• The global population is set to increase from 7.6 billion in 2017 to 9.2 billion in 2040.
• Strong recent economic growth will slow in the medium-term, with global GDP growth expected to average 3.4 per cent per annum in 2017-2040.
• Total primary energy demand will increase from 274 mboe/d in 2015 to 365 mboe/d in 2040, representing an increase of 91 mboe/d – or average annual growth of 1.2 per cent. Almost 95 per cent of this increase is accounted for by developing countries (including China and India).
• Overall, oil will retain the highest share in the global energy mix, with nearly 28 per cent in 2040 (higher than gas or coal), and will remain a major source to satisfy growing energy demand worldwide in the period to 2040.
• Medium-term global oil demand will grow to reach 104.5 mb/d by 2023 – and, in the long-term, is expected to increase by 14.5 mb/d to reach 111.7 mb/d by 2040.
• The largest demand for oil comes from the road transportation sector which, in 2017, represented 45 per cent of global demand or 43.6 mb/d. In the long-term, significant growth is expected, with an additional 4.1 mb/d to reach 47.8 mb/d by 2040.
• Beside road transportation, the forecast for demand growth in the petrochemical sector sees the largest increase, with demand expected to increase by 5.6 mb/d (or two-thirds) of new non-OPEC supply on the back of surging tight oil output.
• However, US tight oil is seen peaking in the late 2020s with fewer sources of other growth.
• In the medium-term, other major sources of non-OPEC supply are Brazil, Canada and Kazakhstan, which collectively add another 2.6 mb/d by 2023.
• The demand for OPEC crude stands at 31.6 mb/d by 2023 and reaches current levels again by the late 2020s, when US tight oil peaks. Thereafter it is expected to rise steadily, reaching nearly 40 mb/d by 2040.

These are encouraging projections for an industry that has
been labouring under stress for years. OPEC remains optimistic that with constant vigilance and the same spirit of collaboration that has characterised the past two years, any ‘headwinds’ that the industry may face will be manageable.

At the same time, we emphasise the need to ensure a timely and adequate level of investment in order to meet future demand for oil beyond maintaining the current production volumes. The recent market downturn of 2014-2016, which led to a significant contraction in investments by 25 per cent each year, underscored the critical value of collaborative efforts between OPEC and non-OPEC producers – in order to avoid such disruptions in the investment needed across the entire supply chain.

Other trends that warrant closer monitoring are the observed eastward shift in the axis of the world economy and energy demand growth; the emerging energy transition; rapidly changing regional demographic trends and consumer behaviour; and policy-oriented challenges, particularly related to climate change and the environment.

Such diverse factors can seem daunting, further complicating the assessment and predictability of the market and its future. But there are other factors that have, in the past, always served to provide us with the wherewithal to meet such challenges. Chief among these is technology and innovation, which has increasingly played a role in the industry. It has been what some might call a ‘positive disruptor’, helping to change processes and techniques in E&P, with an important impact on both the upstream and downstream of the industry.

Additionally, technological advances and other innovations are not only helping the industry to keep up with required supply volumes but also to improve – through collaborative and joint action – the environmental credentials of oil, and reduce the ‘carbon footprint’ across the value chain.

OPEC has long played an important role in contributing to and supporting oil market stability. Our history is one of repeated efforts to ensure equity, fairness and stability for the benefit of consumers and producers, as well as the industry and the world at large. Since 2016, this has been extended to our non-OPEC partners in the Declaration. We are now looking at the potential of establishing a longer term and lasting framework for this cooperation – in order to ensure the sustainable oil market stability for which we all strive.

The closely linked and increasingly complex nature of the energy and oil markets calls for strengthened collaboration among the world’s producers – so that they may continue to serve as reliable and dependable suppliers of oil to the world. As long as we are on this common path, we are confident that OPEC and non-OPEC producers will continue to make progress in their efforts to ensure sustainable market stability for the benefit of all.
As the WPC meets in Astana, Kazakhstan, the global oil market is entering a challenging new phase. Long standing observers are sometimes too quick to spot a supposed new “normal” and often there is nothing really new at all. However, this time, we really could be in a new era because as we leave 2018 and enter 2019 global oil production capacity could be challenged as rarely before. This is because we face a combination of major supply shortfalls: the level of Iran’s oil exports could fall drastically if the US succeeds in persuading customers to cease purchases; oil production in Venezuela might be on the verge of collapse; stability in Libya is far from certain; infrastructure bottlenecks restrict US production growth.

Before we look at the shorter term challenges to the market, it is worth looking at the factors that are expected to influence the demand and supply of oil in the next few years. In March, the International Energy Agency published its latest five-year outlook for the oil market. In Oil 2018 – Analysis and Forecasts to 2023, we noted that demand for oil has been growing strongly and we expect this to continue for the next few years. Since the recovery from the financial crisis began in 2010, demand has grown on average by 1.5 mb/d each year. This pace, or something close to it, is likely to be maintained in the next few years, assuming solid economic growth. As has been the case for some years, China and India together will contribute nearly 50 per cent of global oil demand growth in the near future.

At least for five years, and probably for well beyond that time, peak oil demand is nowhere in sight, although the pace of growth will likely slow to about 1mb/d by 2023. There are signs of substitution of oil by other energy sources in various countries. A prime example is China, which has some of the world’s most-stringent fuel efficiency and emissions regulations. Efforts are intensifying to tackle poor air quality in large parts of the country. Sales of electric vehicles are rising and there is strong growth in the deployment of natural gas vehicles, particularly into fleets of trucks and buses.

In the meantime, the fastest-growing source of global oil demand growth is petrochemicals, particularly in the United States, where the shale revolution has opened up a major source of cheap domestic feedstock and China, where economic growth is lifting more people into the middle class and stimulating demand for consumer goods and services. About 1.7mb/d, or 25 per cent, of total demand growth to 2023 is taken up by ethane and naphtha.

Another major factor that will affect the make-up of global oil demand in the next few years is the implementation at the beginning of 2020 of major changes to marine fuel specifications mandated by the International Maritime Organisation. The new rules loom ever closer and the maritime and refining industries face a huge challenge to implement them. From the vantage point of late 2018, it is not clear how successful they will be, especially as demand for non-marine gasoil grades is growing steadily. The new regulations will cause a massive switch out of high sulphur fuel oil demand and into marine gasoil or a new very low sulphur fuel oil. The total demand for oil products will not be dramatically altered, but the impact of the changes on the product mix is a major uncertainty.

With global oil demand rising steadily, the response from the supply side is crucial. Each year the world needs to replace 3 mb/d of supply lost to natural declines in mature fields while also meeting robust demand growth. That is the equivalent of replacing one North Sea each year. Investment in maintaining current production is one challenge, investing in future supply growth is another. Our analysis shows that discoveries of new oil resources fell to another record low in 2017, with less than 4 billion barrels of crude, condensate and NGLs found. The recovery from the historic drop-off in investments by 25 per cent in both 2015 and 2016 has barely started. Investment was flat in 2017, and early data suggests only a modest rise in 2018. This is potentially storing up trouble for the future. An added concern is that investment is overwhelmingly focused on the light tight oil (LTO) sector in the United States. As a result, upstream investment may be inadequate to avoid a significant squeezing of the global spare capacity cushion by 2023, even as costs have fallen and project efficiency has improved.

In the past three years we have seen oil production from China, Mexico and Venezuela fall by nearly 2 mb/d as a consequence of lower investment. In the first two countries, there are signs of a turnaround. China’s decline has slowed; in Mexico, reform proposals are being developed and production could return to growth by 2023. However, Venezuela remains a wild card and has become a major threat to the stability of global oil markets. In the twenty years since former President Chavez came to power, oil production has collapsed from 3.5mb/d to 1.2mb/d today. It is not inconceivable that by the end of this year production could fall below 1mb/d.

With Venezuela in crisis, the net growth in total OPEC production capacity to 2023 will be only 750kb/d, and this number includes an assumption that shut-in production of around 500kb/d from the Neutral Zone is finally re-started. It also depends on some degree of stability in Iraq, Libya, and Nigeria. The number does not take into account sanctions
against Iran being implemented and maintained for a significant period of time.

With OPEC capacity growing only modestly, more attention is focused on the non-OPEC countries led by the United States, which is becoming ever more dominant in the global oil market. Driven by LTO, by 2023 United States output grows by 3.7mb/d, more than half of the total global production capacity growth of 6.4mb/d expected by then. Brazil, Canada and Norway will also contribute to supply growth. Along with the United States, they provide nearly all of the non-OPEC increase. Production of conventional crude oil in non-OPEC countries will actually decline to 2023.

The upshot of our analysis is that the market could go through two phases in the next five years. Through 2020, record supply from non-OPEC countries is likely to cover expected demand growth. But by 2023, if investments remain insufficient, the effective global spare capacity cushion, held only in OPEC countries, falls to only 2.2 per cent of demand, the lowest number since 2007. This raises the possibility of oil prices becoming more volatile until new supplies come on line. The IEA estimates that in mid-2018, total spare production capacity in the group was estimated to be 3.2mb/d, of which 1.7 mb/d is found in Saudi Arabia.

The main conclusion in our report Oil 2018 – Analysis and Forecasts to 2023, that the oil market is likely to tighten in the next few years, was made before the supply challenges mentioned at the beginning of this article became apparent. The likelihood that oil exports from Iran will fall sharply after the imposition of sanctions by the United States is a complicating factor. During an earlier round of sanctions imposed in 2011 exports fell by 1.2 mb/d and this time the impact could be greater. At the same time, in Venezuela the political, economic and social situation is dire and it is not impossible that oil production could collapse. Currently, oil production is struggling to stay above 1.2 mb/d. A third factor is ongoing strife in Libya. In mid-2018 a fresh outbreak of fighting saw oil production collapse from a fairly steady level of 1 mb/d to only 0.3 mb/d at one point. There has been a recovery since but the fighting reminds us that production from Libya should not be taken for granted. In other countries, there are political problems that inhibit production, with Iraq’s dispute with the Kurdistan Regional Government being a good example.

With global oil demand due to grow by 1.5 mb/d in 2019, the potential loss of, possibly, 3 mb/d of production from the trouble spots mentioned above, poses a major challenge to those producers capable of providing offsetting barrels. At the meeting in mid-2018 of OPEC and non-OPEC countries party to the so-called Vienna Agreement, it was decided to effectively increase production to lower the compliance rate with the agreement to 100 per cent. In practice, this provided the go-ahead for those countries with spare production capacity – Saudi Arabia and its fellow Gulf producers plus Russia – to raise output. This has already started to happen, however, the biggest test is yet to come when it is revealed how successful the United States has been in persuading Iran’s customers to cease purchasing its oil.

At this point, and with Venezuela and Libya in the background, we will see one of the greatest challenges in oil market history in terms of the ability of sufficient spare capacity to be activated and turned into traded barrels. Depending on how the events of late 2018 play out, the challenge to the market will not be just for a few months. It could make a huge difference to the supply outlook for the next five years at a time when demand for oil is strong. Rather than a new “normal” we will be looking at a very abnormal period in oil history.
Lessons from the oil downturn

By David Adams
Senior Vice President of Global Business Development & Marketing, Halliburton

Resilience is the capacity to overcome adversity and grow, and it’s fundamental to personal and professional growth as well as the evolution and growth of a business like Halliburton. As we prepare to celebrate our 100th anniversary next year, we’re looking back at our history and finding that tackling what seemed like insurmountable challenges is simply a part of the Halliburton DNA. That sense of resiliency has shaped our identity as one of the leaders of the oil services industry, and it’s what guided us through the recent oil bust – undoubtedly the worst downturn in more than a generation.

Thankfully, the market has rebounded and the outlook is bright, but as with all challenges, it’s worth taking stock of what we did in the face of that adversity. To understand what lessons we can derive from our experience and apply to future challenges, because it’s not a matter of “if” there will be major challenges down the road, it’s a matter of “when”.

Lesson 1: Doing more for less is possible with people committed to excellence

The biggest impact of the downturn was on the workforce. Like every other company in our industry, Halliburton had to reduce its headcount, and we ultimately cut our workforce by roughly 40 percent. Reductions of this magnitude are very distressing, and yet they continued to win prestigious national awards for their work supporting our products, services, and customer interactions. Likewise for our teams in Business Development and the various product service lines. With fewer members, they continued to win key contracts, execute first-rate work, and maximize the value of our customers’ assets.

Leaner teams meant that everyone had to take on more responsibilities, both broaden and sharpen their skill sets, and collaborate even more than before. All of us understood that the livelihood of the company itself was riding on how well we worked together and performed on a daily basis. Because of that, we learned how to take collaboration to the next level, to find common ground on challenges big and small, and not just get the work done but to do it to the absolute best of everyone’s abilities.

By doing more with less, we learned that Halliburton employees are a resilient bunch, both individually and collectively. Confident leadership at every level of the organization is important, but having resilient employees working together and dedicated to doing their best in everything they do every day is paramount.

Lesson 2: We must continue to innovate new techniques and technologies

We learned that we have to continue innovating, inventing new technologies and techniques and identifying technologies outside the industry that we can repurpose for our work – all this to reduce costs and yield more efficiency and higher returns in what we do for our customers.

Service providers are in business to address industry challenges, to find ways to better locate and map reservoirs, drill more efficiently, improve production yields, and lower operational costs. These challenges remain the same regardless of market conditions; a downturn simply intensifies them and demands more creativity – few things concentrate the spirit of innovation quite like severe economic constraints.

Our commitment to innovation remains strong, and we now have a wider range of innovations we can deploy to fine tune logistics, optimise drilling timelines, reduce costs, and operate more efficiently in deep water, mature fields, and unconventional assets. In fact, innovative technologies like our Earth Modeling platform, dissolvable frac plug, rotary steerable system, and cement become indispensable because they bring more efficiency to the work and help operators improve production, they save time and money and help us deliver on our value proposition.

Lesson 3: Markets outside North America need the shale revolution now more than ever

While the downturn may have heightened the profile of renewables like wind and solar, the reality is that the world will continue to rely on oil and gas for many decades to come. Economics trump aspiration, and the pace of growing energy demand makes a world powered by renewables a distant goal.

The region that has recovered most rapidly from the downturn is North America, and that’s almost entirely due to the advancements that sparked the shale revolution – better surface efficiency, better subsurface insight, better horizontal drilling, better well construction, better hydraulic fracturing, and better chemistry.
We learned that the downturn really pressed home the fact that the oil and gas markets outside North America need a wider embrace of these proven advancements. We’re seeing their application in places like Argentina and Saudi Arabia, but we should expect the pace of application to pick up in other markets as well. The reason is simple: these advancements improve efficiency, lower costs, increase production, and, perhaps most importantly, give operators more flexibility and resiliency to respond to market fluctuations.

Lesson 4: Our value proposition and mainstays are a winning formula
We learned that we have a winning formula in our value proposition, which is: we collaborate and engineer solutions to maximize asset value for our customers. This value proposition is rock solid and survives the different cycles of the market, and it really does convey who we are as a company.

The way we execute that value proposition is through our five mainstays: the Business Acquisition Process (how we win work); Listen & Respond (how we collaborate); Service Quality Minimums (how we do the work); the Technology Acquisition Process (how we put technology to work); and Continuous Improvement (how we remove waste). These mainstays have proved themselves time after time, and they served as firm pillars when the economics were so unstable.

The single biggest reason customers come to and stay with Halliburton is our track record of execution. The downturn showed us that our value proposition and mainstays are a stable and dependable framework for winning and executing work, retaining customers, and strengthening our business relationships for the long-term.

Lesson 5: We cannot control the market, only how we adapt and respond
The downturn reminded us all – in a very harsh and unforgiving way – that the market is unpredictable and beyond our control. It is the proverbial wheel of fortune, at one turn uplifting and at another crushing. There is wisdom in recognizing this, in keeping in mind that change is the very nature of fortune, and that no one, no matter how intelligent, knows what’s coming. We can’t control the market.

What we can control, however, is how we adapt and strengthen our resiliency, and that entails taking stock of our successes and failures as lessons for growth – refining what we do by innovating, collaborating, executing, and sharing knowledge to ensure we fulfill the world’s growing energy needs for the next 100 years. The world is counting on us to make it run.
From shortage to surplus to shortage?

By David Rabley and Muqsit Ashraf
Managing Director, Accenture Strategy, Upstream
and Managing Director, Accenture Strategy, Energy

For the oil industry, the past 24 months have been remarkable. In 2015, the industry entered an age of surplus, after years of apprehension about peak supply, and the energy transition accelerated, casting a shadow on future oil demand. The World Energy Scenarios 2016 report published by the WEC in collaboration with Accenture Strategy focused on five key themes: growing energy demand at lower intensity, golden age for power, emerging competitive advantage for renewables, transportation transition, and peak demand for oil. The last one stole the headlines.

In the past two years, the industry paradoxically faced one of the largest demand accelerations in history. Lower oil prices and better-than-forecasted macroeconomic conditions stimulated demand. These factors added 1.5+ mbpd growth each year, versus a past decade average of ~1 mbpd, putting demand on track to hit 100 mbpd in the coming months. The record growth in EVs and renewables minimally offset the growth in hydrocarbon demand, which is driven by more passenger cars, more commercial and non-road miles, and more petrochemicals.

In this environment, it is worthwhile to revisit the drivers of energy demand and explore what today’s oil and gas leaders and tomorrow’s “energy leaders,” must do to prepare for the new paradigm.

Changes in future energy demand (see figure 1)
1. Chemicals/petrochemicals as fastest growing demand segment, offering high value “path” for energy molecules. Rapid growth in indigenous demand for products and materials, such as plastics, in emerging economies pull more oil into the petrochemicals value chain, doubling its demand over two decades.
2. Continued global growth in transportation alongside a transition to higher efficiency modes. Passenger vehicle fleets will double in two decades (and triple by 2060), with EVs grabbing nearly a 10 per cent share by 2030 and more than a third by 2060. Growth in commercial and non-road (marine, air, rail) traffic will contribute to the doubling of total transportation miles. Therefore, a more meaningful impact in oil demand will come from fuel efficiency gains. In the most optimistic scenarios – in which autonomous vehicles and ride sharing become ubiquitous and fuel efficiency standards fall – the reduction in oil demand for passenger vehicles will not exceed 5 mbpd by 2030. Of that reduction, approximately 80 per cent will be due to fuel efficiency. Within OECD nations, oil demand for passenger transportation has already peaked. For others, the peak remains decades away.
3. Electricity set to dominate consumption. “Electric everything” is changing the way people live. The rise of smart homes,
increased efficiency, and adoption of next-gen storage will check demand growth in advanced markets. But the global picture is clear: as demand accelerates, electricity will become the dominant form of consumption. While that consumption is set to double, the impact on oil demand will be minimal given its small, and shrinking, share in the power sector.

Combined, these factors may bring the peak point for oil demand closer to 110 mbpd. The specific peak point matters less than how the industry will profitably fulfill the supply requirement. Sustainable returns, which were receding even before the current downturn, must be attractive enough to justify the investment required to bring on the 3-5 mbpd of new yearly production needed to offset natural decline and demand growth. This is akin to bringing a Permian basin online every year.

Imperatives for tomorrow’s energy leaders
Competitive advantage will not come through size, scale or asset recovery capacity as it has in the past. A new enterprise ‘DNA’ containing the code for the set of essential capabilities of speed, performance and innovation will be required (see figure 2). Our research identified five fundamental building blocks of this future DNA:

1. The agile portfolio. Today’s monolithic, multi-year portfolios are replaced with dynamic portfolios designed for flexibility and continuously refreshed to align to the highest value. Portfolios will increasingly comprise shorter-cycle assets and achieve quicker time to return.

2. The hyper-effective operating model. Being the second-best means being the first loser. O&G companies will insource only those activities they can dominate and partner on all other aspects of delivery. Digital connectivity resets how organisations need to be structured.

3. The ecosystems of partners. Competition between companies is being replaced by competition between dynamic ecosystems. Adversarial relationships between operators and suppliers will give way to partnership-based models with aligned incentives. Ecosystems, not individual companies, win.

4. The innovative and productive workforce. Oil and gas companies will be seen as employers of choice for future workforces looking for leading-edge work and serious about societal responsibility. Agile teaming will enhance productivity and create a fluid workforce willing to accept careers that include multiple experiences within and beyond the energy industry.

5. The digitally connected enterprise. Leaders that have digitally transformed (versus those that have just digitally optimised the current business), can unlock scale without assets, operate without people, optimise at scale through analytics, and allocate capital with precision.

In today’s dynamic energy environment, there is no finish line, certainly not at the peak demand point for oil in the future. Companies have to think about supply continuity while delivering acceptable returns and capturing new opportunities, which come with growth in energy demand, by successfully transitioning to become energy companies enabled by a new enterprise DNA.

Figure 2: New enterprise “DNA” and enabling capabilities

THE NEW ENTERPRISE DNA

ESSENTIAL CAPABILITIES

Pm PORTFOLIO MANAGEMENT

Vc VALUE CHAIN INTEGRATION

Ce CONNECTED ENTERPRISE

Ti TECHNOLOGY INNOVATION

Em ECOSYSTEM MANAGEMENT

Rn RISK MANAGEMENT

Co CUSTOMER ORIENTATION

Source:Accenture Strategy Energy
The digital transformation

By Bernard Looney
Chief Executive, Upstream, BP

It is often said that digital technology is transforming our industry. But it’s not just the technology, it’s the way we use it. Big data, analytics and artificial intelligence are powerful new tools – but the real challenge is deploying them at scale and at speed. In other words, it’s not just the ‘what’, but the ‘how’.

That’s a challenge we have been taking on in BP’s Upstream since 2016, when we brought BP’s upstream executive team together with a bunch of technology companies to create a plan of action as part of our wider modernisation agenda. We heard from companies like Google, Toyota and Condé Nast. We felt inspired and a bit in awe.

We saw that the new applications and approaches were turning the Internet of Things from a buzz-phrase in to a reality that could make our business safer, smarter and stronger. We saw how it was technically possible to create an integrated physical and digital business. But it meant making digital technology pervasive throughout BP – monitoring, simulating, optimising, automating.

And that required a strategy and some new ways of working. Strategically, we set out an ambition to play a leading role in digital innovation by building what we call the Connected Upstream. This has three parts – connecting people and data, connecting physical and digital assets, and connecting machine intelligence with business decisions. And while the Connected Upstream isn’t going to be built overnight, it’s amazing how quickly it can take shape. It follows ‘Metcalfe’s law’ of networks, which shows how value snowballs as more connections and users are added. A single telephone is of little use, two change the game and millions change everything. It’s been the same for the Internet and, it seems, a 100 plus year old business, like BP’s upstream.

But how do you make the network effect take off at scale? We have found several highly effective drivers: a ‘test local, share global’ approach to scaling new technology; ‘democratizing’ our data; new collaboration models; and arming our people with new skill-sets.

**Test local, share global**
First, the ‘test and share’ approach means we use different operating assets around the world to test out new technologies simultaneously, finding out what works best and then sharing the most effective ones globally. It’s an approach we are taking in several areas, from trialling new methane detection technologies in the US and Azerbaijan to testing new automated drilling technologies in Oman and Alaska, designed to make our drilling safer, smarter and more efficient. Our business model of specialist functions - from explorers to drillers - operating at global scale with global communities of practice, enables us to reduce test-and-refine cycle times, so we can roll out technologies as quickly as possible.

Last year, following trials in the North Sea we deployed APEX, our production optimisation system, to more than 25 fields around the world. Standardisation of the system drove much of that deployment pace. Some 30 thousand barrels of production a day were added last year because of APEX - some of the most competitive barrels we can possibly produce. Technologies like APEX play a key role in delivering the commitment we have made to our investors to decouple cost from the oil price.

Alaska is the latest region to begin deployment of APEX and represents one of BP’s most complex operations with trillions of different routes that a hydrocarbon molecule might travel at our facilities at Prudhoe Bay. Optimization Engineer Amy Adkison explained it best when she said, “We weren’t sure we could use APEX, because of the sheer scale of routing options but we’ve had great support incorporating that complexity. We’re excited to be able to collaborate with the other regions on the same technology platform. Each one has solved a puzzle for their region and we’re eager to share learnings to boost optimization here in Alaska.”

“It’s meant that we have deployed in months instead of years”.

**Democratising our data**
A second way the network effect plays out is in connecting people and data. Once people have access to data, with a few simple off the shelf applications it becomes natural to innovate, cutting cycle times, gaining new insights and sharing information. For one of our major projects in Egypt, we have replaced a complex manual process with a business power analytics dashboard, pulling in thousands of data points from our suppliers to manage project delivery. Our procurement teams are using PowerBI to track deflation costs from drilling to logistics, and using a new Category Portal that performs analytics on purchasing history and market trends from multiple systems across BP. By connecting people and data through such intuitive tools, our staff are finding new opportunities to drive productivity and create new value.

**New collaboration models**
A third manifestation of the network effect is apparent in the way we work with partners. Historically, we have operated bilateral client-supplier relationships, where BP pays a vendor
to provide a service. But increasingly we are bringing our partners together to explore how we might collectively add more value by solving more fundamental problems. One example is a Digital Alliance we are building in our IT function, where we have convened a network of architecture and application partners to solve bigger, more complex challenges collaboratively, like developing a new proactive monitoring capability and using a space consigned for demolition to build a new remote collaboration centre. We are leveraging the collective power of bigger digital brains, using design thinking and work shadowing, to rapidly understand users and define new ways of working that will change BP.

Updating our skill-sets
The final network effect we have experienced is the growing awareness among our people that the world is changing around them – and that their skill-sets also need to change. In our finance organisation, for example, we have been applying data science to deliver more reliable forecasting. Data science is a unifying capability relevant to people from every function across the Upstream. In just over a year an informal Data Science Community of Practice has grown up in BP’s upstream with more than 600 people joining calls each month, as well as short training classes, sharing of case studies and ‘ask the expert’ sessions.

We are supplementing this peer-to-peer learning with data science ‘boot camps’ and online training. This year, we have held cross-function, cross-segment hackathons focusing on solving real business challenges. Bringing together people like this from across our business to make new connections, share what they know and bring different perspectives to bear on a problem is exciting and transformational. It is liberating our staff to develop themselves and become more valuable.

When I look back at BP’s first Digital Energy Day we held in London in 2017, with Google, Amazon, Microsoft in attendance, I remember there was a part of me that wondered whether we could transform an industry which had been forged in the analogue world of drills, risers, valve and pipelines.

Over the last two years rising efficiencies, higher production and lower costs tell me that we can. And in a sense, it is nothing new. We are simply taking our industry’s core skill of project integration to a different level. Twentieth century projects involved integrating resources, physical assets, finance, people, partners and technology. Twenty-first century project management still involves all those factors, but the technology available today has taken a giant leap forward.

As ever, the challenge is not simply to understand the latest technology but to create value from it. And for us, that has involved a ‘test local, share global’ approach to trialling and deployment; making best use of our data; imaginative collaboration with partners; and our people’s willingness, not only to transform their way of working, but their own skill.
The oil and gas industry has emerged from the downturn. All of us – operators, contractors, and service companies – must face a new reality as we make decisions that shape the future. Over the last few years, each company had to assess its strategy to properly position itself in the new-oil price environment. We should especially be looking for more efficient and cost-effective ways to do things so that we can thrive.

To some, efficiency means consolidation. Every time the industry is on a downward trend, we see a rush of mergers and joint ventures. Although these can be great tools when the conditions are right for both parties, there are also more subtle ways to collaborate across company lines in a way that benefits everyone. Working together, whether it be with professionals inside or outside our industry, will help us to work smarter and leaner in this new market.

Within our industry, modern oilfield service companies like Weatherford can sit alongside operators as partners, and come up with solutions together. They can also deliver end-to-end solutions – not just one component used in the process – but the entire package. Outside our industry, we can look to strategies that have worked in other disciplines. In fact, key trends such as standardisation, automation, integration, and digitisation have become a necessity.

Changing the game with digitalisation
In this new era, the industry needs to look beyond what worked before. We need to challenge ourselves to explore new models, in some cases from different sectors. Automation and digitalisation – including principles such as the Internet of Things, Big Data, and Machine Learning – have transformed many other industries, and they are already starting to make an impact on the oil field.

Digital advancements offer a way to remove many personnel from high-risk areas and improve training for the remaining onboard personnel, which reduces the risks and costs associated with health, safety, and environmental incidents. In addition, digitisation can help to increase efficiency. The industry is increasingly adopting remote monitoring of production facilities and remote operating centers for offshore activities.

Digitisation also increases predictability. By identifying the points of failure before they happen, we can reduce nonproductive time during the well construction process and increase uptime during production. Once we pinpoint exactly which digital practices work best in specific situations, we can employ the same protocols time and again. Better data leads to better processes, which means better results for all involved.

Weatherford has advanced oilfield digitalisation with specialised production software, which combine data analytics capabilities to create an advanced and secure production environment. One package helps operators to identify and prioritise production optimisation opportunities across wells, reservoirs, and surface facilities, and easily integrates with other Weatherford software, which collects, manages, and distributes large volumes of operational information generated by field devices and business systems.

Through a recent collaboration with Google Cloud we enable operators to easily access and deploy these software programs to drive improved production performance while maximising uptime per dollar spent. Installed in a matter of hours and reliably hosted, these end-to-end production optimisation solutions effectively place a virtual network of IT professionals and computing power right at our customers’ fingertips. A simple user interface displays data to anticipate failures, reduce downtime, identify optimisation opportunities, and maximise asset-wide production.

Integrating with a shared goal
Years ago, a service company sales representative would come out to the field with a catalog of widgets. Operators would pick the necessary tools to finish the job and move on. Today, the job of a service company is not to sell a tool or a service at an hourly rate. It is to solve a customer’s problems in the best way possible. By making this a first priority, services companies and operators can open up a whole new way of thinking about how we do business.

Integration is one way that service companies can reduce cost and minimise risk profiles for our new normal. During the tendering process, operators can gain cost advantages by working with a single company for multiple services. The service company can then explore ways to crosstrain personnel to reduce the economic footprint, and in some cases also integrate related technologies to further reduce personnel on board.

Operators may not have the time, inclination, or expertise to solve a problem alone, and they shouldn’t have to. At Weatherford, we perform the heavy lifting for operators by leveraging our wide-ranging portfolio as well as complementary products and services from third-party providers. This coordination saves them time and enables us to execute our work more efficiently with little-to-no nonproductive downtime.

For example, in Mexico, we integrated services, from drilling...
to completions, for shallow-water development wells. In each field, we efficiently executed and reduced drilling times well below previous field records set by competitors. In a project in Oman, we incorporated drilling, completions, and artificial-lift services over the life cycle of multiple onshore wells. When drilling, the integrated services used best practices from other regions to create repeat performance wins. In fact, we achieved the two fastest drilling times for the operator in that field, with the last well drilled in the shortest time of 14 days.

Collaborating for greater success

Collaboration is at the heart of today’s advancements. Without it, we would not be digitising the oil field and we would not be customising integrated solutions. No single company can do these things alone. We’ve found that when geologists, drilling and completions engineers, and field technicians from multiple companies work together from the planning stage through production start-up, they can anticipate problems and adjust for them ahead of time, which avoids flat time and generally increases efficiency.

Standardisation is another positive product of collaboration. By aligning the requirements for similar wells and fields across all operators, drilling contractors, service companies, and manufacturers, we can simplify the supply chain and bring down costs. We can also create more modular solutions that we can install more efficiently. Finally, we can help personnel achieve flawless execution as they focus on operating a few number of systems exceedingly well. By standardising common tasks, we can start seeing exponentially greater operational consistency and predictability.

Some of the most tangible examples of collaboration across the industry result from joint development projects. We are seeing more collaboration during the technology development stage as R&D departments have moved away from projects that innovate for the sake of innovating — no one has the budget for that these days. Instead, many of today’s best technologies come about when different parties come together to solve a problem. When operators and service companies collaborate, their different perspectives combine to reveal a more elegant solution than they could have arrived at independently.

Weatherford is increasingly partnering with customers to jointly develop technologies that solve specific field challenges. Working with our partners at Chevron Thailand Exploration and Production, we jointly designed a service specifically for the Gulf of Thailand, where temperatures can exceed 392°F (200°C) and operators must make additional trips to cool the bottomhole assembly during drilling. This unique technology is the first to reliably acquire real-time and recorded logging-while-drilling data – including gamma ray, resistivity, neutron porosity, bore and annular pressure, and density data – in hostile environments with minimal or zero nonproductive time. The technology eliminates extra trips and temperature mitigation, and it provides an alternative to running wireline.

From start to finish, we were able to develop this service in less than two years. We could not have achieved that without a strong collaborative relationship. And now, a short time later, this service is commercially available to all operators and changing how operators look at the development of ultra-high-temperature fields around the world.

Thriving through the energy of teamwork

When you look at what the oil and gas industry has gone through over the past few years, it is clear that this is a time for renewed strength. The cornerstone of the industry’s future is collaboration.

We share a common goal of meeting the world’s energy needs safely and sustainably. Going forward, we must seek cooperative opportunities to best meet our challenges. Solutions that leverage automation, digitisation, and integration will improve profitability and ultimately increase the amount of recoverable reserves to fulfill the growing demand for energy.
Technology’s impact on today’s oil and gas value chain

By Lisa Davis
Member of the Managing Board, Siemens AG & CEO of Siemens Gas and Power

Technologies in the industrial world have taken a great leap forward. With the advent of the Fourth Industrial Revolution, a new era in the manufacturing of industrial goods has dawned: an era of autonomous and personalised mass production can deliver products with nearly a 100 percent quality and availability rates. Integrated systems are beginning to utilise the full potential of their various components. And data is becoming one of the most important resources as operators finally start to turn it into practical value.

The oil and gas sector has experienced its own transition: The shale boom in the US has permanently shifted the market equilibrium. During the downturn, many were forecasting that a ‘lower-for-longer’ price horizon would squeeze North American independents out of existence. Yet the industry transformed itself, adopting new technologies and approaches to produce profitably at a lower price per barrel.

Today, shale operators are not only staving off market pressures, but they are thriving with technological upgrades which are challenging the market to keep pace. Prices near or above USD $60/bbl for WTI are unlocking the potential for strong US crude oil production gains. The scale of growth in shale production is now at levels last reached in 2012-2014. This is increasing pressure across the entire market to lower OPEX and CAPEX expenditures and maximise production and recovery. To secure their competitiveness in this shifting resource landscape, operators must innovate and put themselves at the forefront of the industry.

Digitalisation unlocks system value

Intensified leverage of technology, more effective use of data, and new holistic approaches to project development are increasingly important success factors in this market environment. These levers have the potential to reduce capital and operating expenses, shorten project development cycles, and minimise interfacing risks across the entire oil and gas industry.

O&G fundamentals intact – changed business environment requires adaption and new approaches

Given its demanding environment and high risk, the extraction of oil and gas resources in the offshore sector is an especially promising field for deploying lessons learned from digitalisation and technology integration. The industry downturn in recent years has made the sector rethink how it manages the entire asset lifecycle.

In what ultimately will be a full-scale digital transformation, operators are turning to a digital lifecycle methodology that begins in the conceptual and design phase of a project with a comprehensive digital roadmap. This approach applies advanced capabilities, ranging from enhanced design, testing, manufacturing, and lifecycle maintenance through virtualisation (the creation of digital twins), to remote monitoring and pre-emptive maintenance of mission-critical equipment and enabling cybersecurity capabilities.

The digital twin is a software model that not only mirrors the status and working condition of the asset in near-real-time but also the operational behavior of its real-world counterpart. This virtual twin enables operators to design and test their assets in a risk-free environment and serves as an invaluable tool for lifecycle decision-making support and asset optimisation.

One area where we have put this approach into practice is offshore. Using our digital lifecycle solution for offshore production facilities approach, we have shortened overall project cycle times for midsized offshore platforms by three to nine months, while reducing CAPEX by up to US$15 million. We estimate OPEX reductions at more than US$100 million over a ten-year period.

Integration over the full lifecycle

The midstream sector is also profiting from fully integrated, pre-tested, ready-to-install pumping and compressor solutions. Operators face the need to increase capacities, maximise efficiency, and drive down costs. Shale production in North America is projected to grow steadily over the mid-term, Russia is driving pipeline expansion in the European and Asian markets, and China – in its efforts to shift from coal to natural gas for power supplies – is also encouraging infrastructure investment.

In their search for more effective levers to simplify and streamline the process of bringing new transmission capacity online, operators envisage an integrated approach to the engineering, supply and lifecycle optimisation of their assets. This is putting the spotlight on technology suppliers (OEMs) like Siemens, since we can provide detailed functional know-how for optimal solutions. Once the new assets are in place, operators also have to maximise their utilisation and reduce total cost of ownership over lifecycles that last decades. This is now possible as the industry embraces the use of machine learning, data analytics, lifecycle services and cybersecurity strategies to optimise performance.

One example of how Siemens can help customers turn data into practical value in the midstream market is our SmartPumping application we’re developing to help crude oil...
pipeline operators achieve dramatic energy savings. By deploying sophisticated software technologies – including artificial intelligence and machine learning – operators can improve and optimise pumping operations regarding load management, power consumption and scheduling. Moreover, by utilising turbine and motor vibration data, they can use condition monitoring and preemptive maintenance to extend the life of mission-critical equipment.

**Integrating the advantages of every element**

Taking an even broader view, the new approaches to integration and digitalisation are not only impacting the conventional oil and gas sector, but also its integration into the entire energy sector. Given the long-term goal of decarbonisation of the energy sector and the new energy mix taking shape, we are seeing a general shift from the classic energy chain toward a more decentralised model, flexibly integrating large and small players in the grid. Digital technology offers an increasing degree of intelligence to all kinds of energy suppliers, consumers, and especially in the grid. It is opening up new opportunities to couple the many different elements of the energy landscape – even across sectors – and optimally exploit the advantages of each.

Hydrogen technology, along with biofuels, is emerging as a sustainable alternative to oil and gas that will even ensure most efficient use of generation capacity and infrastructures. By converting fluctuating power from renewable sources into hydrogen (or hydrocarbons), surplus energy can be flexibly monetised, stored in existing gas infrastructures and re-electrified in gas turbines, making those a sustainable investment even in a decarbonised world.

Furthermore, hydrogen may subsequently be synthesised to hydrocarbon fuels, such as methanol, offering refineries a new business field besides fossil fuel production. These synthetic fuels are a means to utilise renewable power in other sectors, thereby vastly decarbonising energy in all sectors of consumption.

Still, alternative fuels will have to compete against other energy options. Battery storage is among today’s most promising game changers, being significantly driven by the growing e-mobility sector. The industrial and building sectors also offer significant opportunities to shift energy allocations by better integrating their high demand and storage capacities, for example, for heat, cold or chemical products. One thing is certain: The energy landscape will continue to shift and rearrange itself in the coming years and provide opportunities for both old and new players.

**Make way for disruptive concepts!**

What matters in this transition is not only technological strength, but also strong and strategic partnerships. The industry must be open to the many emerging possibilities to find and implement the most effective and future-oriented solutions. And this applies to the business and academic players as well as to the political community to create the necessary business framework. The pressure to achieve sustainability will continue growing as nations strive to reach the Paris climate target of 2°C. So it’s all the more important to invest in solutions that benefit the system over the long run.

As a technology provider that stands for innovation and excellence, we achieve the best solutions when we have the opportunity to collaborate with our customers from a very early phase to identify and solve challenges that may differ from those encountered in traditional customer-supplier relationships. Dialogue and collaboration continue to be essential for jointly mastering the challenges and opportunities presented by today’s – and future – energy systems.
Gas as a cleaner alternative in cooking and transportation

By Suleiman Al-Herbish
Director-General, OPEC Fund for International Development (OFID)

Sustainable energy access is often discussed in a misguided context that implicitly or explicitly rejects a future role for any fossil fuels. However, natural gas and liquefied petroleum gas (LPG) are identified as important fuels with the potential to change energy development paradigms when given the chance. Advances in technology for extracting gas have resulted in an abundance of affordable energy that can be used to address access at a variety of scales. Natural gas and LPG are clean-burning fuels, with lower greenhouse gas emissions than traditional biomass. Indeed, the use of fossil fuels and the reduction of emissions are not mutually exclusive. Due to the cleaner nature of natural gas, switching the three billion people in the world currently cooking with traditional biomass to LPG would not only reduce global greenhouse gas emissions but would also have significant positive health outcomes.

Reducing Energy Poverty with Natural Gas

The UN commitment to achieving 17 global goals by 2030 includes “access to affordable, reliable, sustainable, and modern energy for all” as SDG 7. The eradication of energy poverty has a spillover effect for the achievement of other global goals; one in particular is SDG3 which is focused on ensuring good health and well-being. Household air pollution (HAP) harmfully impacts almost 41 per cent of the global population, predominantly poor, who continue to rely on solid fuels such as biomass, crop residues, and dung, for heating and cooking. Owing to poor combustion efficiency, these solid fuels release aerosol emissions and particulate matters. They are a major source of HAP. These emissions have a detrimental impact on health and environment. Particularly, poor women and children are at a high risk of exposure to biomass smoke and adverse health outcomes causing acute and chronic respiratory infection. Approximately 4.3 million annual premature deaths are attributed to HAP exposure. Nearly 50 per cent of deaths from acute lower respiratory infection among children below 5 years in underdeveloped countries are attributed to exposure to HAP. Continuous exposure to these emissions also leads to pregnancy complications and the stunted growth of children.

To address this challenge, a number of international development organisations, including OFID, have promoted improved cookstoves as a pathway to clean cooking. However, as the understanding of the health risks has grown, programmes have tended to broaden and to add the provision of other cleaner fuels like LPG. For example, the World LPG Association has launched “Cooking for Life”, a long-term program to demonstrate the health benefits of switching communities from biomass and other traditional fuels to LPG for cooking. It also encourages decision-makers to recognise the need to ensure that LPG markets develop in a safe, managed way.

In addition, the Global LPG Partnership (GLPGP) is working to accelerate the transition to LPG for cooking for 50 million people by the end of this year. Via its grant program, OFID supported the GLPGP to promote the adoption and utilisation of LPG for clean cooking across the Economic Community of West African States (ECOWAS), through the creation of an enabling environment for impactful investment and intervention to scale up LPG use. OFID also extended a grant to the Global Alliance for Clean Cookstoves to conduct research and analysis on barriers to the accelerated use of liquefied petroleum gas (LPG) as part of a scaleable clean cooking strategy in three countries, Ghana, Kenya and Uganda.

Without a doubt, LPG is a common path to access clean cooking options, especially in urban areas. In 2015, an estimated 2.5 billion people, or 43 per cent of the population in developing countries, cooked with LPG. However, its use varies by region. For example, only 7 per cent of people in sub-Saharan Africa have access to LPG, mainly in Sudan, Nigeria, Angola and Ghana. Access to LPG is widespread in North Africa and parts of Latin America, and is increasingly being used in Asia. China and India are taking a strong stance on clean cooking through government-led policies. In China, residential biomass use has been declining 6 per cent per year since 2010, largely replaced by natural gas, LPG and electricity demand, especially in urban areas driven by policy efforts targeting clean cooking.

In India, though the number of people without clean cooking access has plateaued around 780 million since 2010, there are clear indications however that government policy efforts targeting LPG have begun to take hold. The Government’s Pradhan Mantri Ujjwala Yojana Programme is set to provide LPG connections to 50 million households living below the poverty line by 2019, with a target of 80 million households by 2020. By 2030, the promotion of LPG and improved biomass cookstoves by the government means that more than 300 million people will gain access to clean cooking facilities, but still more than one-in-three people will remain without. To support the efforts of the Indian Government, OFID provided a grant to scale up the adoption of “smart” gas meters and “pay-as-you-cook” business models that address the problem of LPG affordability. This project also receives the financial support from Saudi Aramco and the Shell Foundation, both are members of the “Oil
and Gas Industry Energy Access Platform (EAP)”. The EAP is a collaboration among OFID, the WPC, TOTAL, Shell, ARAMCO, OMV, Schlumberger, IGU, GLPG, BCG and other strategic partners.

Therefore, in the transition to a new energy mix, fossil fuels will continue to have a major part and that provides the petroleum industry with an opportunity to play an integral role. This is due to the huge potential demand for energy which exists in the poorest countries. For example in developing countries, the additional LPG supply required to meet the cooking fuel demand in the IEA “Energy for All Case” will reach 0.7mb/d in 2030. This is equivalent to 30 per cent of the demand that is expected to be displaced by electrical vehicles by that year.

Natural Gas Fuelling the Transport Sector

The transport sector plays a very niche role for overall gas consumption. Only 1 per cent of global gas consumption is used for transport, with gas providing 2 per cent of overall energy used in the sector. Approximately 90 per cent of this consumption is for road transport in the form of CNG or LNG.

Despite low use globally, gas plays a prominent role for transport in some specific cities. In China, India and Pakistan, for example, gas consumption in transport is rapidly growing given public programmes to incentivise fuel switching as a means of improving air quality.

In India, the Government is promoting the use of CNG in the country. According to Cedigaz, 11 per cent of total India gas consumption is in the transportation sector. CNG is now prevalent in around 11 (out of 29) Indian states, with many cities mandating its use in public transport (taxis, auto-rickshaws and buses). However, growth in this sector is severely constrained by infrastructure. India’s Petroleum Planning & Analysis Cell reports that as of December 2017, there are 3.045 million natural gas vehicles (NGV) but only 1,282 CNG filling stations.

Meanwhile, in Europe and North America, many cities have supported the adoption of gas for heavy duty fleet vehicles like buses or garbage trucks. In Italy, for example, nearly 1,100 natural gas refuelling stations are currently used for 880,000 natural gas vehicles. However, as gas uses for urban transport increase, it requires the development of a new refuelling infrastructure.

LPG is also used as an alternative fuel for vehicles. Global consumption of LPG as a transport fuel has been rising rapidly in recent years, reaching 26.7 million tonnes in 2016 – an increase of 5.5 million tonnes (Mt), or 25 per cent, over the 2009 level. There are now more than 30 million vehicles in use around the world that use LPG, yet LPG as a transport fuel even for Heavy Duty Engine (HDE) and vehicles is still concentrated in a small number of countries. However, government initiatives in emerging economies such as China, Indonesia, and India to encourage LPG applications on HDE, could drive market growth over the coming years.
Catching the wave: What role will US LNG play?

By Dr Jason Bordoff and Akos Losz
Founding Director and Senior Research Associate respectively, SIPA Centre on Global Energy Policy, Columbia University

The rapid emergence of the United States – alongside Australia – as one of the world’s largest exporters of liquefied natural gas (LNG) between 2015 and 2020 was widely expected to create a decade-long glut in the global LNG market. However, to the surprise of most analysts, global LNG demand has proved more than a match for fast-growing LNG supplies, initially led by a collection of new and emerging LNG importers, and later by the policy-driven demand boom in China. Over the past 12 months or so, talk of a looming LNG market oversupply has given way to tightening markets and fears of a supply shortage by the early 2020s, or potentially even sooner. Given the LNG demand outlook and the three to five-year lead time of new liquefaction projects, new LNG investments are required in the near-term to avoid demand outstripping supply in the years ahead, resulting in tighter markets and higher prices.

Despite a robust demand outlook, investment in new LNG supply capacity has come to a standstill in the last couple of years, as buyers have been less willing to sign long-term offtake agreements, and suppliers have thus struggled to secure project finance debt, which is still needed for the majority of new LNG projects. How this impasse will get resolved – and what role the United States will play in the next wave of LNG supply – is a key question for the future global energy system.

Breaking the Impasse

In the last couple of years, the global LNG industry has found itself in a bit of a catch-22 situation, with buyers unwilling to sign long-term deals linked to the price of oil, banks reluctant to lend, and suppliers challenged to sanction new projects. Because of the impasse, final investment decisions have been few and far between since 2016. Until a few months ago, industry analysts had wondered who will blink first: the buyers, the suppliers or the financiers.

Since the global LNG market started to tighten in late 2017, however, buyer appetite for long-term LNG contracts appears to be returning strongly. Meanwhile, LNG suppliers are looking for ways around the traditional project-finance-based model, including through balance-sheet financing, more portfolio offtake, and innovative new business models. Where differences between buyer expectations and seller requirements still remain, portfolio players and trading houses can increasingly step in to aggregate and intermediate. Some traditional buyers (e.g., in Japan) are also looking to play a more active role as traders and portfolio aggregators in the marketplace. As we approach the end of 2018, the market seems to be moving past the deadlock, and the race to build the next wave of LNG projects is now well underway. The launch of Cheniere Energy’s Corpus Christi Train 3 project in the US Gulf Coast earlier this year seems to have kicked off a new investment cycle.

What Role for Second-Wave US LNG Projects?

As the global LNG industry gears up for another round of investment in new capacity, US-based projects could once again play a major role in the upcoming investment cycle, just as they did during the previous one. New American liquefaction projects have some important advantages over many of their overseas competitors, including their relatively low construction cost, limited completion risk, destination flexibility, and transparent Henry Hub-based pricing. These characteristics make American projects attractive in the eyes of many prospective buyers around the world, including in China.

At the same time, there are also a number of challenges that exist for US-based LNG projects. Permitting delays at the Federal Energy Regulatory Commission (FERC) could be one such roadblock. Staffing shortages and a steady stream of applications created a growing backlog at the FERC earlier this year, and slowed down the permitting of new LNG projects considerably. The agency has since taken steps to speed up permitting, including hiring outside contractors and outsourcing some aspects of the review process to the PHMSA. The recent changes should still enable most second-wave projects to take a final investment decision by the end of 2019. But any further slippage in the permitting process could mean that some developers miss the window, and thus have to wait until the next turn of the cycle before they can once again consider launching their project.

The competitiveness of US LNG—particularly in Asia—can be another challenge. Although the cost of building liquefaction capacity is comparably low for second-wave US projects, the cost of feed gas in America, which is linked to the Henry Hub index in most cases, is higher than for competing projects in Qatar, Mozambique, Russia and elsewhere. Projects along the US Gulf Coast are also further away from key LNG markets in Asia than most competitors, which means higher transportation costs for US exporters. The landed cost of US gas in Asia could further increase, if the Panama Canal becomes a bottleneck for LNG transit, although the waterway has so far been able to accommodate the growing LNG flows between the US Gulf Coast and the Pacific Basin. While some
US projects might find ways to source gas at a price below Henry Hub (and thus improve their cost structure), the full cost of delivering US LNG to Asia remains mostly in the range of US$8 per MMBtu, which positions American developers higher up on the cost curve than some of the lowest-cost opportunities in other geographies.

Trade wars are another nuisance for American LNG exporters. The 25 percent tariff on imported steel, which the Trump administration implemented earlier this year, imposes direct costs on new US LNG and pipeline projects. While the steel tariff, in and of itself, will hardly be a fatal blow to the US LNG industry, it can nevertheless increase project costs by a few percent, and impose an unnecessary burden that can weaken the economics of new US LNG projects vis-à-vis their global competitors.

America’s escalating trade war with China also comes at an unfortunate time for second-wave US projects. The market window for the next wave of LNG supply has recently opened, and the global competition to finalise commercial arrangements and reach final investment decisions within the next one or two years remains fierce. US LNG projects are well-positioned in this competition. But the potential loss of long-term buyers in China—the largest source of LNG demand growth in the foreseeable future—can be a disadvantage for US projects, particularly for those that are developed by independent players and need to raise project finance debt on the back of long-term offtake agreements. The potential for an escalating trade war with the fastest-growing LNG import market may deter investment in the US relative to other sources of new LNG export capacity. Moreover, many US projects are actively marketing to Chinese buyers or even have reached preliminary agreements in some cases. The ongoing trade dispute may give pause to potential Chinese buyers in their discussions with US project developers. If the trade tensions persist for a prolonged period, then interested Chinese buyers may be compelled to look elsewhere for long-term LNG volumes—and potentially help overseas projects cross the finish line ahead of their US rivals. Given the need for new financing models for the next wave of US LNG export projects, there is the possibility for Chinese investment in the projects themselves, yet that may raise political as well as regulatory challenges in Washington DC given the need for Committee on Foreign Investment in the United States (CFIUS) review and approval.

America has every opportunity to play a prominent part in the next wave of global LNG expansion. But, as the above list of potential headwinds indicates, despite the Trump administration’s “energy dominance” rhetoric and efforts to boost production by rolling back regulations, US policy is currently creating its own set of challenges as well.
The Oil and Gas Climate Initiative: A catalyst for change

By Pratima Rangarajan
Chief Executive Officer, OGCI Climate Investments

Climate change is a significant global challenge. Transforming the ways we produce, supply and use energy in the future requires innovative thinking, new technologies and greater collaboration. Such unprecedented change also presents us with significant opportunities to shape and improve the oil and gas industry of tomorrow.

Solutions cannot be looked at in isolation. Enabling the transition to a low emissions future while ensuring there is enough energy to meet the needs of a growing global economy and population is central to delivering sustainable development both now and in the future.

OGCI Climate Investments is a billion-dollar investment fund focused on initiating practical actions to deliver solutions for a sustainable, low-emissions future. It was launched in November 2016 by the Oil and Gas Climate Initiative, a voluntary initiative led by the CEOs of ten major global oil and gas companies. We invest in innovative low emissions technologies that have the potential to significantly reduce greenhouse gas emissions on a significant scale.

Working together to be part of the solution

By working together, OGCI member companies can multiply the impact of their efforts to deliver the transition to a lower carbon future. Collaboration is the key to achieving this – both amongst OGCI member companies and OGCI Climate Investments, as well as with our partners and policy makers. By sharing knowledge and collective resources we aim to accelerate the use of innovative solutions.

OGCI Climate Investments invests in areas where we believe we can make the most impact on emissions reduction now, as well as removing obstacles to the development, deployment and scale-up of technologies which are needed to achieve long-term climate goals. We have initially allocated funds in four programme areas where the development of new technology is needed to reduce the carbon footprint of the oil and gas industry; methane reduction; increasing industrial and transport efficiency, and carbon capture, utilisation and storage.

Reducing methane emissions – This is an urgent short-term climate priority to ensure that the full climate benefits of gas can be realised.

Improving energy efficiency in industry: We aim to lower the GHG emissions of industrial processes and applications by advancing the demand-side efficiency of energy utilisation and consumption.

Reducing transport emissions: We have a unique opportunity to deploy technologies in our own respective operations – greatly amplifying the scale and impact of our initial investments.

Carbon capture, utilisation and storage: Transforming energy systems will be too slow and costly without CCUS, if the foundations are not built now – reaching net zero emissions will be difficult. The oil and gas industry has the technical ability and motivation to help solve the obstacles to widespread deployment, in conjunction with supportive governments and society.

Investments so far

OGCI Climate Investments is investing in technologies which can be integrated into existing operational environments, which are commercially viable, and have the potential to be deployed at scale. OGCI member companies are ready to take advantage of these solutions and technologies to enable fast deployment in their own supply chains: this means we have a market and can have an immediate impact.

Our investments are already creating results and showcase our broad reach both in terms of geography and technology areas. These projects are:

Solidia Technologies, a US-based cement and concrete production company. Their patented technology allows for the production of cement in a way that generates far fewer emissions; CO₂ is then used rather than water to cure the concrete. Solidia’s innovative technology has the potential to lower emissions in concrete production by up to 70 per cent and water consumption by up to 80 per cent. Companies like Solidia demonstrate how carbon dioxide can be re-used successfully from both an environmental and a commercial perspective.

Achates Power, a company developing more efficient commercial vehicle engines. Achates Power develops innovative high-efficiency opposed-piston engines with the potential to substantially reduce the greenhouse gas emissions produced by vehicles. With investment from OGCI Climate Investments, as part of a broader consortium alongside engine makers, Achates Power aims to accelerate its technology deployment worldwide.

A clean gas project that aims to design a full-scale gas power plant with carbon capture and storage, including industrial CO₂ sequestration capability. OGCI Climate Investments will work with the project team on a commercially viable concept and basic engineering design that can receive government support and attract private sector investors.

Econic Technologies, a company that creates new value from CO₂ waste for the plastics industry. The funding will be used to further develop Econic’s pioneering catalyst systems that
enable up to 50 per cent by weight CO₂ to be incorporated as a raw material into the manufacture of polyols, the base of all polyurethanes. By unlocking the positive potential of CO₂ waste and incorporating it as a feedstock, Econic’s technology reduces the reliance on fossil fuels and potentially enhances industry margins.

**Venture Day, a deployment accelerator**
In June 2018 OGCI Climate Investments held its inaugural Venture Day, focused on methane and encouraging entrepreneurs working in the areas of methane detection, measurement, and mitigation to apply for US$20 million funding. From 56 applications from around the world, including the US, Canada, Europe, the UK, Australia, New Zealand, and Singapore, 10 applicants were shortlisted and invited to pitch their ideas. Winners will be announced at the Oil and Gas Climate Initiative’s annual CEO event in September, to be held this year in conjunction with Climate Week in New York.

This was the first in a series of Venture Days that will be held to align with our focus areas, creating an opportunity for start-ups and companies to submit ideas or funding proposals to OGCI Climate Investments and our venture partners.

**Strategic Partnerships**
In addition to investments we continue to collaborate with other organisations working to reduce greenhouse gas emissions. One example is the Breakthrough Energy Coalition, co-founded in 2015 by Bill Gates. The Breakthrough Energy Coalition has brought together governments, research institutions and nearly 30 leading private investors to create a new model for investing in sustainable energy innovation. By collaborating with the Breakthrough Energy Coalition and its partners and by leveraging our strengths, we believe that we can accelerate the commercialisation and deployment of new technologies. This coalition of public and private partners is a significant step in identifying, supporting and delivering the worldwide sustainable energy solutions necessary to help solve climate change.

**Looking to the future**
It is hard to anticipate what the world will look like in the second half of the century. Oil and gas are expected to remain in the global energy mix over the long-term, but their relative share is likely to change over time with the growth of alternative energy sources, and the introduction of negative emissions technologies.

By working and investing together we can create solutions and accelerate the transition to a lower carbon future. OGCI combines the scale, depth of expertise and reach of ten oil and gas majors with an ecosystem of potentially ground-breaking start-ups. We are confident that collectively we can lead our industry’s action to help tackle climate change and support sustainable development.

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**Figure 1: Carbon dioxide emissions from fuel combustion**

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Electricity and heat</td>
<td>42%</td>
</tr>
<tr>
<td>Other energy</td>
<td>6%</td>
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<tr>
<td>Buildings</td>
<td>10%</td>
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<tr>
<td>Industry and construction</td>
<td>19%</td>
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<tr>
<td>Road passenger vehicles</td>
<td>23%</td>
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<tr>
<td>Road freight</td>
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<td>Shipping</td>
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<td>Aviation</td>
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<td>Rail</td>
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*Sources: IEA, IPCC AR5, EIA*
Hydrogen: The potential for a low carbon future

By Matthew Tipper
Vice-President for New Fuels, Shell

Hydrogen is a long-established product in the chemical and refining industries and has the potential to play a much wider role in the global transition to a low-carbon energy system. Hydrogen has many applications, practically anything that uses energy can be powered by it. However, its usefulness is most clear-cut in the transport sector.

Because hydrogen fuel-cell electric vehicles emit only water from their tailpipes, they can keep people and goods moving while reducing carbon emissions and pollution. They are also able to cover long distances between fuel stops and refuel as quickly as petrol cars.

Hydrogen is also an option for meeting transport needs when other low-carbon alternatives are of limited use. For example, while it is inefficient for battery-powered trucks to carry goods over long distances, because of the size of the batteries required, hydrogen’s high energy density is well-suited to freight transport.

However, despite hydrogen’s potential for lowering emissions, its role in the global economy is unlikely to grow significantly without strong government support. Close collaboration between governments, vehicle manufacturers and energy companies is essential to develop the necessary infrastructure to make any emerging energy source a practical alternative. Hydrogen is no exception. To reach its full potential, both the new vehicles and refuelling points need to be made available at the same time.

That’s why we are working as part of the H2 Mobility joint venture to develop a network of 400 hydrogen fuelling stations across Germany by 2023. This joint venture was formed to help drive hydrogen transport forward by increasing the number of fuel-cell cars available, while also providing more refuelling stations. Shell already has 11 hydrogen filling stations at its retail sites in Germany and aims to have 25 in operation by the end of this year.

In addition, Shell is part of several initiatives to encourage hydrogen use in transport in other key countries. We already have two hydrogen refuelling stations in southern California and are working with Toyota and Honda to expand the hydrogen refuelling network in Northern California. We opened our first hydrogen station in Vancouver in June 2018 and plan to open at least two more in Canada soon.

In the UK, we have been working with ITM Power to make hydrogen fuel available at three Shell retail sites in the south east of England, two of which have already opened, and we are assessing the potential for more projects in North America, Europe and Asia.

Multiple solutions

Shell sees real long-term promise in hydrogen. But we believe that a range of technologies will be needed to help reduce carbon emissions while keeping the world economy moving. It will require a variety of fuels, including petrol and diesel, depending on the needs of the traveller or the kind of freight.

Battery-electric vehicles are increasingly popular and we are working to meet the needs of drivers who own these vehicles in Europe. We expect battery-powered cars to become more competitive with combustion engines, and for their use to gain pace in parts of Europe, Asia and North America.

Last year, we began offering fast charging for battery-electric vehicles at retail sites in the UK and the Netherlands. We also acquired NewMotion, one of Europe’s largest providers of electric vehicle charging points, and are working with high-powered charging network developer IONITY to offer super-fast chargers across Europe in the next few years.

While the increasing variety of hydrogen fuel-cell electric cars gives a glimpse of the future of personal mobility, it is the commercial sector that may offer the greatest opportunity to reduce vehicle emissions with hydrogen. Buses and trucks are currently a major source of emissions and their numbers will increase significantly over the next few decades as the global population and trade in goods grows. Small fleets of fuel-cell buses have been transporting people around cities scattered around the world over the last few years, and the world’s first hydrogen trains will transport passengers in Germany from the end of 2021.

Shell also plans to build a dedicated hydrogen station for trucks in southern California to supply Toyota’s fuel-cell truck fleet at the Port of Long Beach, one of the world’s largest freight hubs.

Industrial consumers of hydrogen are also looking at its potential for reducing the environmental impact of their products. Natural gas network operators are exploring ways to blend hydrogen with natural gas, and we are building a 10-megawatt electrolyser, the largest of its kind, to produce hydrogen for our Rhineland refinery.

There is no doubt in my mind that hydrogen has exciting potential in the long-term transition to a low-carbon world. But its full benefits will only be harnessed through strong co-operation between businesses and governments around the world.

There have been false dawns for a hydrogen-fuelled future before. But, if we all work together, hydrogen’s day could come soon and the world has much to gain when it does.
Priming the pump with plastics: Harnessing value from trash

By Marie-Hélène Labrie
Senior Vice President, Government Affairs and Communications, Enerkem

At the current rate of pollution, experts say that by 2050 oceans are expected to contain more plastics than fish (by weight volume), and the entire plastics industry will consume 20 per cent of total oil production, and 15 per cent of the annual carbon budget. The problem is not limited to marine environments; agricultural land, surface waters, freshwater lakes and rivers and landfills are also contaminated with plastics and suffer as a result.

According to a recent report by the Ellen MacArthur Foundation, only 14 per cent of plastic packaging materials are recycled today and more than 7 million tonnes of plastic, mostly packaging, ends up in the oceans each year, killing fish and other wildlife. Harnessing the fuel content of the 86 per cent of used plastics currently not recycled could create US$80 billion to US$120 billion in revenues. Plastics are created primarily from energy feedstocks, usually oil or natural gas, and therefore have an intrinsic value as a fuel source. Innovative solutions and technology helmed by smart business leaders can drive an integrated circular economy approach to create value from this stored energy while delivering significant environmental and economic outcomes by producing this liquid fuel source.

Enerkem is a Montreal-based biofuels and specialty chemicals producer that has developed an award-winning and game-changing technology that converts non-recyclable and non-crop-based waste—such as discarded sofas, running shoes, plastic food containers, candy wrappers and old diapers—into advanced biofuels such as methanol and ethanol. The company was the first in the world to produce household waste-derived biofuels on a commercial scale and remains the only company across the globe doing this.

In 2014, Enerkem inaugurated the first of its kind commercial scale waste-to-biofuels facility. As part of a 25-year agreement with the City of Edmonton, Enerkem can process some 100,000 dry tonnes of sorted municipal waste—primarily household refuse—every year. In fewer than five minutes, Enerkem’s technology produces a synthetic gas and converts it into renewable, non-toxic, water-soluble, highly biodegradable and clean burning transportation fuel and renewable chemicals, used respectively as a high octane oxygenate in gasoline and in industrial and specialty applications.

At its Edmonton plant, Enerkem’s technology produces enough to fuel over 400,000 cars on a 5 per cent ethanol blend. It will also help Edmonton achieve its overarching goal to increase its waste diversion rate up to 90 per cent. The company was the first ever waste-to-biofuel commercial facility to receive approval and registration from the US Environmental Protection Agency (EPA) as well as from the International Sustainable Carbon Certification.

Biofuels from urban waste and residual biomass provide alternative fuel sources that can complement petroleum in the global fuel pool, and positively impact today’s most pressing energy and environmental issues, including plastics pollution. While it enables diversion from landfill or incineration and drives other sustainable waste management, it simultaneously reduces greenhouse gas emissions and helps oil companies meet obligations to use renewable fuels.

The emergence of alternative fuel sources is driven by the need to reduce dependence on oil and greenhouse gas emissions as well as to increase energy diversity. Our company continues to build partnerships with municipalities and industrial groups to implement biofuels production facilities worldwide.

In the months to come, the company is slated to begin the construction of a new facility in Varennes, Quebec. It is also developing similar projects in the US and elsewhere across the globe where markets are driving demand.

In Europe, the company is developing its first project with a consortium led by AkzoNobel, Air Liquide, and the Port of Rotterdam in the Netherlands. The planned facility will provide a sustainable alternative to incineration. It will manage more than twice the volume of the Edmonton facility, processing up to 360,000 tonnes of household and industrial waste, plastics, and wood residues into up to 220,000 tonnes per year of low-carbon methanol.

Recently, the company joined forces with Suez in Spain to build a €250M waste-to-methanol plant near Barcelona. Using 375,000 tonnes of plastic, paper and textiles, the facility will produce 265,000 tonnes of renewable fuel annually. In the region only 10 per cent of waste is currently recycled, ending up either buried or incinerated. The new project is expected to boost it to 70 per cent, with the possibility to increase furthermore.

Earlier this year, Enerkem signed an agreement with SinoBioway Group worth over C$125M to manufacture, license and launch the construction of some 100 state-of-the-art facilities in China by 2035.

Oil prices have been on a rise for more than two years and are now higher than in 2005 when oil prices, climate change and energy security fears first drove the establishment of biofuels programmes. Regardless of the change in oil prices, we know that there continues to be a growing desire for renewables and a need to address the environmental impact of plastics and other materials polluting the planet. It is a tremendous opportunity for the oil and gas sector to reinforce its innovation and leadership.
Safety: A collaborative response to Deepwater Horizon

By Taco Franssen
Chairman, Safety Committee, International Association of Oil & Gas Producers (IOGP)

Safety. This is a constant preoccupation, particularly since a revived oil price has renewed interest in deep water exploration and production. How have safety practices and rules changed since the Deepwater Horizon incident?

After the Deepwater Horizon and Montara incidents, the International Association of Oil & Gas Producers (IOGP) brought the industry together in our Global Industry Response Group (GIRG). Drawing on the knowledge of more than 100 leading technical experts and senior industry figures from around the world, the GIRG focussed on major incident prevention, intervention and response. What did the GIRG achieve, and how are its findings and recommendations impacting safety today?

Improving well safety

After almost a year of in-depth analysis, the GIRG determined that more reliable well safety relied on renewed efforts in four key areas:

• Creation of an industry-wide well control incident database
• Assessment of blow-out-preventer reliability and potential improvements to this equipment
• Improved training and competences with more attention paid to human factors
• Development and implementation of key international standards pertaining to well design and well operations management

Today, IOGP’s Wells Expert Committee (WEC) has issued over 50 Well Control Incident Alerts to the upstream industry. It also keeps a comprehensive database of such incidents. Additionally, IOGP has issued two thematic reports to its members (representing 40 per cent of the world’s oil and gas production), detailing the trends found in the analysis of these alerts. Unsurprisingly, human factors and risk management are main causal factors to the well control incidents reported to IOGP, as do procedural discipline and responding to signals. It is important to note that in each of the well control incidents reported to IOGP, the blow out preventer (BOP), when called upon, functioned as designed. To assess BOP reliability, IOGP, alongside our partner and sister trade organisation the International Association of Drilling Contractors (IADC) administers a Joint Industry Project (JIP), the RAPID S-53 BOP reliability database. This JIP records component failures, mostly minor, that could result in leaks or secondary control failures etc. Armed with the knowledge of these failures, we are working with the manufacturers to improve reliability of every BOP component. For example, a failure in small bore tubing and couplings leading to leaks, identified the need to bring several BOPs to the surface for repair. The main cause for this – surprisingly – was a failure in following the small-bore manufacturer’s instructions when connecting the pipes. Once this problem was identified and rectified, problems with small bore piping system leaks were reduced by over 80 per cent.

The thematic reports derived from the well control incidents reported to IOGP identified training and human factors as key causes. This coincided with the GIRG’s call for improved training and competence and more focus on human factors. In response, IOGP has produced a range of industry good practices to address some of these issues. These include:

• Report 501, Crew resource management for well operations teams
• Report 503, A Guide to the use of behavioural markers of non-technical skills in oil and gas operations (one of IOGP’s flagship documents)
• Report 476, Recommendations for enhancements to well control training, examination and certification, which has been universally adopted as the training syllabus for well control

Finally, in the area of international well standards, IOGP has been working with organisations such as the American Petroleum Institute (API) and ISO to produce standards and specifications to enhance well control safety. A recently published example is the API Technical Report 16TR1 BOP shear ram performance test protocol. IOGP worked with API on this to produce and publish protocols for performing sealing and non-sealing BOP shear ram performance tests.

Tangible progress in intervention

Up to now, we have been concentrating on the industry’s efforts to prevent well blowouts. But what if the worst were to happen again? How prepared is the industry to respond?

The Subsea Well Response Project (SWRP), was a consortium consisting of BG Group, BP, Chevron, ConocoPhilips, ExxonMobil, Petrobras, Shell, Statoil and Total. SWRP designed and built a comprehensive capping system, complete with subsea dispersant capability. It is now available via subscription to OSRL, the world’s leading oil spill response organisation. The SWRP team had four core objectives:

• Design and develop a capping toolbox with a range of equipment to allow wells to be shut in
• Design and develop a subsea incident response toolkit for the subsea injection of dispersant
To collaborate with Oil Spill Response Limited on an international deployment mechanism so that the equipment could be made available to the wider industry.

Complete studies to determine the feasibility of global containment system.

The first elements of this integrated intervention system are now available to the industry. This equipment includes four subsea capping stack systems and two subsea incident response toolkits for debris-clearing and the subsea application of dispersant.

The SWRP also developed a concept for a subsea well containment solution. This relies extensively on existing drilling rigs and commercially-available well-testing equipment to capture fluids from an incident well. Once captured, the fluids flow to the surface for processing and disposal (in the unlikely event of a well capping operation being unable to completely stop uncontrolled flow of hydrocarbons to the sea).

The entire system is designed to be readily transportable by air and/or sea from one of the four OSRL-operated strategic base locations in Europe, Africa, South America and Asia Pacific.

In shallow waters, or where vertical access to install capping systems is challenged, the industry has developed and built offset installation equipment. This allows for successful capping and containment that would not have been possible just a few years ago – and has enhanced the industry’s ability to react to more incident types than ever before.

A united effort in oil spill response

To consolidate the lessons learned from the Deepwater Horizon incident – and to stimulate new research – the GIRG recommended the formation of an Oil Spill Response Joint Industry Project (OSR-JIP). Its 18 members worked with key stakeholders around the world, including the SWRP, API, the Marine Spill Response Corporation, the European Maritime Safety Agency and several IOGP and IPIECA standing committees and related JIPs.

The result was a comprehensive framework that includes guidance on:
- Oil spill preparedness and response,
- Tiered preparedness and response,
- Net environmental benefit analysis.

The framework is available at www.oilspillresponseproject.org. It also includes comprehensive guidance on oil spill planning, training and exercises, various response strategies and tactics and potential impacts. As a result, there is now a country-independent framework to assist companies in participating in local, regional or global mutual aid efforts.

An industry better prepared than ever

The Macondo and Montara incidents were a wake-up call to the industry. Huge improvements in well operations and personal safety notwithstanding, the warning signs from other sectors – the refining and chemical industries in particular – demonstrated that process safety was still not well understood.

That is not the case anymore today. The upstream oil and gas industry have taken huge strides in advancing understanding of the risks involved in deepwater exploration and production. We have improved safety and competence, made the disciplines associated with human performance and human factors integral to our operations, improved the technology and reliability of our equipment and are significantly better prepared should the unthinkable happen. Contemporary response capability and effectiveness are the best they have ever been.

IOGP, the voice of the upstream oil and gas industry, has been at the forefront of these improvements. The Association continues to champion advances in safety, reliability and industry cooperation and collaboration. This work is ensuring that the exploration and production of oil and gas can continue – safely and sustainably – to meet global energy needs for decades to come.
Creating more diversity in oil and gas

WPC interview with Amina Benkhadra, General Director, National Office of Hydrocarbons & Mines, Morocco
Maria Moræus Hanssen, CEO & Chairman of the Management Board, DEA Deutsche Erdöl AG, Germany
and Joanna Desjardins, Vice President, Diversity, Inclusion & Youth, WPC, Canada

The WPC’s “Untapped Reserves” study in conjunction with the Boston Consulting Group found that the share of women in the oil and gas industry currently stands at 22 per cent, one of the lowest percentages in any industry sector. What can the industry do to attract and create a more diverse work force?

Maria Moræus Hanssen (MMH): First, companies need to decide on the importance of this topic and need to develop a real will to do something about it. In order to get more women into the industry and to the top of the industry there are some key aspects to consider. Currently, career development in most companies follows an extremely conservative and complicated promotion scheme. We need to recruit and promote differently. We, as executive managers have to lead by example and dare to try out different schemes.

Above that – and in general for all talents - we as an industry have to demonstrate the importance of oil and gas. We need to raise a desire to work with us.

Amina Benkhadra (AB): The oil industry is without any doubt a male dominated environment, but the industry perception on gender diversity is changing for the better. Oil and gas companies can play a greater role in encouraging more women to join the sector. Some actions that can be implemented are:
- Start early: While not essential to study STEM subjects to reach the board in oil, there is still the need to attract young women into technical and operational career paths.
- Increase collaboration between oil and gas companies and schools: More networking and mentoring programmes, increasing the visibility of strong female role models who can share their views of the benefits of joining the oil and gas industry (e.g. the variety of experiences, travel and good pay), could all make a huge difference.
- Increase Sponsorship: Helping high potential women to identify sponsors who will play an active role in career development – research has shown that men are 46 per cent more likely than women to have a sponsor.
- Implementation of quotas: to increase the proportion of women on company boards in every sector, from quotas to voluntary targets

Attracting more women into the oil and gas sector will take time and requires effort at all levels – in schools and universities, and within the sector itself.

Joanna Desjardins (JD): Promote a culture of being inclusive from the top down and actively promote diverse talent to model opportunities and expectations to younger staff. Create flexible work environments and be consistent with merit promoting (not just to those who ask or are ‘popular’). Finally, allow opportunities for ‘diverse networking’ as not all connections and networks are built the same way.

From your experience, what do you see as the main challenges for women moving up the career ladder, and how can these be overcome?

AB: I think there are many challenges:

The first challenge is the lack of qualified candidates: The need for technical skills in oil and gas sector jobs, combined with women’s smaller presence in STEM disciplines is a key reason for the lack of women in oil and gas.

The second challenge is the access to top management for women. Indeed, although men and women start out on an equal footing, women rarely reach the top of the organisation. Among women who are still at the company after 15 to 20 years, the probability of becoming a senior executive is small, less than 20 per cent.

The third challenge and maybe the most important one is the negative perception. There are negative perceptions of the industry commonly held by women: that it is male dominated, involves excessive compulsory travel to remote or challenging locations, requires hard physical labour and a background in STEM. Women also often lack confidence in themselves.

MMH: Employers actively need to neutralise natural differences between genders in the workplace and offer equal opportunities. There are some good examples around, e.g. extended maternity leave for employees becoming parents when shared between the two partners. Because gender equality in business life only works when you have gender equality in the families.

Likewise, working part-time while you have small children should not automatically fall on mothers. It may be a good solution for the family but I believe part time work should be shared between parents. I personally believe it is difficult to aspire for leadership positions if you work part time for a long period, while your peers are fully committed, gain a lot of experience and demonstrate strong ambition.

JD: Plain and simple: women network and communicate differently, and because the leadership is mostly male, that predefined model is hard to break into. Leadership needs to actively seek diverse candidates for succession, at every level, as we tend to only notice and look for qualities that we have in common. If we are intending to be ‘diverse’, expect those commonalities to be muted. Thus diversity needs to be a conscious effort.
Were there any key early events that helped shape your own careers?

**AB:** Two important factors should be highlighted: The first concerns men’s perception of women in these professions (as engineers or senior executives in the energy field) and that women will not be up to the jobs. The second concerns the support that the hierarchy can provide at the highest level and the trust in their female employees.

I have faced several challenges during my career, but each of them has only strengthened me as the person I am today. This has taught me three things:

- The passion that guides us is the best ally to advance
- Learning is for your entire life (we keep learning)
- The human aspect and its importance in any organisation

**JD:** Curiosity in other people’s areas, wide networks, and great supporters. Not just good sponsors, GREAT sponsors. All my opportunities were a result of someone pulling me up as I climbed.

**MMH:** I had the advantage of growing up in Norway where working in a male-dominated industry did not become a significant disadvantage for me and where I had strong role models, for example my mother with her own career as a CEO. Also, I have a group of close friends, male and female, who all have career ambitions. I have two children. For both of them I went on maternity leaves of approximately 6 months. I did not hold on to my exact positions when I left and when I returned I got new positions, de facto being promoted both times. During the maternity leaves, I maintained a close relationship with the company, the teams and my boss and I also engaged in professional tasks such as attending meetings and conferences. Employees and companies should see maternity leaves as opportunities for job rotations. On the other hand: I cannot encourage employees enough to take time off for the family. We should all ask our male employees, “Why on earth are you here when you just became a parent?” or “Why are you not home with your family?” when the weekend approaches or during the first days at school.

What do you see as the key positive business impacts for companies by engaging more women in the sector?

**JD:** Women tend to be win-win negotiators, and today, when geopolitics, community relations, regulation and competition are driving every step of this industry, the altruistic approach seems more and more prevalent with industry converging around this change of thought process. Women have a natural tendency for this behaviour and I believe it’s an opportune time for us.

**AB:** As women, we have to show that we are not only equal but that we can surpass the limits set. We must always try to turn constraints into opportunities.

Some people may have doubts about a woman’s abilities in a rather male technical sector, but commitment and work have shown the capacity of women in all sectors.

**MMH:** We, as an industry, would benefit if we could tap into the whole talent pool and represent the whole society in our work force, which to me is a moral responsibility. It would also support a shift of perception of oil and gas as an “old fashioned dirty” industry to a more modern one.

What advice would you give young people – men and women – in oil and gas on the best way to get to the top of their profession?

**JD:** Be fair, not ‘nice’. This goes both ways in that you should not promote based on favor or nicety, and others will not feel that non-promotion is ‘not nice’, so long as fairness was the clear goal. Always treat your people and your decisions with fairness in mind. Leading this way naturally invites diversity.

**MMH:** Do not worry about promotion and advancement at the beginning of your career. Show a bit of patience. Get as much experience and exposure as possible. Be interested. Say yes to new tasks, contribute actively with your knowledge and your energy but also bring your heart to work. On a personal level, you should always try to be a nice colleague. You should aim to be a colleague others like to have on their team. Develop a genuine interest and try to understand the importance of the industry. To sum up: When building your own brand: be interested and be positive!

**AB:** The oil and gas industry is an attractive and interesting sector. Petroleum is a rewarding industry with huge growth potential and demand for a new wave of talent. This presents a unique opportunity for recent graduates and young professionals interested in hatching their oil and gas careers.

My advice to young people is: Passion is energy! Passion makes you hungry for knowledge, and knowledge strengthens your confidence! And of course sell yourself! Brush up your CV. Ideally shape it to a specific application, ensuring that you keep it concise and focused on the key points. Make sure you include all relevant skills and experience. Start networking, pay attention to your profile, follow relevant industry news as well as influencers to help develop your market knowledge, and attend industry events to grow your circle of contacts.

View our full report at www.world-petroleum.org/diversity
In December 2015, the United States Congress lifted the 40-year ban on exporting US crude oil, a move many energy experts would have never predicted less than a decade ago. For decades prior, energy pundits agreed that the US was poised to run out of oil; the rhetoric portended an extreme energy crisis. However, thanks to energy friendly policy changes and industry ingenuity with the development of horizontal drilling and hydraulic fracturing, our country has completely altered the global energy landscape, moving from an energy importer to a world-class energy exporter.

In the first year of the Trump administration, energy policy was largely related to economic growth, specifically jobs. Major policy initiatives aimed to increase domestic production, provide regulatory relief, open federal lands to increase exploration and production, and support energy exports. These efforts underscored the ultimate goal – bolstering the US economy and paving the way forward in energy.

Now, partway through the second year of his administration, President Trump’s policies remain consistent with a few nuances. The economy and labor market are still priorities. Both gross domestic product and unemployment numbers have improved substantially since President Trump won the 2016 presidential election. Much of the economic boost is from the tax cuts. But, increased domestic energy production had held gasoline (until recently), natural gas, and electric power costs to consumers relatively low, generating a savings effect for energy customers.

Table one illustrates the US Energy Information Administration projections of World Energy Consumption by energy source to 2040. Please note that while renewables have substantial growth, petroleum and other liquids, natural gas, and coal are significant. In fact, fossil fuels remain the dominant energy source.

Furthermore, BP, Exxon Mobil, and Equinor (former Statoil) all have forecasts that show fossil fuels providing up to 80 percent of world energy in 2035, 2040 and 2050 respectively. The Trump administration is correct that traditional fuels on a global basis are not going away. Policies that encourage these trends are by far a net positive for the economy.

Accelerated drilling, driven by regulatory changes and permit efficiency, has led to significant discovery increases in both crude and natural gas reserves. Charts two and three illustrate these trends. Both have more than doubled, and as technology becomes even more sophisticated, it is probable to see these trends continue.

Improved drilling technology advances have also played a major role in this narrative. The industry can drill three kilometers vertically and three kilometers horizontally to efficiently extract the most natural gas. Combining horizontal drilling with hydraulic fracturing has led to this remarkable US energy revolution.

Both crude and natural gas production is expected to double between 2010 and 2020. This is a notable achievement. For much of the last 40 years it was well accepted that the US...
was running out of oil and natural gas.

At the time, it was strategic for the country to move away from oil and natural gas for power generation to make room for coal and nuclear units. Now the Trump administration is trying to find ways to keep coal and nuclear power plants operational where they might not be otherwise; the low price of natural gas has made natural gas power plants more attractive to grid operators. The US Energy Department is currently structuring a plan to make whole grid operators, whose profits may suffer from choosing coal and nuclear units, over natural gas ones.

The global energy industry is expected to more than double its services by 2050, due largely in part to a world population increase of more than 2 billion people. Industry is also expected to provide power to 1.2 billion people currently living with no electricity, and 1.3 billion people living without adequate electricity. The US is uniquely positioned to help meet this growing demand through exports.

Crude oil exports have skyrocketed since late 2015 when the US Congress lifted the export ban. The US is expected to export two million barrels a day in 2018 or early 2019.

Canada is the largest buyer of US crude with China in second place, followed by the UK, the Netherlands and South Korea. Over 15 countries imported US crude in 2017. Coupled with petroleum product exports, combined exports were over six million barrels a day.

The liquefied natural gas (LNG) story is equally notable. Cheniere’s Sabine Pass facility in Louisiana became the country’s first operational LNG export terminal in 2016. Cheniere has since requested that the Federal Energy Regulatory Commission approve its LNG train at Corpus Christi facility by the end of 2018.

In addition, Dominion’s Cove Point began commercial operations in early 2018 and has shipped three cargoes in the first month. In May 2018, Dominion exported three cargoes of US LNG through the Panama Canal – a first.

Overall, the Trump administration energy policy has helped boost the economy, change the global energy landscape, reduced cost for US consumers, and inspired a manufacturing renaissance. And that’s just in a year and a half.
The 2018 ‘super cycle’ will give way to a calmer electoral schedule in 2019, but turbulence is likely on the oil and gas policy front. The market-friendly reforms that began in Mexico in 2013, and then extended to Argentina in 2016 and Brazil in 2017, could be under threat by end-2019.

A short shelf-life for South America’s reforms could quickly flip investor sentiment on the region’s major offshore and unconventional plays.

A relapse – even a moderate one – towards resource nationalism in Argentina and Brazil could leave Colombia a pro-market regional outlier – and potentially a big investment winner. However, the more likely mixed outcome at the ballot box in the Southern Cone, and the considerable fiscal restraints on both countries, mean that a complete policy U-turn is improbable.

Furthermore, none of the big regional NOCs (from Pemex to YPF) have the financial capacity – or the technical skill – to go it alone. Therefore, competition to attract IOC partners and investors will oblige governments – including in Mexico – to stick with broadly pro-business frameworks.

Regional stand-off will fuel pragmatism

Verisk Maplecroft’s Extractives Risk Index – an aggregate of 37 political, regulatory, economic, security, environmental and human rights indices – shows that the four countries have a broadly comparable risk profile. Drilling down to specific performance drivers shows two clear camps though. Colombia and Mexico have higher risks in the Threats pillar, while Brazil and Argentina are characterised by their weaker operating environments.

Criminality is a major issue in both Colombia and Mexico, while the risk of terrorism in Colombia drags its score down further. Security will not improve significantly in either. Therefore, a worsening of the operating environment would remove the offsetting role played by strong pro-business frameworks, solid economic performance, and stable political landscapes.

Without a structural shift in security policy, the presence of drug trafficking organisations (DTOs) will continue to grow under in Mexico. And with DTO expansion, pipeline taps, kidnap and extortion rates will also rise, pushing up security costs.

Extortion is common in areas with high rates of oil theft, and Pemex reported 10,363 incidents of pipeline tapping last year alone. Companies entering JVs with Pemex need to determine how the rise in tapping will decrease the NOC’s profits and investment capability.

In Colombia, President Iván Duque will have to tread a fine line between his pledged tougher security policy and the risk of collapsing the peace deal with the FARC. Verisk Maplecroft expects the exploratory peace talks with the country’s other guerrilla group, the ELN, to end without a positive outcome. This means that attacks against oil infrastructure, one of the ELN’s main tactics, are set to continue.

If implementation of the peace deal with the FARC falters under Duque, the agreement could collapse. Recidivism by former FARC members could boost the ranks of the ELN, as a willing host for ex-guerrillas. As such, direct and incidental security risks could increase, including the likelihood of more aggressive turf wars between criminal groups for control of the cocaine business.

In Brazil and Argentina, a stronger performance in the Threats pillar does little to assuage investor concerns over economic and political volatility.

The key variable is the outcome of the highly unpredictable presidential races in October 2018 and 2019, respectively. Popular frustration with the political class in Brazil, and dissatisfaction with the economic performance of both countries could weaken the pro-market options at the ballot box. This leaves investors looking at a potentially boggling array of changes to economic and regulatory frameworks.

In Brazil, the proposals threatening E&P range from tighter environmental and social regulations to the expropriation of all the ‘pre-salt’ concessions tendered after Rousseff’s impeachment.

The main risk in Argentina stems from efforts to prevent the removal of energy subsidies. Subsidies threaten macroeconomic stability, and limit the state’s ability to invest in the infrastructure required to reduce business operating costs and shipping bottlenecks.

However, the potential return of the Peronist party to power in 2019 does not appear as threatening as it once was from a regulatory standpoint. With Mauricio Macri already managing to get legislation into place from a minority position, progress made thus far has a greater chance of survival in the medium-term.

Public consultations – the thorn in Duque’s side

In addition to curbing security risks, Duque must clarify the severe legal uncertainty surrounding public consultations. With 27 oil projects facing this threat in 2018, the lack of a social license to operate could prove the main stumbling block to revitalising Colombia’s production, which has been
in decline since 2015.

Anti-extractives sentiment has intensified in recent years. Increasingly, activists have managed to delay and even stop projects by alleging violations of their social and environmental rights before the Constitutional Court.

The government argues that local consultations, which are organised and funded at municipal level, are not binding. However, in April the Council of State – the supreme tribunal with jurisdiction over administrative issues – ruled that local authorities do have the right to decide whether extractive operations should be permitted in their regions.

Legally, this ruling opens the door for local authorities to overturn national decisions on O&G projects. Duque, therefore, must find a legislative solution to assuage both community and investor concerns.

AMLO – executive intervention on the rise
An upsurge in policy uncertainty in Mexico is the only certainty for the O&G sector in 2019. AMLO’s energy policy foreshadows greater politicisation of the 2013 energy reform and threatens fiscal instability, both at federal government level and for Pemex.

Senior energy appointments to date have been political and ideological in tone. There appears to be less of a focus on improving Pemex’s performance and competitiveness (as was the case under Peña Nieto). Within the current 2013 legal framework – and without recourse to the constitution — this politicisation of institutions and regulatory agencies could put a brake on implementation of the reform.

For example, the executive ultimately decides which E&P blocks to put out to tender. It can also impose new limits on private sector downstream involvement; amend local content requirements; delay permitting processes; and dictate Pemex’s policy on private partnerships and JVs.

High price tag will moderate resource nationalism
While the ‘Pink tide’ of the early/mid-2000s was able to deliver electoral dividends, it failed to bring economic ones. In the post-commodity supercycle context, governments need to boost production to contain fiscal pressures. Ultimately, the need for fiscal consolidation may prove a stronger check on resource nationalism in the region than political ideology.

Mexico, Colombia and Argentina are all at various stages of trying to reverse production declines. In Brazil, the fallout from the Lava Jato scandal and a ballooning fiscal deficit will limit the ability of any future president to unwind the recent reforms.

The electorate wants more transparency, better public service delivery and cheaper fuel – greater state intervention in Petrobras would accomplish the opposite on every item. In Mexico, AMLO’s vision is too expensive to deliver without IOC involvement and the government will be forced to maintain a moderate degree of pragmatism. Economists put the minimum cost of his ambitious energy plan at MXN284 billion (US$15.2 billion) in the first three years, increasing Pemex’s 2018 E&P budget by 44 per cent. To cover this, Pemex would need to turn to capital markets, swelling its already substantial debt.

Neither the federal government nor Pemex can meet this investment target without major additional borrowing. To deliver, AMLO ultimately may have no option but to remain open to further private investment in the energy sector – both upstream and downstream – even as he looks to retain certain privileges (but also obligations) for Pemex.
Surprisingly for many observers, over the last few years the Russian oil industry demonstrated solid production growth. In the five years from 2012 to 2016 oil and condensate production in Russia grew by 6 per cent – from 518 million tonnes to 548 million tonnes (Figure 1). An insignificant decline of 0.1 per cent in 2017 compared to 2016 was driven by Russia’s agreement within OPEC and not by upstream factors.

The overall increase was mainly provided by bringing online greenfields: production at these fields increased by 87 per cent (57 million tonnes), which more than compensated for an 8 per cent (29 million tonnes) drop in production at existing fields. The commissioning of over a dozen new deposits in 2014–2017 was the result of investment during the period of high oil prices and the absence of sanctions prior to 2014. By 2017 all of these projects yielded additional output of over 25 million tonnes, with the state companies Rosneft and Gazprom Neft claiming two thirds of these volumes.

Several additional factors have substantially supported the economy of these projects, driving production growth:
• The rouble devaluation, which, given the prevalence of rouble costs, significantly cut US$ production costs and, therefore increased the competitiveness of Russian oil in foreign markets;
• The peculiarities of the Russian tax system, which reduces budget revenues ahead of company revenues when oil prices fall;
• The numerous tax breaks adopted for new fields in 2013 (primarily in Eastern Siberia).

The situation seems to be quite positive, and production growth is expected to continue, but there are several significant challenges which together create real threats for the longer-term sustainability of Russian oil output. These challenges are coming from the result of different factors, related to resource base, financing, global oil market conjuncture and technologies.

The Resource Base Deterioration
In recent years, the proportion of high-quality oil reserves in Russia has been steadily declining: this is indicated by the composition of the proven reserves: of the 15 billion tonnes, as much as two thirds (10 billion tonnes) are hard-to-recover reserves – highly viscous oil, tight oil, oil from the Arctic and deep offshore fields. Though oil reserves in Russia have been growing steadily, the bulk of this increase is not due to the discovery of new deposits, but to additional exploration of the fields under development and the introduction of modern production technologies, which significantly increase the oil recovery ratio. There were some new discoveries as well, but most of them are small and located far from the infrastructure, so they seem unprofitable to develop.

Putting new reserves on the balance sheet requires additional investment, which is difficult given the current price environment. In 2016, the industry showed the lowest additional increase in reserves relative to production over the last 6 years – less than 50 million tonnes. In 2017 the figure increased to 72 million tonnes, but these indicators are still lower than those prior to 2016.

Lower Oil Prices
Oil prices correlate directly with investment in exploration. The current period of low oil prices provides for operational profitability of projects, mainly due to the rouble devaluation, but in the longer term it is likely to negatively affect investment in development and production. During the last three years annual average oil prices have fallen twice – this has affected investments in Russian exploration (Figure 2).

Sectoral Sanctions
The implementation of US and EU sectoral sanctions against the main Russian oil companies is another significant challenge for sustainable oil production. Financial sanctions limit their ability to borrow money on international markets, while technological sanctions are limiting supply of critically important equipment for shale and offshore projects.
Offshore Oil Production
As of 2017, oil production on the Russian shelf totaled 25.7 million tonnes. Almost half of this output is produced on the Sakhalin shelf. In the future the main increase in production is to come from the Arctic shelf and the Caspian Sea. A significant number of shelf projects were planned in cooperation with international oil companies or with the active application of foreign technologies, but the introduction of sanctions seriously undermined their development, mainly the Arctic ones. Most of these projects were geared towards the involvement of foreign partners and were suspended under the pressure of sanctions. The reason is simple – the absence of Russian technologies and equipment. However, this has not affected current production volumes, as most of these fields were to be commissioned after 2020.

Shale Oil Production
With the introduction of sanctions, Russian companies are also having difficulties with the implementation of joint projects to develop shale oil, and nearly all projects were suspended. However, similar to offshore projects, this did not affect the current levels of Russian production: in any case, significant output at these fields was only expected after 2020-2025. As of 2017, accrued oil output at the Bazhenov Formation (main Russian shale) totaled over 10 million tonnes.

The ban on equipment for hydraulic fracturing and multistage hydraulic fracturing might not only significantly affect future shale oil production, but also oil production dynamics on brownfields. Oil production using fracturing methods accounts for approximately 10 per cent of total production – in 2017 approximately 50-55 million tonnes out of the almost 550 million tonnes of total Russian output were extracted directly via hydraulic fracturing. Russia manufactures its own equipment for hydraulic fracturing, but it cannot compete with foreign models. Russia counts around 80 hydraulic fracturing fleets, with just 3 per cent of these domestically manufactured. If the development of oil shale projects is a matter of medium and long-term prospects and therefore less critical, the lack of equipment at conventional fields with declining production in Western Siberia could lead to serious problems for oil companies today.

Russian Oil Production Outlook
At the moment it is possible to say that the Russian oil companies have completely adapted to the new conditions and sanctions regime. But, in the long term, maintaining levels of oil production in Russia will become an increasingly difficult and complex task. The main challenge for maintaining levels of oil production in Russia is the reduction of the reserves’ quality – they require more financing as well as new technologies. The situation is aggravated by lower oil prices and by restrictions on critically important equipment supplies.

Due to past investment, Russian oil production is expected to keep growing in the next few years – up to 580 million tonnes in 2020, but it should be noted that these production volumes may be limited by market need, both domestic and external. It is quite possible that Russia will have idle production capacity. By 2025, oil production might decline to 540 million tonnes. By 2030 if these restrictions are exacerbated, production might drop to 480 million tonnes.
Delivering a Governance Strategy for the energy sector in Guyana

By Raphael Trotman
Minister of Natural Resources, Co-operative Republic of Guyana

Guyana is emerging as one of the world’s largest emerging oil producers after ExxonMobil, Hess and CNOOC Nexen discovered huge oil reserves off-shore in 2015. The country is anticipating an influx of capital investment, human resources and revenue which will lead to rapid economic, social and cultural transformation. Governance of the natural resources and energy sector is attracting attention nationally, regionally and internationally.

In July 2018, ExxonMobil increased its estimate of the discovered recoverable resources to more than 4 billion oil-equivalent barrels, the previous recoverable resource estimate was 3.2 billion oil-equivalent barrels, and has advanced its evaluation to support a third phase of development and consideration of two additional phases. The increase follows completion of testing at the Liza-5 appraisal well, a discovery at Ranger, incorporation of the eighth discovery, Longtail, into the Turbot area evaluation and completion of the Pacora discovery evaluation. Initial stages of development drilling are being completed for Liza Phase 1, which will consist of 17 wells designed to produce up to 120,000 barrels of oil per day. First oil is expected in early 2020. Phase 2 concepts are similar to Phase 1 with a production capacity of 220,000 barrels per day. A third development, Payara, is planned to follow Liza Phase 2.

Cognisant of its mammoth responsibilities to reduce poverty, manage inherent weaknesses of the country’s economic and social infrastructure, build capacity to provide sustainable good governance, deal with global climate change by adopting the Green State Development Strategy (GSDS) and simultaneously encourage the development of a world-class emerging oil and gas industry, the Government of Guyana has decided to boldly embrace international best practices and learn from the experience of other countries.

In Guyana the main Government energy related institutions include the Ministry of Public Infrastructure, the Guyana Energy Agency, the Public Utilities Commission and Guyana Power and Light. There is a recognised need to develop a comprehensive and cohesive regulatory environment.

The Government of Guyana intends to amend the Electricity Sector Reform Act, with specific reference to various aspects, including the interconnection and integration of intermittent renewable energy sources into the public electricity grid. By defining ‘Smart Grid’, which encompasses large-scale energy management technologies like advanced metering infrastructure, distribution systems, smart building technologies, modern power plant control systems, and the information and communications infrastructure necessary to manage the flow of electricity, Guyana will consider the advantages gained in the State of California. The country will also leverage opportunities available through international trade and cooperation with many foreign countries including Brazil, China, Germany, the Caribbean Community, USA, EU, Colombia, Mexico and Costa Rica.

In addition to monumental legislative reform, and the strengthening of existing agencies, measures are being taken by the Government of Guyana to establish a series of new institutions, including a department of energy and a petroleum directorate. The Guyana Geology and Mines Commission, which operates a petroleum division, is currently being restructured.

The transition away from fossil fuels will certainly be an unprecedented test of energy governance in Guyana. The GSDS is in progress and to realise its ambitious vision, the Government of Guyana is simultaneously pursuing integrated energy planning, the formulation of policies for energy conservation and efficiency and expanded and improved governance and institutional capacities.

The Government of Guyana has committed to the GSDS within the framework of its declared Sustainable Development Goals. A Green Guyana International Small Business Expo and Summit is scheduled to be held in October 2018 and the Government is expected to announce a small business green economy framework.

Energy efficiency and renewable energy requires strong financial support from the energy sector, adequate skills in energy system planning, as well as predictable and independent regulatory frameworks. All these tools can enable cost-recovery pricing, clear sector and market rules for new capability building, and system operations and distribution.

Energy governance impacts the environment and the communities within range of commercial operations. Many environmental disasters have been caused by poorly regulated extractive companies, like the pollution the world has seen in Zambia’s Kafue River to the deforestation of the Amazon. The Guyanese are faced with the dilemma of taking the environmental risks associated with oil and gas production and receiving a substantial increase in revenue. In this regard, good governance will also be put to the test.

One of the very important policies of the current Government of Guyana is linked to its leadership role in proactively and publicly promoting civil society’s engagement. The Constitution of Guyana guarantees Freedom of Expression, Freedom of the Press and Freedom of Assembly. The Government has been inviting all the citizens of the country to “hold the Government and all its officials accountable”.

Regional Perspectives
Guyana has pursued Extractive Industry Transparency Initiative (EITI) candidacy since May 2010. It took seven years for Guyana to complete the necessary steps and the country became an EITI Candidate country in 2017. The Guyana Extractive Industry Transparency Initiative (GYEITI) has a functioning multi-stakeholder group that is actively engaged in the EITI implementation processes. GYEITI has submitted its inaugural annual progress report, a beneficial ownership roadmap and is currently preparing the first ever Guyana EITI Reconciliation Report. Public awareness events are planned and are taking place in various regions. Capacity building activities have been organised for all stakeholders, the GYEITI has been engaging government agencies and companies and data and information are being collected and analysed as the EITI Report preparation intensifies.

The Government of Guyana publicly declared a clear intention to embark on a comprehensive anti-corruption program. This commendable approach hinges on the institutionalisation of transparency at all levels of government, in the private sector and in civil society. In addition to embracing the EITI Standard, the Cabinet of Ministers made a conscious decision to establish a Natural Resources Multi-Stakeholder Committee. This reinforces the GYEITI pillars by expanding the scope and reach of the levers of transparency and accountability in Guyana. These new elements of governance would require appropriate legal, regulatory and institutional frameworks in order to better achieve the desired objectives.

The provision of data and information by government agencies and companies should become the norm as the new governance environment demands greater citizen participation and public scrutiny. The government has begun drafting Bills, Policy Frameworks and organising country-wide public consultations.

The Government of Guyana has been consistently seeking innovative ways to build energy governance capacity. In 2017 a Draft Petroleum Commission Bill was prepared and widely discussed. This Bill seeks to establish and incorporate the Guyana Petroleum Commission. The functions, duties and responsibilities of the envisaged Petroleum Commission can be seen as cohesive aspects of a comprehensive energy governance policy. Public debates have been taking place on the Bill after which the feedback from citizens will be considered and a revised Bill is expected to be tabled in the National Assembly.

Resource wealth and how it is managed will make a crucial difference to the lives of all Guyanese. There is optimism that a well-governed resource wealth fund would certainly offer a path out of poverty. Strong institutions and policies, as well as greater transparency mechanisms are absolutely necessary to stifle corruption and reduce the chances of Guyana falling victim to the ‘resource curse’ and the ‘Dutch disease’. An additional effort by the Government of Guyana to managing future petroleum revenues is the establishment of a Sovereign Wealth Fund with internationally acceptable fiscal rules and legislative regime. In August 2018, the Government released a Green Paper on the Establishment of a Sovereign Wealth Fund. Again, the Public has been invited to participate in discussions and debates. This is expected to stimulate discussion on details of specific issues and recommend possible courses of action relevant to policy, legal, regulatory and institutional framework.

The Ministry of Natural Resources of Guyana in April 2017 published a working draft local content policy framework and invited civil society, companies and government personnel to participate in consultations. This is aimed at making the most of the country’s oil and gas resources and maximising benefits while retaining value through capacity development, local content and value addition. Guyanese businesses and employees continue to play an important role in ExxonMobil’s operations in the country. According to information available on ExxonMobil’s website, ExxonMobil and its project partners spent US$24 million with more than 300 local suppliers in 2017 and opened the Centre for Local Business Development in the capital city of Georgetown to promote the establishment and growth of small- and medium-sized local businesses. ExxonMobil’s priorities in Guyana are focused on enabling local workforce and supplier development and collaborating with government to support the growth and success of its economy, both in the energy and non-energy sectors.

The unequivocal announcement of an anti-corruption stance, coupled with the acceptance in internationally recognised transparency associations, solidify Guyana’s chosen path to good governance. The enactment of new, and the revision of existing, legislation together with the establishment of new, and the improvement of existing, institutions are characteristic of a viable governance structure.

At this time of rapid economic change, expectations must be effectively managed. The efficiency and productivity of labour, machinery and equipment must be emphasised as essential for sustainable economic and social benefits. The limitations of a short paper do not permit elaborate discussion, but I do hope we have stimulated the reader’s interest in some of the more important elements and aspects of the Guyana Sustainable Good Governance Charter during the country’s fascinating initial period of anticipated and unprecedented rapid growth and development.
# WPC Vision, Mission and Values

As a non-advocacy, non-political organisation the World Petroleum Council has accreditation from the United Nations as a non-governmental organisation and is registered as a charity under UK law. WPC is dedicated to the promotion of sustainable management and use of the world’s petroleum resources for the benefit for all. WPC conducts the triennial World Petroleum Congress, covering all aspects of the industry, including management of the industry and its social, economic and environmental impact.

## Vision

An enhanced understanding and image of the oil and gas sector’s contribution to sustainable development.

## Mission

The World Petroleum Council is the only organisation representing the global oil and gas community. WPC’s core value and purpose centres on sustaining and improving the lives of people around the world through:

- Enhanced understanding of issues and challenges
- Networking opportunities in global forums
- A neutral platform for dialogue with all stakeholders
- Cooperation and partnerships with other organisations
- An opportunity to showcase the industry and demonstrate best practice
- A forum for developing business opportunities
- Information dissemination via congresses, reports, special meetings and workshops
- Initiatives for recruiting and retaining expertise and skills to the industry
- Awareness of environmental issues, conservation of energy and sustainable solutions
- Engaging the next generation

## Key strategic areas

- **World Class Congress** to deliver a quality, premier oil and gas congress
- **Inter-congress activities** to organise forums for cooperation and other activities on specific topics; and to engage WPC members and all stakeholders
- **Cooperation with other stakeholders** to add value by cooperating with other organisations to seek synergies and promote best practice
- **Communication** to increase awareness of WPC’s activities and oil and gas operations, through enhanced communication, both internally and externally
- **Global representation** to attract and retain worldwide involvement in WPC
- **Youth and gender engagement** to increase the participation of young people and women in oil and gas issues, including a dedicated Committee for the development of active networking opportunities with young professionals
- **Legacy** to manage a central WPC legacy fund to benefit communities and individuals around the world based on WPC’s mission.

## The World Petroleum Congress

Every three years, the Council organises the World Petroleum Congress hosted by one of its member countries. The triennial Congress is also known as the “Olympics of the petroleum industry”. It covers all aspects of oil and gas from technological advances in conventional and unconventional upstream and downstream operations to the role of natural gas and marketing, management of the industry and its social, economic and environmental impact. The USA will be the host of the 23rd World Petroleum Congress in 2020 (www.23wpc2020.com).

## Benefits of joining the WPC

The benefits available to National Committees when they join the Council include:

- opportunities to host meetings of the Executive Committee, task forces, committees, events and, once fully established, a Congress
- discounts on Congress fees and copies of WPC publications
- regular information on WPC activities, task forces, meetings and briefings
- network with other National Committees, directly and through the Secretariat
- invitations to propose programme officers for congresses

The most significant benefit of joining the World Petroleum Council and Congress is to participate in the leading global institution representing the international and domestic oil and gas industries and to have an equal voice and vote in its deliberations and decisions.

For more information on the full benefits and how to join visit [www.world-petroleum.org](http://www.world-petroleum.org)
The world’s most prestigious oil and gas events

2018 - 2020

World Petroleum Council (WPC)

Schedule of Events

2nd WPC Leadership Conference
18-20 February 2019 | Renaissance Hotel, Mumbai, India

A global conference on industry leadership in responsible operations, international cooperation & sustainable solutions for the petroleum sector.

www.wpcleadership.com

6th WPC Youth Forum
23-28 June 2019 | St. Petersburg, Russia

A special Forum held every 3 years and led by WPC’s Young Professionals Committee, provides a platform for the next generation of the oil and gas sector to present their views alongside senior industry experts.

www.wpcyouthforum.org

WPC Downstream Conference
Integration, Strategy and Leadership
14-16 Oct 2019 | International Exhibition & Convention Centre, Manama, Bahrain

The Downstream Conference will focus on the global challenges facing this sector of our industry, considering the strategic leadership and changing business models needed for refining and petrochemicals.

www.world-petroleum.org

23rd World Petroleum Congress
6-10 December 2020
George R. Brown Convention Centre, Houston, USA

The triennial World Petroleum Congress is the largest international petroleum congress and attracts the highest level of industry and government leaders, including Heads of State and C-Suite from around the globe.

www.23wpc2020.com

For more information about any event, please contact
WPCSecretariat@world-petroleum.org