

OPEC bulletin

2-3/14

*Skyscrapers:
entering the era
of the mega tall*

Other OPEC flagship publications



Among OPEC's various objectives, one of them is to continually strive to provide oil market data and analysis to energy stakeholders and to the general public. It does this by publishing different monthly and annual publications, which consider many aspects of the global oil industry – with an emphasis on OPEC Member Countries. Two of the Organization's flagship publications are the **World Oil Outlook** and the **Annual Statistical Bulletin**. The 2013 editions can be downloaded free-of-charge from our website at: www.opec.org.

World oil demand just keeps on rising

Things are looking decidedly better. The global economic picture is slowly, but surely, improving. And, in tandem, world oil demand continues to grow.

It is very easy to take these facts for granted. But in the business OPEC is in, they are highly significant facts.

It seems like forever since we were basking in the limelight of strong economic growth. Actually, it is not that long; in the two years preceding the financial crisis in 2008, world GDP growth was comfortably over five per cent. We all know what has happened since then.

But the good news is that the economy appears to be now going in the right direction. As the March edition of the *OPEC Monthly Oil Market Report (MOMR)* observes: "The assumption that the global economy will see a gradual recovery in 2014, led by growth acceleration in the major OECD economies, remains valid." OPEC backs this comment with the forecast that last year's global GDP growth of 2.9 per cent will rise to 3.5 per cent in 2014.

"OECD economies will contribute most of the increase, with growth improving from 1.3 per cent in 2013 to 2.0 per cent in 2014," it notes. Importantly for OPEC and the oil sector in general, the improving global economy is also resulting in higher oil demand. Of course, many challenges remain, but there is every reason to be optimistic.

One month earlier, the February issue of the *MOMR* went into more detail about oil demand, reminding us that only twice in the past quarter of a century has annual oil demand not risen. That was in 2008 and 2009, at the time of the financial turmoil.

Going back even further to OPEC's birth in 1960, we find only six other occasions when annual demand fell – and five of those were in the troubled first half of the 1980s.

This strong positive trend is expected to con-

tinue in the future. OPEC's latest annual *World Oil Outlook* projects that demand will increase throughout the reference case period up to 2035.

Historically, annual average world oil demand has risen from 21.4 million barrels/day in 1960 to 62.9m, 76.5m and 89.9m b/d in 1980, 2000 and 2013, respectively. It is currently projected to average 91.0m b/d in 2014 and 108.5m b/d in 2035.

Taken together, this means that demand may eventually

turn out to have increased by around five times in the space of three-quarters of a century, from 1960 to 2035.

Moreover, it is not enough to note the absolute growth in demand. There is also the frequent need to replace depleted wells and old plant and equipment and to accommodate ever higher standards and tighter regulations.

Clearly, therefore, there will be plenty of challenges facing oil producers for years to come as they seek to meet this continually rising demand.

This is good news for the industry.

But it also underlines the responsibility of the industry to ensure that consumers continue to receive their oil in a timely and orderly manner in the future.

A stable oil market has been a central objective of OPEC since its establishment more than half a century ago. This objective has guided its decisions and actions over the years, ensuring that the market is well supplied with crude oil at fair and reasonable prices. It has benefited producers and consumers alike and supported world economic growth.

However, the achievement of market stability is a shared responsi-

bility among producers, consumers, oil companies, investors and other interested parties. They all benefit from market stability and so they should all contribute to it.

The big advances in dialogue and cooperation in recent years have provided important support for this.

Indeed, it is the recognition of this shared responsibility that lies behind these advances. OPEC has actively encouraged dialogue and cooperation, notably through such multilateral channels as the International Energy Forum, bilateral dialogues with the European Union, Russia and other leading stakeholders, and participation in countless conferences, seminars and other fora aimed at developing and enhancing the industry.

As the *World Oil Outlook* puts it: "OPEC continues to highly value the importance of a cooperative and coordinated approach to dialogue that is beneficial for market stability in both the short and the long terms, recognizing that security of demand and security of supply are two faces of the same coin." And this statement takes on added importance when we consider the big increases in world oil demand that are expected in the coming decades.



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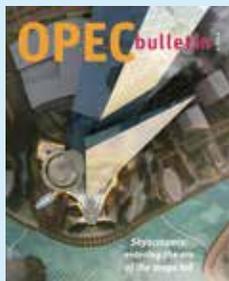


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Ghana facing commercial and practical challenges in realizing oil quest



Cover
This month's cover shows a rendering of the Kingdom Tower in Jeddah, Saudi Arabia, designed by architects Adrian Smith and Gordon Gill. When completed, the 167-floor tower will break a new world record as the first-ever building to reach one kilometre in height (see story on p40). Photo courtesy Jeddah Economic Company/ Adrian Smith + Gordon Gill Architecture.

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OPEC Membership and aims

OPEC is a permanent, intergovernmental Organization, established in Baghdad, on September 10–14, 1960, by IR Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. Its objective — to coordinate and unify petroleum policies among its Member Countries, in order to secure a steady income to the producing countries; an efficient, economic and regular supply of petroleum to consuming nations; and a fair return on capital to those investing in the petroleum industry. Today, the Organization comprises 12 Members: Qatar joined in 1961; Libya (1962); United Arab Emirates (Abu Dhabi, 1967); Algeria (1969); Nigeria (1971); Angola (2007). Ecuador joined OPEC in 1973, suspended its Membership in 1992, and rejoined in 2007. Gabon joined in 1975 and left in 1995. Indonesia joined in 1962 and suspended its Membership on December 31, 2008.

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The *OPEC Bulletin* welcomes original contributions on the technical, financial and environmental aspects of all stages of the energy industry, research reports and project descriptions with supporting illustrations and photographs.

Editorial policy

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OPEC Secretary General addresses MENA Conference in London

Price stability — a key component of the oil market's future welfare



*OPEC Secretary General, **Abdalla Salem El-Badri**, again attended the annual Middle East and North Africa (MENA) Conference at Chatham House in London, which this year addressed the key concerns for the region's energy producers under the theme 'New uncertainties and new opportunities'. In his customary keynote speech to the gathering, El-Badri spoke on the importance of oil prices to the future welfare of the global petroleum sector, stressing that stability was the key to the future success of all the industry's stakeholders.*

The price of crude is a central component of the global petroleum market and how oil prices evolve in the future “matters to every one of us”.

That was the view put forward by OPEC Secretary General, Abdalla Salem El-Badri, to the 2014 Middle East and North Africa Energy (MENA) Conference, in London at the end of January.

“Whether you are a consumer purchasing a petroleum product at the pump, or the refined products for your airlines, ships and trains; or whether you are a producer looking at oil investments and future prices, a stable and fair oil price is vital,” he said in a keynote address to the annual gathering, held at Chatham House.

“High oil prices, for example, are bad for consumers today and lead to situations that are bad for producers tomorrow. And low oil prices are bad for producers today and lead to situations that are bad for consumers tomorrow,” he said in his speech on ‘Gulf Region Scenarios’.

“Thus, as I have often said, extreme prices — either too high or too low — are not in the interests of either producers or consumers.”

El-Badri told delegates that given the long-term nature of the petroleum industry and the need for clarity and predictability, the essential component came in three words — stability, stability and stability.

“Stability for investments and expansion to flourish; stability for economies around the world to grow; and stability for producers, allowing them a fair return from the exploitation of their non-renewable natural resources,” he affirmed.

“And, of course, long-term price stability is a fundamental element to all of this,” he added.

El-Badri has become a familiar face at the MENA Conference, held at the prestigious Chatham House, formerly known as the Royal Institute of International Affairs.

This year’s two-day event had as its theme, ‘New uncertainties and new opportunities’ and addressed the key concerns for MENA energy producers, exploring how political, economic and market factors are reshaping the energy sector in the region and beyond.

Global market importance

The MENA region is considered crucial to meeting the world’s energy demand in the years ahead, but enduring political uncertainties and unfolding geopolitical changes pose a number of challenges for the oil and gas producers in the region.

According to notes on the Chatham House website, policymakers in the region must meet growing domestic demand for energy, whilst maintaining export prices to sustain national economic goals, as well as continue to foster opportunities for investment from international energy companies.

“The tilt in energy demand to Asian markets and competition from unconventional hydrocarbon production

represents shifts in the established global energy order; how producers in the MENA region adapt to these changes will be critical to their long-term economic health,” it commented.

El-Badri began his address by emphasizing the importance of the international petroleum sector.

He said the size, scope, and complexity of the global oil market made it almost unique among physical commodities.

Currently, he informed, more than 90 million barrels of oil were produced and consumed every day.

“Beyond the scale of this trade, the strategic importance of oil and the crucial role that it plays in the global economy make it a commodity like no other. It is the backbone of the global transportation sector and is used to develop and produce a vast array of everyday products.”

But El-Badri posed the question how could longer-term oil price fluctuations be managed?

“This is obviously an extremely important issue and one that requires the close attention of both producers and consumers,” he maintained.

The OPEC Secretary General said that he thought it was important to initially stress that past experience had shown that no one country or institution could set or control prices.

“However, it is crucial we better understand how the market can help realize a stable and fair oil price and eliminate excessive fluctuations. It means looking at the price from both the short- and long-term perspectives.

“Clearly there is always much focus on the ups and downs of the price on a daily, weekly and monthly basis.

“... it is crucial we better understand how the market can help realize a stable and fair oil price and eliminate excessive fluctuations.”

“... some price movements have not been driven by fundamentals ... they have been driven by market speculation.”

Short-term price fluctuations caused by such issues as geopolitics, supply disruptions, economic developments and weather are natural. They are expected. They are unavoidable. They are absolutely normal.

“However, it is important that we differentiate between such normal fluctuations and those that can be viewed as ‘extreme,’” he asserted.

El-Badri said that over the past decade, the petroleum sector had witnessed the increased financialization of oil markets. Oil had increasingly been treated as an individual asset class by financial investors. Speculative funds flowing into — and out of — the commodity futures markets, had exposed the physical oil market to financial market volatility.

Since 2005, he continued, the total open interest of the New York Mercantile Exchange (NYMEX) and London Intercontinental Exchange (ICE) futures and options had

increased sharply. And what had evolved was a close link between crude oil prices and speculative activity.

“This has meant that some price movements have not been driven by fundamentals or the normal ebbs and flows of the market. They have been driven by market speculation,” he explained.

El-Badri noted that this was starkly apparent back in 2008 when crude prices escalated from around \$90/barrel in January to a peak of over \$145/b in the middle of the year, before sinking to a low of around \$30/b in December.

“It is clear we cannot avoid speculation and volatility altogether. But extreme price fluctuations on this scale are clearly not conducive to the effective functioning of the market, particularly given the long-term nature of investments in our industry.”

El-Badri said that 2013 generally witnessed prices moving in the \$100–110/b range, a range that was acceptable to producers and consumers alike.

“Outages, supply disruptions and improved macro-economic indicators have driven price increases, while lower refinery appetite, production increases and generally higher inventories have weighed on prices,” he observed.

However, said the OPEC Secretary General, speculative activities continued to play a role and had widened both the upside and downside price movements. “That is why it is important to keep a watchful eye over speculative activities, particularly with the relaxed monetary policies seen in a number of major markets today.

“It is vital for the market to focus on actual market fundamentals and to continually look to mitigate extreme volatility and excessive speculation.”

El-Badri said that given the long-term nature of the oil industry, especially when looking at investments, one needed to also pay close attention to future years and what could be done to help provide more stability in the long-term price.

“Let me stress here that long-term oil prices and fluctuations cannot really be managed and that any price forecasts cannot be made with absolute certainty. No-one has the capacity to do this. There are always unknowns.

“What can be done, however, is to provide a strong framework for the future. And this begins with the short-term I have just mentioned.

“We need to continually work towards a balanced market between supply and demand — a market with adequate and flexible spare capacity and storage for both crude oil and refined products to counter any short-term turbulence.”

El-Badri said that looking at the market today OPEC believed that the fundamentals remained balanced. There was more than enough supply to meet demand. Spare capacity and stocks were at healthy levels. And prices were at comfortable levels for both producers and consumers.

“Stability and a balanced market today will be helpful in providing stability and a balanced market in the future.”

Need for reliable data

In addition, he said, there were evidently a number of other factors that could help to deliver a balanced market, with stable and fair prices, in the years ahead.

Providing some key points, the OPEC Secretary General said it was important to provide rational and impartial supply and demand forecasts.

“We need to continually strive for more reliable and

transparent data to help alleviate uncertainty and volatility. This can be done through dialogue between all stakeholders and through initiatives such as the Joint Organizations Data Initiative — or, as it is better known, JODI.”

El-Badri said that for oil producers, it was also critical to have a better understanding of demand side developments, particularly policies that might discriminate against oil.

“At the heart of this is security of demand. This is just as important to producers, as security of supply is to consumers,” he professed.

Committed to invest

“We need to remember that all investments require certain conditions. These can obviously vary, but in general, the focus for producers is on stability. Its absence can lead to investment uncertainty and, in turn, future market instability.”

El-Badri said that, to put it simply, producers did not want to waste precious financial resources now on infrastructure that might not be needed in the future. At the same time, however, if timely and adequate investments were not made, then future consumer needs might not be met.

“And, of course, both under- or over-investment can lead to future price fluctuations, with potential knock-on consequences. In this regard, and specifically in terms of lower prices, we need to think about the cost of the marginal barrel.”

El-Badri said that, given the complexities of the oil market, it was difficult to establish a single number that represented the marginal cost. But it was evident that the cost of some oil sands projects, tight oil plays, deepwater and Arctic fields were the most likely to represent the marginal cost.

“This raises the question: at what price levels would some of these projects become unworkable? It is clear that for some projects it may not be far below current price levels.”

El-Badri pointed out that it was in no one’s interest to have an industry where investments were ‘on, off, on off’, every time prices witnessed extreme fluctuations. It was wildly changing prices that could most affect investments — and do most damage to both producers and consumers.

“Let me stress here that OPEC Member Countries are committed to invest, and to ensure that consumers receive oil when they need it.”

He said these investments were important as OPEC expected to see the call on the Organization’s liquids increase by over 10 million b/d by 2035, which was greater than the expected increase in non-OPEC supply over the same period, at just under 9m b/d.

“However, as with any investments, they will obviously be influenced by various factors, such as the price of oil, as well as the overall economic situation and policies.”

El-Badri also highlighted one other issue that, he said, was often overlooked when talking about oil prices.

“This is the amount of taxes paid by end-consumers at the pump. In many cases, such as in a number of European Union countries and Japan, the amount of taxes paid is more than 50 per cent of the overall cost.

“It is thus clear that the taxation of oil products has the potential to significantly impact end-prices and accentuate price fluctuations for consumers,” he asserted.

El-Badri said it would be wrong for anyone to provide any guarantees to eliminate long-term price fluctuations. “All we can do is look at our forecasts and try to put the best framework in place to arrive at a future that works for us all. This requires producers and consumers to work together with innovative thinking, collaboration and swift action, where and when appropriate, on key issues. And it means further evolving data transparency and clarity and making sure that price extremes are kept in check,” he added.

Other OPEC-related officials attending the conference were Dr Hussain Al-Shahristani, Iraqi Deputy Prime Minister for Energy, along with Thamir Ghadhban, Chairman of the Advisory Commission to the Prime Minister of Iraq, in addition to Suhail Mohamed Al Mazrouei, Minister of Energy of the United Arab Emirates, Aldo Flores-Quiroga, Secretary General of the International Energy Forum, and Ali Hached, Senior Adviser to the Minister of Energy and Mines, Algeria. 

“Let me stress here that OPEC Member Countries are committed to invest, and to ensure that consumers receive oil when they need it.”

IEF hosts latest Symposium on Energy Outlooks

The International Energy Forum's headquarters in Riyadh, Saudi Arabia, once again played host to the IEF-OPEC-IEA Symposium on Energy Outlooks. The fourth incarnation of the event took place at the end of January. The OPEC Bulletin reports on some of the key issues discussed.



Assembled delegates of the three organizations meeting in Riyadh.

The International Energy Forum (IEF), the Organization of the Petroleum Exporting Countries (OPEC) and the International Energy Agency (IEA) held their Fourth Symposium on Energy Outlooks towards the end of January.

The annual event has become a regular part of the three organizations' dialogue and forms part of a wider joint programme of work agreed by the three entities and endorsed by energy ministers at the 12th IEF Ministerial Meeting in Cancun, Mexico, in March 2010. The agreement from those talks is known as the 'Cancun Declaration'.

The Riyadh Symposium facilitated the sharing of insights and the exchange of views about energy market trends and short-, medium-, and long-term energy outlooks. The main focus was on the most recent outlooks from the IEA and OPEC, specifically the key findings, and where differences in methodologies, definitions and numbers occur.

In addition, this year, for the first time, the talks also included a session of presentations from other industry stakeholders. Those presenting offered up their views on future trends in energy supply, demand, policies and technology developments.

This was followed by a session on the petrochemicals sector. The Symposium also welcomed representatives from the Gas Exporting Countries Forum (GECF), with its Secretary General, S M Hossein Adeli, leading its delegation.

Harmonization, but not uniformity

The importance of engagement and dialogue was highlighted in many comments from the opening remarks to the Symposium.

HRH Prince Abdulaziz Bin Salman Al-Saud, Assistant Minister, Ministry of Petroleum and Mineral Resources, Saudi Arabia, said the Kingdom has a great deal of enthusiasm for this annual event and its efforts to try and better harmonize outlooks.

He pointed out that uncertainties in the energy market "stress the importance of our collective engagement" as "history has told us that no-one can do it alone."

OPEC Secretary General, Abdalla Salem El-Badri, stressed that "the fact that we have gathered together every year since 2011 is recognition of this Symposium's value and its importance to furthering cooperation and dialogue."

He added that the Symposium has led to solid achievements in practical terms. "We have had the chance to improve our understanding of each other's outlooks. And we have also enhanced our efforts in the harmonization of definitions, regional groupings and data through

technical meetings between the organizations. These achievements will continue to further strengthen our collaboration.”

Antoine Halff, Head, Oil Industry and Markets Division, IEA, speaking on behalf of the IEA’s Executive Director, Maria van der Hoeven, reiterated that much progress has been made through the Symposium over the years and “we are now challenging each other to become smarter.”

He said it has become much more than just comparing numbers and definitions — it was also about brainstorming on various ideas and challenges.

The Secretary General of the IEF, Dr Aldo Flores-Quiroga, described what is going on as “an incremental process to promote collaboration.”

He said they need to determine “what subjects and issues we want to work on together” and then understand what is behind any differences and variances there might be. But he stressed that this is not about looking for uniformity.

It was a point expressed by a number of speakers, with El-Badri underlining the importance of the human element in determining viewpoints and making decisions.

The first session of the Symposium focused initially on the latest IEA and OPEC projections. The IEA’s presentations were made by Antoine Halff and Tomur Gül, both from the IEA’s Directorate of Global Energy Economics.

And from OPEC, presentations were made by Dr Hojatollah Ghanimi Fard, Head of the Petroleum Studies Department, and Oswaldo Tapia, Head of the Energy Studies Department.

This was then followed by some of the key findings from the Third Symposium on Energy Outlooks and developments since, as well as comments on a recent comparison of the two organizations’ outlooks.

Facilitating dialogue

The introductory paper to the Third Symposium, published in January 2013, identified various opportunities to enhance the comparability of the outlooks by facilitating dialogue between OPEC and the IEA. It was clear from those talking about what had happened over the past year that some advancement had been made.

Zack Henry, the IEF’s Director for Energy Dialogue, said that progress had been seen on a number of important issues, citing the cooperation and flexibility of both OPEC and the IEA.

Two examples of the progress, he said, were the IEA’s improved demand estimation strategies for China and

other non-OECD countries, and OPEC’s inclusion of non-commercial biomass in its figures, which makes its energy demand outlook more comparable with that of the IEA.

He added, however, that more work could still be done and this was reflected upon by Richard G Newell, Director, Duke University Energy Initiative, who helped the IEF prepare the report ‘A Comparison of Recent IEA and OPEC Outlooks’, in consultation with the two organizations.

Similarities and differences

Newell said the paper had identified many similarities and differences between the IEA and OPEC’s short-, medium- and long-term outlooks and that he personally has had “much fruitful dialogue with the IEA and OPEC.”

The report concluded that the purpose of the comparison was “neither to harmonize all, nor to eliminate all differences in perspectives” and stressed the importance of “a diversity of opinion”.

However, it did highlight a number of issues that warrant further discussion, including: bridging historical data differences, particularly in non-OECD demand and OPEC natural gas liquids and unconventional; advancing efforts to better harmonize liquids fuel supply categories; better understanding the challenges related to a uniform classification of country groupings; and looking to standardize unit conversion processes.

Some of these issues were discussed by experts from both OPEC and the IEA at a technical meeting the day after the Symposium.

Sessions two and three of the Symposium offered up some additional viewpoints, with the first of these seeing contributions to the energy outlook debate. Presentations were made by Repsol, Statoil, Shell and the Energy Research Institute of the Russian Academy of Sciences.

Their input was welcomed, with El-Badri stressing that “the different perspectives offered by these important stakeholders can only be enriching and beneficial.”

The third session focussed specifically on the petrochemicals sector, with discussion topics including supply and demand dynamics, the changing feedstock market, the impact of shale gas and regional competitiveness. Presentations were made by Total, Argus DeWitt and the Saudi Arabian Basic Industries Corporation (SABIC).

There was general agreement that the Symposium had once again been a success and that work between the organizations on better harmonizing energy outlooks would continue in the coming year.

The three organizations also have other joint events planned for 2014 — the Fourth Workshop on Interactions between Physical and Financial Energy Markets and the Second Symposium on Gas and Coal Market Outlooks.

In summing up, both OPEC and the IEA underscored the significance of the event in terms of the producer-consumer dialogue and the importance of coming together to discuss a variety of issues, particularly those where there is divergence.

This was supported by Flores-Quiroga, who saw room for more accomplishments in the years to come.





Abu Dhabi Sustainability Week goes from strength to strength

Energy supplies the “backbone” of global economic growth



Across the generations ... over 3,400 people attended the grand opening ceremony of ADSW 2014.



The United Arab Emirates (UAE) is committed to delivering energy supplies — both from new and traditional sources — as a fundamental pillar to ensuring global economic growth and security.

That was the message Sheikh Mohamed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces, had for delegates attending the opening ceremony of this year’s Abu Dhabi Sustainability Week (ADSW).

In inaugurating the 7th World Future Energy Summit (WFES) and the 2nd International Water Summit (IWS), which formed part of the week’s activities, he stressed that energy was the backbone of economic growth and played an even more important role in arid climates where water security was dependent on energy-intensive desalination.

“Without achieving long-term energy and water security, sustainable development cannot be achieved,” he was quoted as saying by the UAE news service, WAM.

Sheikh Mohamed commended the UAE renewable

energy company, Masdar, and its projects, for helping to extend the country's energy leadership and solidifying the UAE's strong position on the renewable energy map.

"The UAE will also continue to diversify its own energy sources, while advancing viable clean technologies, in an effort to improve energy security and achieve sustainable development," he affirmed.

Promoting sustainable development

The WAM report stressed that, through Masdar and global events like ADSW, Abu Dhabi had emerged as an international energy hub, promoting the adoption of sustainable development, renewable energy and raising awareness to the growing challenge of water scarcity.

ADSW 2014, which attracted some 30,000 people, several thousand more than last year, is now considered the Middle East's largest gathering focused on addressing the interconnected challenges affecting energy, water and sustainable development.

This year's opening ceremony specifically focused on Africa's energy challenges and how they restricted the continent's economic development.

Sheikh Mohamed, in his opening comments, emphasized Africa's tremendous opportunity to adopt sustainable development as a pathway to grow its economy, while protecting its natural resources.

WAM pointed out that the focus on sub-Saharan Africa's energy and economic challenges during the ADSW opening ceremony was aligned with the international agenda for 2014.

The United Nations Decade of Sustainable Energy for All, which was launched in January this year, calls on member states to ensure that universal access to more sustainable sources of energy become a priority for national policies.

The declaration also calls upon governments, companies and civil society to work together to achieve universal energy access, double the global energy efficiency rate and double the share of renewables in the global energy mix.

"With six of the ten fastest-growing economies of the past decade located in sub-Saharan Africa, the development opportunities in this region are tremendous," Dr Sultan Al Jaber, UAE Minister of State and Chief Executive Officer of Masdar, was quoted as saying.

"But these economies are also hampered by energy industries beset by high costs, poor reliability and often limited or no access to the grid," he noted.



Sheikh Mohamed bin Zayed Al Nahyan (c), Crown Prince of Abu Dhabi, during the opening ceremony.

Al Jaber maintained that providing safe, reliable and sustainable energy in sub-Saharan Africa and in developing countries across the world, "relies on our ability to rethink the energy sector."

He added: "Access to clean technologies will enable developing economies to 'leapfrog' the inefficient technologies of yesterday, allowing them to rapidly adopt and



Dr Sultan Al Jaber, UAE Minister of State and Chief Executive Officer of Masdar.



Ernest Bai Koroma, President of Sierra Leone.



Hailemariam Dessalegn, Prime Minister of the Federal Democratic Republic of Ethiopia.

scale the advanced technologies emerging on the market today. “These new industries will have the most opportunity for growth and the most impact in the developing world,” he professed.

However, continued Al Jaber, despite the continent’s growing stability, impressive macroeconomic statistics and growing middle class, more than 600 million Africans still lacked safe and reliable access to electricity.

The topic of Africa and its potential to utilize the latest

technologies to boost its economic standing was highlighted during a panel discussion that featured Macky Sall, President of Senegal, Ernest Bai Koroma, President of Sierra Leone, and Hailemariam Desalegn, Prime Minister of the Federal Democratic Republic of Ethiopia.

Sall told the panel that Africa was a continent that was moving and changing, blessed with a dynamic population and youth, and natural resources that were important to its future growth.

Sustainable energy mix

“Paradoxically, despite its potential, Africa suffers from drawbacks that hinder its swift development,” he explained. “Therefore, we need an energy mix that is sustainable for nations that do not produce oil, like Senegal,” he was quoted as saying.

In the case of Ethiopia, Desalegn said the country saw a huge global challenge coming from rising greenhouse gas emissions.

“Even though Africa contributes negligible emissions compared to the rest of the world, we have opted for a green climate friendly vision for our future,” he pointed out. “There is much potential in hydro, geothermal, and wind energy — resources that must be harvested, not only for Ethiopia, but for all of Africa,” he contended.

According to a report by the International Renewable Energy Agency (IRENA), sub-Saharan Africa will need an additional 250 gigawatts of electricity by 2030, in order to meet the demands of its growing population and economy.

It stated that solar energy possessed huge renewable energy potential throughout the continent, while wind power was as yet virtually untapped.

The lack of conventional energy infrastructure actually permitted African economies to invest in clean, safe and renewable sources of energy, bringing electricity to the continent cost-effectively and with minimal carbon emissions.

Stated Koroma: “Africa should not be defined by what happened in the past. We now have countries with governments committed to transparency and good governance.”

He said that, at the same time, Africa was going to be the place where clean energy technologies were going to scale and encourage sustainable development.

“That is why I believe conferences like these are welcome developments for continents like Africa to be a market,” he added.

Over the seven days of ADSW 2014, participants from over 170 countries had the opportunity to attend

more than 30 events, listening to decision-makers from government, industry, academia and civil society, who addressed some of the world's most urgent energy and sustainability challenges.

These included the economics of renewable energies, the effects of water scarcity, and the impact on the environment and natural resources of population growth.

Once again, the WFES, the world's foremost event dedicated to the advancement of renewable energy, energy efficiency and clean technology, was the centerpiece of ADSW 2014.

Hosted by Masdar, it comprised a three-day conference, which attracted around 125 speakers, and a substantial exhibition, with new and expanded features. More than 650 exhibiting companies showed and demonstrated their products and services.

Renewable energy

Since its inception in 2008, WFES has grown to become the leading discussion platform for renewable energy, clean technology and sustainability and is now considered the preeminent international event for government and industry decision-makers to find viable, sustainable solutions to the world's growing energy challenges.

Also hosted by Masdar at ADSW 2014 was the IWS, a global forum advocating water sustainability in arid regions. Delegates to this event addressed water scarcity, sustainable strategies and emerging water technologies in arid regions, the future challenges of water availability and the promotion of international collaboration on water governance to address the water-energy nexus.

In addition, Masdar launched the inaugural EcoWASTE exhibition, a specialized event for sustainable waste management and recycling in the Middle East.

Held in partnership with the TADWEER Centre of Waste Management, the exhibition covered the entire spectrum of solid waste management services, bringing together experts from both the public and private sectors to exchange know-how, network and do business in what is rapidly becoming a multi-billion dollar industry.

"EcoWASTE offers a unique platform for investment and partnerships in waste management and recycling and we are confident that this new exhibition will become a major platform for the commercial growth of sustainable waste management solutions," Naji El Haddad, Show Director for WFES, IWS and EcoWaste, was quoted as saying.



Macky Sall (r), President of Senegal, with Adnan Z Amin, Director-General, International Renewable Energy Agency (IRENA).

Also new at ADSW this year was a Renewable Energy Jobs Conference, hosted by IRENA, which looked at best practice on converting renewable energy investment into secure employment opportunities.

Another new venture was the first Blue Economy Summit, organized by the UAE Ministry of Foreign Affairs and the Republic of Seychelles. This focused attention on policy frameworks for the conservation of oceans and the sustainable development of ocean-linked communities.

In addition, ADSW 2014 held 'China Day' to celebrate China's recent membership of IRENA and mark the agency's growing status in the renewable energies sector, where it is encouraging greater collaboration in renewable energy projects in the Middle East and North Africa (MENA) region and international markets.

And outside the exhibitions halls, the Festival @ Masdar City took the sustainability message into the community, with food stands, market stalls and family entertainment promoting sustainable living to UAE residents.



Naji El Haddad, Show Director for World Future Energy Summit, International Water Summit and EcoWaste.

All images courtesy Reed Exhibitions Abu Dhabi.

MDTC capacity-building programme strengthened

Number of attendees doubles



Members of the OPEC Management welcoming participants to the MDTC are (l-r) Oswaldo Tapia, Head, Energy Studies Department; Dr Adedapo Odulaja, Head, Data Services Department; Dr Omar Abdul-Hamid, Director, Research Division; Asma Muttawa, General Legal Counsel and MDTC Task Force Head; Kamal Al-Dihan, Head, Human Resources Section; and Hassan Hafidh, Head, PR and Information Department.

The virtual doubling of the number of participants to OPEC's 14th Multi-Disciplinary Training Course (MDTC) speaks volumes about a key Secretariat human development programme.

"My impression is that it has been the best MDTC for the Organization," concurred MDTC Task Force Head, Asma Muttawa, who is the Secretariat's Legal Counsel.

"Not just because we had a high level of participants, but I think we have tailored the programme to ensure they are included and integrated into all aspects of the programme," she affirmed.

The number of participants rose to 45 from 24 last year, by far the highest number since the programme began. Causes for the jump in attendance include sending the invitations out before the end of the calendar year.

"It is the time when the national oil companies are

making their evaluations and making their training plans, and therefore we were able to capture the slot where the high performers are proposed for training for the next year," observed Mrs Muttawa.

"So our training programme became part of capacity-building for the national oil companies," she stated.

"It was quite a key factor and the fact we had a successful programme last year and to some extent the year before."

In addition, added Mrs Muttawa, the Secretariat's Academic Committee worked very hard to develop capacity-building programme guidelines, which reached Member Countries through their Governors, thus raising awareness of what the MDTC is about and the type of attendees sought.

The MDTC is meant to attract young, talented individuals with education and some experience to build on

the background they may have already acquired as professionals in the petroleum industry.

“This is definitely an outreach and networking session,” said Mrs Muttawa, adding that this year’s candidates were exactly what the Secretariat was looking for.

“We are trying to find the potential delegates who can serve both our Member Countries in their everyday work by understanding the oil market and the oil industry better, but at the same time be able to represent our Member Countries in international fora — whether it is OPEC or anything else — that their capacity be built to a level where they can be examples and representatives.”

Another change worth noting was the level of social interaction this year, added Mrs Muttawa. “This year we made sure we sort of had them surrounded for all the sessions, all the breakouts, all the lunch times and they were very, very, very involved.

“This shows in the attendance. We have never had a course where everybody attended every day.”

Deepen relationships with OPEC

Because, as Dr Omar Abdul-Hamid, Director of the OPEC Research Division, insinuated in his welcoming address, people are the core of OPEC’s success.

“Everyone involved in OPEC — from the Member Countries to the Secretariat — is working towards the same goal. Although our backgrounds may vary considerably, our discussions reflect respect for diversity and opinions,” he said.

Abdul-Hamid added that the MDTC provides an opportunity for participants to deepen their relationships with OPEC and with each other. It is part of OPEC’s mandate and common goal with such an interaction to share thoughts and experiences and to learn from each other, he stated.

“The oil industry is becoming more complex. It requires well-educated, communicative and forward-thinking individuals to meet the challenges of tomorrow. As future leaders of our industry, you will be required to be well-informed, inquisitive and creative,” he affirmed.

To this end, the MDTC is one of many programmes provided by the OPEC Secretariat in an ongoing effort to support human capacity-building for Member Countries.

The course shares with attendees the internal workings of the Secretariat, its mandate and goals. The participants received information on the type of support provided to Member Countries.

The MDTC also provides a platform to discuss market issues such as the world economy, short- and long-term

oil outlooks, supply and demand determinants, product markets and transportation and refinery developments.

In addition, the programme covers data collection and sharing, as well as modelling work, both of which are essential to outcomes.

Abdul-Hamid explained: “The world of oil is dynamic. It is primarily driven by the economy, technology and energy policies, but it is also influenced by many other factors, from speculation and geopolitical situations, to regional regulations and the weather. It is our prime responsibility to provide pertinent and reliable information and analysis on oil and energy markets to support decision-making in OPEC Member Countries.”

In order to do this, OPEC’s team of researchers and specialists follow market trends as they make projections about the future outlook, he stated. They continuously monitor oil and product market developments in the short term and develop modelling approaches and quantitative tools to support analysis. These are used particularly for medium- and long-term oil supply and demand forecasting, addressing key issues in the upstream and downstream operations.

Model-based studies are used in developing alternative scenarios, added Abdul-Hamid, with an emphasis on energy and related matters, keeping in mind energy policies. OPEC also contributes to the coordination of its Member Countries in international negotiations, such as those on climate change and sustainable development.

The MDTC agenda structure was adapted somewhat this year to better accommodate the subject matter, disclosed Mrs Muttawa. “We gave them light days, some days in which they can relax and have the afternoon off, and more very structured days when (they could) look at research division subjects (with) no interruption in subjects.”

For example, participants were given a full day to look at short-term topics with experts from the Secretariat’s Petroleum Studies Department (PSD), and a whole day to examine long-term issues with the Energy Studies Department (ESD).

“The feedback I got was very, very positive,” said Mrs Muttawa. “There wasn’t any confusion about what the topics were.”

She said that the highlight of the event was a role-play exercise which took place at the end, during the question-and-answer session with OPEC Secretary General, Abdalla Salem El-Badri.

“When we put them in the seats of their delegations before the Secretary General in the Conference room,



Above: A record number of participants from Member Countries attended the annual OPEC MDTC in 2014.

Below: As part of the course, participants also spend some time at OPEC's sister organization, the OPEC Fund for International Development (OFID).

they felt like OPEC Economic Commission Board (ECB) members. They felt like real technical people who can question the management, and we set up all the management there ... this is what it looks like for our technical meetings. They really felt like they could play the role.”

Mrs Muttawa added that the Secretary General found the questions excellent, probably the best he has received at an MDTC. “At the same time it was very relaxed ... that role playing in the end and that exercise was really effective this year. It made an impact.”

In response to a comment about the future status of OPEC at the Q&A session, the Secretary General answered: “We are facing a lot of challenges. But we are here, we will defend our interests. We have problems among Members, but at the end of the day we solve them and reach a conclusion for the benefit of all Member Countries. We are here to defend Member Countries.” He added: “We are here to help the young generation of all Member Countries.”

When one delegate asked about the main challenges facing the Organization, El-Badri said the list was very long, but he pointed out some main ones, including manpower and the environment.

“We are not training enough people — it is a problem with all oil companies. The old retire and there are not

enough of the new generation. We need to pay attention to this.”

El-Badri added later that one suggestion to combat the human resources issue is to have students “go to college with commitment”, meaning they have a guaranteed job at the end. A European Commission study suggested that, “governments and international oil companies should pay and have to have a commitment to universities, pay student expenses and guarantee a future,” he said.

OPEC’s market share

On the environment, he added that a lot of pressure has been put on fossil fuels as a whole, not only oil, as CO₂ contributors, and that OPEC defends its interests in international debate on the subject.

Asked whether OPEC can maintain its position in the market, El-Badri answered “yes”. He stated that OPEC’s global share was 53 per cent in 1970 and now it is at 31–32 per cent. However, the oil income in 2012 was \$1 trillion, or 53 per cent of the share.

“Most important is the income. We have to give up a share of the market, there are new things everywhere. The share may be down to 29–30 per cent in 2035. The



OFID/Alipour Jeydi



decline will not be much, but don't forget that the oil capability from Member Countries is declining. Until 2040 we are not in bad shape. We have huge reserves and can produce more, but we have to think of the price.

"I think OPEC has a great future still ... if we manage our resources right. Until 2035, oil will be a main source of energy, expanding to 2040. We still have a great share and great income."

At the same time, OPEC tells its Member Countries to look for other sources of income, stated El-Badri. "Don't depend only on oil until the end of the century ... one day oil will finish, be depleted. (Countries) should think of other sources of income."

On the question of how OPEC faces capacity production challenges, the Secretary General answered that, "we agreed as OPEC to produce 30m b/d of crude oil. We cannot leave the market short (due to problems that disrupt oil supply). Other countries have replaced this amount through good management."

He added that most OPEC Member Countries are investing and will have rising capacity.

"Iran has huge reserves and is investing. Libya is investing. There are problems now, but I am sure they will be solved. Iran has a huge reserve and very qualified

technical people ... I am sure that by the end of the year most of our problems will be solved."

After the Q&A, attendees received certificates from the Secretary General for the successful completion of the course and took part in a group photo.

The smooth running of the MDTC this year was in no small part due to cooperation within the Secretariat, concluded Mrs Muttawa. "I think this is a programme where, in its 14th year, is very well established. People know pretty much what is expected of them and there was no hesitancy. It was very straightforward and very cooperative."

The overall evaluation from the students was also positive, with much praise and thanks at the final Q&A session, along with comments such as: "I learned a lot about the history of OPEC."

And for next time?

"We need more budget," maintained Mrs Muttawa. "We are attracting higher numbers of participants. We are delivering a very high-level programme with the best expertise in the industry."

She added: "Traditionally we were receiving 23–27 participants a year. Now we are receiving 46 and we aim to achieve up to the maximum of 60."

Below: All participants and OPEC officials assemble for a group photograph with OPEC Secretary General, Abdalla Salem El-Badri.



OPEC launches research lecture series at Secretariat

By Scott Laury



Dr Omar S Abdul-Hamid, Director of OPEC's Research Division.



Professor Ken Koyama, Managing Director and Chief Economist of the Institute of Energy Economics (IEE), Japan.

OPEC launched a new lecture series in February marked by an insightful presentation by Professor Ken Koyama, Managing Director and Chief Economist of the Institute of Energy Economics (IEE) in Japan.

The presentation, entitled '*A Japanese View on the World Energy Future*', was delivered to officials and staff at the Organization's Secretariat in Vienna.

Dr Omar S Abdul-Hamid, Director of OPEC's Research Division, opened the event by welcoming the guest speaker and audience to the Secretariat. He explained that this was the first in a series of research lectures in which international experts will be invited to the Secretariat to share information and provide their perspectives on energy-related themes.

In his welcoming remarks, Dr Abdul-Hamid mentioned that Professor Koyama had been to the Secretariat on several occasions in the past, and that this was a perfect opportunity to welcome him back again. He then provided an overview of the Professor's career and education before turning the floor over to him.

Before beginning his lecture, Koyama thanked Dr Abdul-Hamid for his introduction and expressed his gratitude to OPEC for inviting him back again to speak at the Secretariat. He also added that he was pleased to see some familiar faces from previous visits.

In his presentation, three main areas were covered: the growing importance of the Asian market; the

impact of the shale revolution; and an update on the status of Japan's energy policy debate.

The lecture began with the subject of Asia's increasingly important position in the world's energy markets. It was stated that Asia will continue to experience healthy economic growth in the years to come, making it a very important market for energy.

Energy consumption

According to IEEJ's Asia/World Energy Outlook 2013, Asian energy consumption in 2040 will increase 1.8 fold from the present level, and non-OECD countries will experience 90 per cent of global energy consumption growth between 2011 and 2040. As far as world oil demand goes, IEEJ projects Asia's share of that demand will increase from 32 per cent in 2011 to 41 per cent in 2040, and that approximately 65 per cent of global oil demand growth will be seen in Asia.

The speaker added, however, that this trend would most likely come with various risks that would have to be monitored and addressed when appropriate.

The next theme covered was the 'shale revolution', a term Koyama used to describe the current boom in production of tight oil and shale gas taking place in the United States.

He stated that this development is already influencing the global energy landscape and that further enhancement of these unconventional resources around the world could lead to real changes in energy supply and demand, as well as in trade and the political economy.

Right energy mix

The final topic presented was the current energy debate going on in Japan. In the aftermath of the country's tsunami-triggered nuclear meltdown in 2011, Koyama suggested that a comprehensive review of the country's energy policy and its strategy to address greenhouse gas emissions was necessary.

The top priority currently, he added, is the stabilization of the Fukushima Daiichi complex, and that achieving the right energy mix would be critical to the future of Japan's economy, environment and energy security.

The lecture concluded with a question and answer session and concluding remarks by Dr Abdul-Hamid, in which he thanked Koyama for his engaging presentation and invited him for a return visit to the Secretariat in the future. 



Professor Ken Koyama

Professor Ken Koyama has been with IEEJ since 1986, when he joined the organization as an economist in the Oil Group.

Since then, he has held many senior positions, including Head of the World Oil and Energy Group, General Manager of the Energy Strategy Department and Director of the Strategy and Industry Research Unit. In addition to his current position as Chief Economist and Managing Director, Koyama teaches at the Graduate School of Public Policy at the University of Tokyo.

He holds a Bachelor's and Master's degree in Economics from Waseda University in Tokyo, as well as a PhD from the University of Dundee in Scotland.

He has published a variety of material on the subject of energy economics and the world oil and gas markets.

Some of his latest work includes a research paper entitled '*Japan's Post-Fukushima Energy Challenges*' from December 2013 and a chapter entitled '*Energy Problems in Emerging Asia*' published by the Energy Forum last year. 

Ghana facing commercial and practical challenges in realizing oil quest

Indigenizing the prize



The Eirik Raude semi-submersible rig operating in Ghana's Jubilee field.

With Ghana pinning its oil development hopes on the promising Jubilee field, as well as the new nearby TEN fields, implementation of the country's ambitious local content laws are imminent. But this has implications for current and potential petroleum operators in the country. The OPEC Bulletin looks at some of the most important issues.

It is a transformational sum: \$20 billion in revenue from Ghana's fledging oil industry could be generated within the next five years, according to the West African nation's Minister of Energy and Petroleum, Emmanuel Armah Kofi Buah. But how can that be spent within the country, rather than being fluttered away overseas?

The answer is Ghana's local content law, which was passed in November 2013, and slated to come into effect three months later so that Ghanaians can reap the financial, employment, and operational benefits of this lucrative sector.

And a major consideration is whether there can be any flexibility in its implementation considering the striking commercial and practical challenges.

Ghanaian companies will have first preference when bidding for petroleum licences under the new law and local companies can secure a minimum five per cent equity stake in every oil contract granted to foreign investors.

But critics have questioned whether there can be equitable allocation to indigenous companies if the government is involved in awarding it. It is highly likely that this would be the rich and the connected.

By 2012, only 840 Ghanaians were appointed roles in the industry, despite there being 1,500 jobs, according to Ghana's Energy and Petroleum Ministry. The new legislation aims to create jobs and strengthen local industry, but it will not be easy to implement considering its ambitious target of seeing 90 per cent local participation in the oil sector by 2020, the lack of experienced Ghanaian nationals to participate, as well as training up small and medium enterprises (SMEs) to meet the high standards required by operators.

Ghana's Energy and Petroleum Ministry has brought some oil companies together to establish the Enterprise

Development Centre to equip local SMEs with the appropriate training to satisfy their demands.

New risks

Although the spirit of local content legislation is understandable, there are considerable risks for prospective investors who need to rely upon local governments or regulators.

"In high-risk jurisdictions, the sometimes blurred lines between government and business and the need for regulatory or government approvals often leads investors to seek out influential partners," said Matthew Clark, an associate at law firm, Norton Rose Fulbright.

"The latent and associated risk is that the partner may engage in unlawful or corrupt activities, in order to obtain a benefit perceived to be of mutual interest."

Operators need to be wary of breaching international legislation with extra-territorial reach, such as the United States Foreign Corrupt Practices Act, the United Kingdom Bribery Act, or the South African Prevention and Combatting of Corrupt Activities Act.

Operators are also hesitant about the tight timetable — they were given just 90 days to prepare detailed plans on how they will meet local content requirements, including significantly raising the number of employed Ghanaians.

They have cautioned that local content policy could prevent the growth of the oil industry, making it unlikely the government will reach its output target of 250,000 barrels/day by 2021 as it would be harder to convince investors to bring the necessary foreign capital, technology, and expertise. One potential knock-on effect would be escalated costs and delays.

Production headaches

“We understand that promoting local content has a positive social impact, as well as being a responsible business practice which enhances bottom line and reputation,” said President and General Manager of Tullow Ghana, Dai Jones.

First oil from the country’s Jubilee field, which holds over one billion barrels of crude, happened in 2010. The Jubilee partners, where Tullow is the operator, have built a \$3.5 million technical training centre at the Takoradi polytechnic in the Western Region to bring Ghanaians into the oil business.

Jubilee is an exciting asset as the government plans to use oil revenues to transform the economy and offer new skills and opportunities to its citizens — thereby expectations about its production profile are high and it is unsurprising that there is so much debate about how Ghana’s energy policy should evolve to meet the multitude of interests of different stakeholders.

Speaking to 241 key stakeholders, comprising members of parliament, regulators, community representatives, environmental groups and employees in 2012, Tullow found that local employment and development of local suppliers had not matched the hopes of the government, local businesses and the citizens of Ghana.

“It is clear from this that we need to ensure we manage expectations as to the size and timing of these opportunities in the lifecycle of an oil project,” the company admitted.

Risks in maintaining and optimizing the local supply chain become particularly prominent when things do not go quite to plan. Jubilee’s production has been flaky, due to technical problems with the wells which have now been fixed and gas export issues which are still ongoing.

According to Jubilee partner, Kosmos Energy, the field delivered over 87m b of oil at year-end 2013.

Tullow Oil, the parent company of Tullow Ghana, said that in 2014 the field will produce, on average, 100,000 b/d. This is lower than its initial target of 120,000 b/d as the onshore Atuabo plant, which is to process 150 million standard cubic feet/day of associated gas has fallen far behind schedule from a January 2013 start-up to May 2014. This has resulted in the Jubilee consortium re-injecting gas into the field.

The Ghanaian government and Tullow are exploring other gas disposal alternatives, including limited flaring, which will enable the field to average 100,000 b/d in 2014. This year, additional infill wells and subsea

infrastructure are scheduled to boost recovery and maintain plateau production levels, but this cannot happen until gas exports start.

Controversy

Kojo Agbenor-Efunam, Deputy Director of Oil at the Environmental Protection Agency, said the reservoir had reached unsafe levels for gas to still be re-injected. But flaring is a controversial option as there is a zero gas-flaring policy: flaring is only permitted in emergency circumstances under the country’s Petroleum Law.

The questions are how much the consortium should be fined and for how long the flaring would continue — considering the environmental harm it causes. Around 40m cf/d is estimated will be flared until the plant opens.

Residents living within the oil production vicinity are troubled about how it would affect their health and vegetation — pointing to the gas-flaring problems in the Niger Delta.

“The real constraint is not the reservoir, it is the gas export scheme,” said Paul MacDade, Chief Operating Officer at Tullow. “We do not have the gas export facility to push the gas onshore, so we are injecting it and that is really our bottleneck at the moment.”

Another option on the table is to reduce output from Jubilee, but this has financial implications for the government and the oil companies.

Dutch disease

Economists are warning that Dutch disease is looming in Ghana’s economy in the light of oil revenues from Jubilee, thereby jeopardizing investment in non-oil sectors and leading to their contraction. Ghana is a leading exporter of cocoa and gold.

In October last year, Mohammed Amin Adam, Executive Director at the Africa Centre for Energy Policy (ACEP), an African energy policy think-tank, highlighted that Ghana’s oil and gas sector, which had low linkages with the economy, had outpaced cocoa as the second largest export.

ACEP said oil exports reached a value of \$2.8bn, due to increasing production, compared with \$1.4bn from cocoa, attributable to declining global commodity prices, adding: “We strongly believe the effects of the Dutch disease cannot be discounted.”

Senior Economist at the Institute of Economic Affairs, Dr J K Kwakye, has called upon the Ghanaian government

to prevent the deterioration of other sectors of the national economy.

“Let us spread our economic growth from the oil sector to the non-oil sector because that is the area where we will be able to generate more employment for the people,” he observed

TEN project

Outside of the Jubilee oil field that drew investors’ attention to the new play within the West African Transform Margin, the other huge development project comprises the deepwater Tweneboa-Enyenra-Ntomme (TEN) fields, which lie 20 km west of Jubilee. With estimated recoverable reserves of 245m b of oil and 365bn cu ft of gas, development drilling started earlier this year with the Nt-04 and En-01 water injection wells.

In 2014, Tullow expects to spend \$500–600m on TEN developments. Discovered in 2009, TEN demonstrates how quickly Ghana is monetizing its oil resources as an initial 80,000 b/d is scheduled to begin in 2016 via 24 development wells connected to a Floating, Production, Storage, and Offloading (FPSO) vessel moored in 1,500 metres of water.

Conversion of the Centennial Jewel trading tanker into the FPSO is underway at the Jurong Shipyard in Singapore.

Local content for TEN will be through expanding local capability and participation in the supply chain, particularly through the in-country fabrication requirement of the TEN Project.

TEN represents significant future value for operator Tullow Oil, explained Aidan Heavey, the company’s Chief Executive Officer.

“There are 214m b of oil equivalent of net high value reserves and resources booked. Upside potential still remains.”

TEN sale

The TEN fields are within the Deepwater Tano licence, which spans more than 800 sq km. The TEN consortium comprises Tullow Oil, Kosmos Energy (17 per cent), Anadarko Petroleum (17 per cent), Sabre Oil & Gas Holdings Ltd, a subsidiary of Petro SA (3.825 per cent), and the Ghana National Petroleum Corporation (15 per cent).

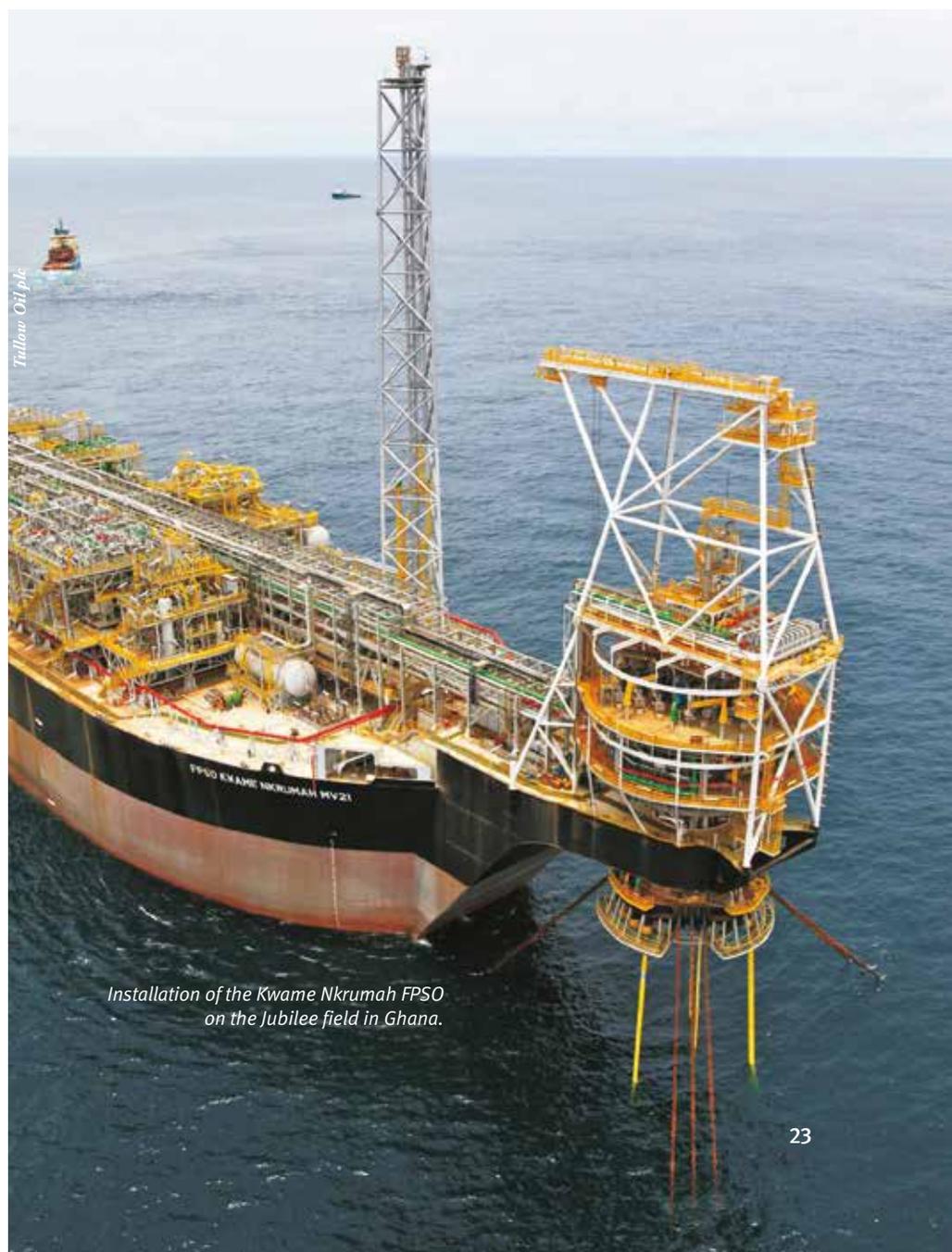
This structure could change as Tullow is considering bids from prospective buyers that wish to purchase part of its 47.15 per cent stake in the \$4.9bn project. Companies rumoured to be interested are Itochu Corporation and

Mitsui & Company Ltd and the sale could deliver around \$600m, according to reports.

Any new entrant would be compelled to use local businesses and contribute to social development. This will require delivering skills training and apprenticeships, but perhaps most importantly helping local suppliers find the financial resources to effectively compete, as well as ensuring international suppliers utilize indigenous businesses.

“What we lack is capital, technical skills and expertise. We need to develop all three and education is key to that,” said the Ghana National Petroleum Corporation.

Productive partnerships between the industry and government are necessary to avoid that all-too-familiar problem of natural resources no longer being a blessing, but a curse.



Installation of the Kwame Nkrumah FPSO on the Jubilee field in Ghana.

Oil drilling hits 30-year high amid busy licensing round activity

Global oil and gas drilling outside North America in 2014 has reached its highest level in three decades, with OPEC Member Countries leading the way.

According to the international oil field services company, Baker Hughes, the majority of the large exploration and production programmes are centred around the Middle East and Africa.

Quoted by *Reuters*, the firm disclosed that more than 1,300 drilling rigs have been operational over the last half year, which is the largest number since 1983.

It noted that the current number of rigs was 20 per cent higher than in 2008 and has more than doubled since 1999.

The Middle East is leading the heightened activity, where the number of rigs operating now has tripled since 1999. In Africa, the centre of much activity in recent years, the rig count is up almost four-fold since 1999.

Rigs in operation

Baker Hughes data shows that, in the Middle East alone, more than 400 onshore and offshore rigs were engaged in drilling operations in December and January, the largest number since the 1970s.

Looking at OPEC Member Countries in the region, the report stated that, over the last six months, Saudi Arabia had more than 90 rigs in operation, compared with less than 20 rigs in 1999.

Kuwait, which has embarked on a programme to boost its oil production capacity over the next few years, was seen to have more than 30 rigs in operation, three times as many as at the turn of the century.

And Iraq, which is recovering strongly from years of unrest and restrained oil production, has more than

90 rigs active. This compared with no activity at all in 1999, when the country was still under United Nations sanctions.

Meanwhile, in Africa, activity is being led by two other OPEC Members — Algeria and Angola. The former has around 50 rigs in operation, while Angola, which is making a strong recovery after years of crippling civil war, has 13 offshore rigs working. In both cases, drilling activity has tripled over the last 15 years.

Mature producers

These five OPEC Member Countries, which are regarded as very mature producers with large conventional oil and gas fields, are together accounting for some 30 per cent of the increase in oil and gas drilling outside North America since 1999.

It has to be noted that rig counts reported by Baker Hughes do not include onshore China, Russia, the Caspian and certain other countries.

The *Reuters* report points out that the drilling activity boom is a welcome development for the global petroleum sector, given the recent production losses from such countries as Iran, Libya, Syria and South Sudan for varying reasons.

Despite these disruptions, exploration and production activity is seen to be rising strongly in some of the oil industry's most traditional areas and the underlying production potential has expanded significantly in the past three years as a result of increased investment.

The report noted that the prevailing high crude oil prices made investment more accessible, especially in recent years for the development of unconventional oil, such as shale oil and gas, which has transformed the fortunes of North America.

But the higher prices were also supporting the development of conventional reservoirs that required more geologically demanding and expensive technology to reach otherwise inaccessible oil and gas resources.

The report noted that since the summer of 2013, most major integrated oil and gas producers had announced reductions in their capital expenditure programmes. However, the reduced expenditure was likely to be mostly in megaprojects costing \$1 billion or more.

It stressed that technologically straightforward conventional plays in the Middle East and onshore Africa were likely to be unaffected. It forecast that, barring any unforeseen circumstances, global oil and gas output should remain healthy for the next two to three years.

Meanwhile, according to a report from Energy Intelligence Research & Advisory's Country Risk Evolution (CRE) service, more than 40 international oil licensing rounds are either open or scheduled to be held by the end of 2014.

The report revealed that five of the countries involved in licensing activity — Algeria, Angola, Cameroon, Argentina and the United Kingdom — were considered very positive due to their experience in previous bidding rounds and the negotiation process.

It noted that Algeria had entered into its fourth international bidding round, in the hope of boosting years of lagging interest in its upstream sector. The country was offering 31 blocks across multiple basins, including the Tindouf, Timimoun and Reggane basins in the west and southwest, and Illizi and Berkine in the east.

And following a presidential decree issued late last year, Angola is due to launch a licensing round this year involving 15 onshore blocks in the Kwanza and Lower Congo basins. Five of these blocks will be allocated to the national oil company, Sonangol, while the remaining ten blocks will go to international bidders.

In Cameroon, four blocks — three onshore and one offshore — were announced in a tender issued in January. Under the government's regulations, the national oil company, SNH, is able to take an equity stake in the blocks. It already holds a 20 per cent interest in several of the country's producing fields.

Argentina is set to launch a bidding round in March, centred on the Vaca Muerta shale formation in Neuquen province. The round will give existing interested parties, including ExxonMobil, Chevron, Wintershall, Apache, and Americas Petrogas, the chance to expand their shale activities.

UK licensing round

Meanwhile, the UK, which is fighting to correct years of decline in its petroleum output and operations, launched its 28th Seaward Licensing Round in January, which involves blocks in the northern, central and southern North Sea areas, as well as an area west of the Hebrides. Areas to the west, south and southwest of England are also included.

The CRE report also noted that bid rounds in other frontier countries included Guinea, Lebanon and Liberia, where access to unexplored areas was on offer. But these possible concessions also came with a lot of risk.



Kuwait's oil sector forecast to expand by four per cent in 2014

Kuwait's efforts to develop its heavy oil capacity form a vital part of the country's plan to increase its overall crude oil output capability in the next several years, according to a report by the Kuwait Finance House (KFH).

Quoted by the Kuwait news agency, *Kuna*, it said that the country's overall plan entailed boosting total oil production capacity to 4.0 million barrels/day by 2020 from current output of around 3.0m b/d.

But with the heavy oil operations, some 60,000 b/d of extra capacity will be added by 2017 through the Ratqa engineering, procurement and construction tender, which represents the first phase of such developments.

The scheme will entail the construction of the production facility, as well as pipelines, steam-generation facilities and an oil export facility.

The report noted that the second phase was slated to up production by an additional 120,000 b/d by 2020 and 270,000 b/d by 2030.

Around 260 wells are planned to be drilled in fiscal 2013–14 as part of plans to drill around 1,500 wells in the first phase of the project, said the report.

It pointed out that Kuwait's oil sector, which would remain a vital driver of the country's economic growth, was expected to expand by four per cent in 2014.

It noted that as the world's eighth-largest oil producer and accounting for over three per cent of global production, oil income comprised over 90 per cent of the country's budget revenue and domestic merchandise exports.

Proven oil reserves

The report stated that the country was also home to the seventh-largest proven oil reserves in the world at 101.5 billion barrels, while a further 5bn b was located in the Neutral Zone field shared with fellow OPEC Member, Saudi Arabia.

It said that as a Founder Member of OPEC, Kuwait was the world's 10th largest oil producer in 2012 and despite having the second-smallest land area among OPEC Member Countries, it exported the third-largest volume of oil.

The report quoted comments by the United States Energy Information Administration (EIA) as predicting that Kuwait would remain as one of the world's top oil producers as the country pushed towards a production capacity target of 4m b/d by 2020.

It disclosed that in December 2013, Kuwait's oil production dropped slightly to 2.90m b/d – the third straight month of being below 3m b/d. However, output still remained higher than in the previous year when the production average stood at 2.79m b/d.

"The slight drop in Kuwait's oil production is in line with the slowdown in OPEC's recent oil output," it explained.

According to OPEC's *Monthly Oil Market Report* for January, the Organization's total oil production in December stood at 29.44m b/d, the lowest monthly figure for some considerable time and well below the 30m b/d targeted by the Organization under its policy agreement.

Kuwait City by night.



Saudi Arabia's solar power plans heating up

Saudi Arabia's plans to move ahead with a switch to 100 per cent clean energy are starting to heat up.

An agreement signed at the beginning of February with a leading solar technology manufacturer will see the Kingdom jointly fund a feasibility study for the establishment of a vertically integrated solar panel factory.

The proposed project —which would see production start in 2017 — would process polysilicon into wafers, then turn them into cells and modules using technology from agreement partner Belmont's SunEdison Inc.

The cost of the scheme is estimated to be \$6.4 billion. The size of the project is impressive — initial output is planned to be three gigawatts of electricity annually, approximately equal to that of three nuclear reactors.



Growth of solar energy

The agreement has been signed with the OPEC Member Country's public investment fund and government-owned Sanabil investments, and supports growth of solar energy in the Kingdom, an aim strongly backed by the government.

If all goes as planned, the plant would be located in the Kingdom's northern region — at Wa'ad Al Shammal.

The Ministry of Petroleum and Mineral Resources has already agreed to supply the plant with natural gas, while the country's electrical utility will provide power.

"We anticipate substantial growth of solar PV within the Kingdom and the region," said Ahmad Chatila, Chief Executive Officer of SunEdison, in a statement. "This project will support that growth, and the growth aspirations of SunEdison and our Saudi partners."

This is in line with statements from the beginning of October 2013, when Prince Turki Al Faisal Al Saud, one of the Kingdom's top spokesmen, told the Global Economic Symposium that the country, one of OPEC's Founder

Members, had plans to become 100 per cent powered by renewable and low-carbon forms of energy.

He admitted that this could take some time, but he hoped to see this change by the end of his lifetime.

Meanwhile, the Saudi government has set a goal of providing one-third of the country's electricity from renewable resources by 2032.

If the Kingdom can reduce its reliance on fossil fuels — one half of its electricity is still produced by burning oil — it could free up more oil for export. The move towards alternative energy is also part of the plan to diversify the Gulf country's economy.

Saudi Arabia has plans to spend billions of dollars over the next two decades to install more than 50 GW of renewable power at home, according to the United States Department of Energy's National Renewable Energy Laboratory, which is working together with the Kingdom.

Much of this will be concentrated in solar generating capacity and would represent more GW of renewable energy than the amount that was installed in the entire world as of 2012.



China's crude oil imports set new record this year

China's domestic crude oil consumption growth, which reportedly slumped to 22-year lows last year, is seemingly revitalizing if import figures for the first two months of 2014 are anything to go by.

According to data released by the country's General Administration of Customs, China's combined crude oil imports for January and February surged by 11.5 per cent over 2013 levels to reach 6.36 million barrels/day.

The customs office gave combined data for the two months, due to the Chinese New Year holidays, which were celebrated at the end of January.

in the country — the 200,000 b/d PetroChina Sichuan plant and the 240,000 b/d Sinochem Quanzhou facility — also boosted import requirements. Other supplies were also reported to have gone into storage.

Implied oil demand

The *Reuters* news agency calculated that implied oil demand in China rose by just 1.6 per cent in 2013, or 150,000 b/d, the lowest expansion in over two decades. This was logged against a background of lower economic growth, which affected the consumption of transportation and industrial fuels.

China's crude oil imports last year increased by just four per cent, lower than the 6.8 per cent rise seen in 2012.

China is now the world's largest importer of crude oil. It took over that mantle from the United States in September last year and is set to continue in that position for some years, while North American shale oil output continues to surge.

With oil imports set to remain high, the country is keen to boost domestic production of crude.

The China National Offshore Oil Corporation (CNOOC) is looking to boost domestic oil production by around 4.3 per cent in 2014. This forms part of a development programme that aims to see annual growth of 6–10 per cent recorded over the five year period 2011–15.

To support this goal, the company is looking to the development of around 30 projects, with capital spending increasing to almost \$20 billion in 2014.

"The company expects such capital expenditure will strongly support its production and reserve growth in the future," CNOOC was quoted as saying in a comment on its 2014 strategy.

The company's 4.3 per cent growth in 2014 would translate into around 967,000 million b/d of oil equivalent.

CNOOC has announced that it intends to drill some 155 exploration wells this year, higher than the estimated 132 wells worked on in 2013.



The busy streets of Beijing — a growing source of domestic oil demand.

Oil import activity is customarily high ahead of the annual celebration and 2014 proved to be no exception with data showing that 6.66m b/d of crude was acquired by the country in January alone — a record high.

The January oil import figure was 5.1 per cent more than the previous record of 6.31m b/d, set in December 2013.

Reports noted that the start-up of two new refineries

India set to launch first strategic crude storage unit

In a move that follows its fellow Asian oil importers, India is planning to launch its first strategic crude oil storage facility in August.

The unit, to be located in southern Andhra Pradesh, will have the capacity to hold 1.33 million tons, or 9.75 million barrels, of crude oil.

Rajan Pillai, Chief Executive Officer of India Strategic Petroleum Reserves (ISPRL), was quoted by the *International Oil Daily* as saying that the move was aimed at boosting the South Asian nation's oil import requirements.

Cushion against disruptions

India, which is the world's fourth-largest energy consumer, is striving to set up a reserve that, by 2020, will give the country 90 days' cover of crude oil imports and thus provide a cushion against supply disruptions and extreme price volatility.

ISPRL has been mandated by the government to set up the storage units and oversee their replenishment and any release of stocks.

The full programme entails plans to commission a total capacity of 5.3 million tons (38.85 million barrels) at three locations — Visakhapatnam in Andhra Pradesh, and Padur and Mangalore in southern Karnataka state.

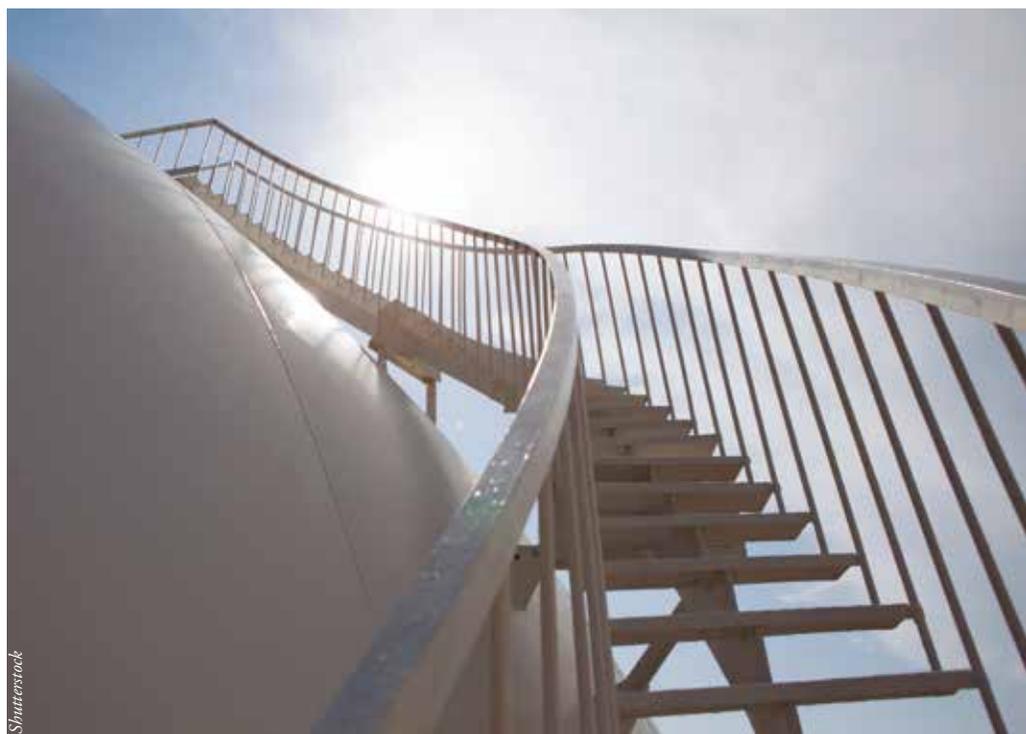
The project is already late in coming, due to delays in selecting suitable storage sites, while budget costs have also spiraled.

Following a request from parliament, India's oil ministry has been looking at using underground storage caverns, as well as utilizing floating barges, or identifying proven and extractable oil wells and declaring them as strategic reserves.

The ministry told parliament in February that the cost of constructing caverns in India would be lower than that in other overseas markets, while pointing out that floating barges would leave the country open to external threats.

The government has since estimated that it will cost 234.77 billion rupees (\$3.77bn) to fill the caverns.

Pillai was quoted as saying that the government was



now working on various funding options, while a project advisor, SBI Markets, had been asked to suggest alternate means.

Oil storage facilities

The report said the government had already approved the second phase of the strategic storage, comprising 12.5 million tons of crude reserve capacity in four caverns — at Bikaner in northwestern Rajasthan; Rajkot in western Gujarat; Padur in southern Karnataka; and Chandikhol in eastern Orissa.

India will join fellow oil importers China and Japan in providing emergency oil storage facilities.

According to reports, China plans to provide around 500 million barrels in strategic oil storage capacity by 2020 from its current capacity of over 160m b.

Meanwhile, Japan's strategic crude oil inventories stood at 590m b at the end of December 2012. 

In the course of his official duties, OPEC Secretary General, Abdalla Salem El-Badri, visits, receives and holds talks with numerous dignitaries.

This section is dedicated to capturing those visits in pictures.



Left: Samir Koubaa, Ambassador of Tunisia to Austria, visited Abdalla Salem El-Badri, OPEC Secretary General, on December 17, 2013.

Below: Students of the OMV-NOC Libya Exchange Programme visited the Secretariat on February 11, 2014. Pictured here are (l-r): Ms Maria Mittermair-Weiss, Head of Public Affairs (International & Governmental Relations), OMV Exploration & Production; Adel Elhooni, Junior Production Technologist; Abdalla Salem El-Badri, OPEC Secretary General; Zeyad Makhashkesh, Reservoir Engineer; Ahmed Elwefati, Reservoir Engineer; Abdulmoneim El Arabi, Geophysicist.



Left: Visiting Abdalla Salem El-Badri (c), OPEC Secretary General, are (l-r): Hager Ahmed Eshawesh, Enass Sadek Nasouf, Rehab Mohamed Terfas, Aimen Mohamed Erhouma, visiting, who attended the Orientation Programme for the Libyan National Oil Corporation at the Secretariat on February 10-14, 2014.



The NATO Science and Technology Committee's, Sub-Committee on Energy and Environmental Security visited the OPEC Secretariat on March 4, 2014. Pictured here (l-r) are: Osman Askin Bak; Maria Martens; Abdalla Salem El-Badri, OPEC Secretary General; and Domenico Scilipoti.



Ambassador Keith Azzopardi, from the Permanent Mission of the Republic of Malta, visited Abdalla Salem El-Badri, OPEC Secretary General, on March 4, 2014.

Kuwait appoints new Oil Minister



Dr Ali Saleh Al-Omair has been appointed Kuwait's new Oil Minister. He succeeds Mustafa Jassim Mohammad Al-Shamali, Deputy Prime Minister, who held the portfolio for a brief period.

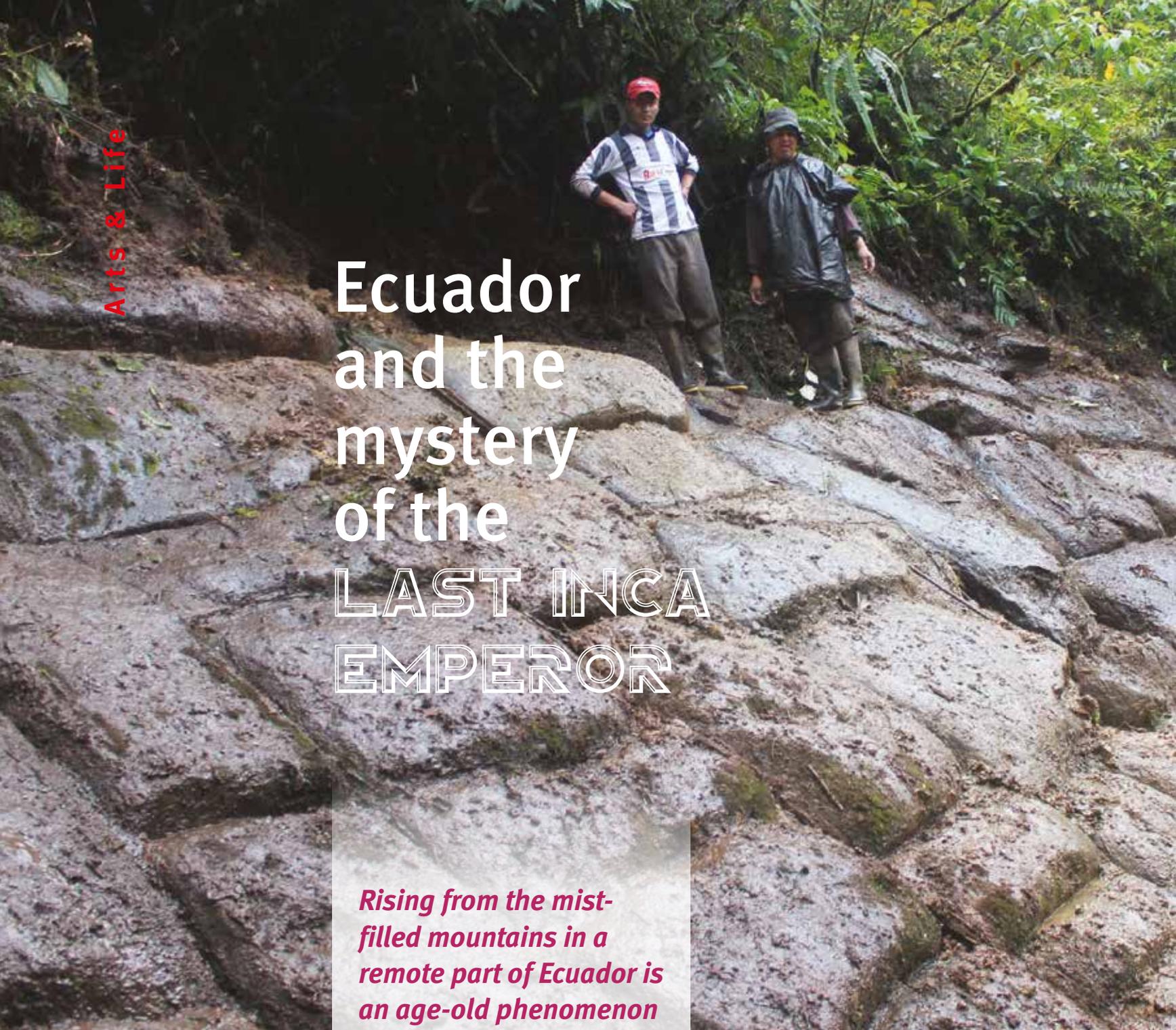
Born in 1958, Al-Omair, who is also Kuwait's Minister of State for National Assembly Affairs, as well as Chairman of the Kuwait Petroleum Corporation (KPC), attained his PhD in Analytical Chemistry in 1990, which he studied for at the University of Kent, in the United Kingdom.

He achieved an MSc in Analytical Chemistry from the same university in 1986, after attaining a BSc in Chemistry from the Kuwait University in 1982.

In his working career, Al-Omair was a Faculty Member at Al-Ain University, in the United Arab Emirates (UAE) in 1990–91 and was a Seconded Lecturer at Kuwait University in 1992–93.

He was also a Seconded Lecturer at the Public Authority for Applied Education and Training (PAAET) in Kuwait from 1994–96, after which he was appointed Director of Laboratories at the Kuwait Institute for Scientific Research.

Four years later, Al-Omair became a Member of the Kuwait National Assembly. ❁

A photograph showing two people standing on a stone staircase in a forest. The person on the left is wearing a red cap and a blue and white striped shirt. The person on the right is wearing a black raincoat and a hat. The staircase is made of large, flat stones and is surrounded by lush green vegetation.

Ecuador and the mystery of the LAST INCA EMPEROR

Rising from the mist-filled mountains in a remote part of Ecuador is an age-old phenomenon that may just hold the key to understanding a captivating era and lay to rest an enduring mystery. The OPEC Bulletin's Maureen MacNeill investigates.

An enormous structure, which appears to be a paved wall, has been uncovered by a group of explorers and archaeologists some 50 kilometres from the remote town of Baños de Agua Santa, in OPEC Member Country Ecuador. The find, which until recently was hidden by thick vegetation and mud, could hold answers to a number of questions.

Britain's Daily Telegraph described the structure as being "a wall, sloping at a 60° angle, with a flat area at



search for the mummy of the last Inca emperor, Atahualpa, as well as the lost gold associated with him.

Based on information provided by an Ecuadorian explorer, who has been a guide in the region for over a decade, French-American explorer and web entrepreneur, Benoit Duverneuil, launched an expedition to the area in April–May 2013, but visual evidence was only gathered with the help of British author Bruce Fenton late in the year.

Natural formation

“This is a massive structure and literally in the middle of nowhere,” stated Duverneuil. “It looks like a buried pyramid,” he said, adding that it did not seem to be a true pyramid because there was no evidence of it having four sides, though many of the rocks had sharp edges as though shaped by human hands.

The two geologists who accompanied the explorers concluded that the site was a natural formation, said Duverneuil, adding: “That said, a natural formation could have been used by a culture for a specific purpose.”

The archaeologists also confirmed that there was a perfectly perpendicular Inca road right in front of the site, according to Duverneuil. “This is really intriguing.”

The site, over 2,500 metres high, in a ‘cloud forest’, is inside the Llanganates National Park, home to extremely inhospitable landscape and weather. One of the most remote regions in the world, it features a harsh, rainy, cold climate most of the year. The area is comprised mainly of Andean and Amazonian cloud forests and jungles, along with deep valleys, grand waterfalls, mysterious lakes, volcanoes and treacherous rivers.

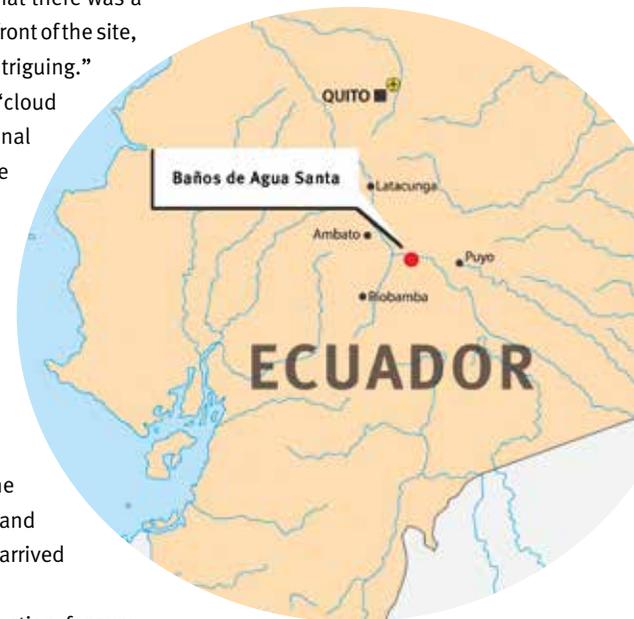
The trek to the ruins is strenuous; the group had to travel over three mountains and several rivers to reach the site, where they arrived covered with bites and cuts.

“We know it is an unusual natural formation, for sure. We had doubt about the central part of the site since the shape of the stone blocks is so perfect and several layers of stones seem to be perfectly aligned with each other,” noted Duverneuil.

“There has been a lot of buzz around the assumption that it could be connected to the story of Atahualpa,” he added. “There are many contradictions in texts written by the chroniclers about the death of Atahualpa and much

the top ...” where many artefacts have been found. On the left side is a powerful waterfall. The approximately 80-metre tall by 80-m wide structure, constructed from hundreds of two-ton stone blocks, was uncovered by the group at the end of December last year.

The expedition party, including members of a non-profit research group called LostIncaGold, is planning to lead several trips to the region of the Llanganates. They want to investigate the story of the Valerde’s Derrotero,



Right: The story of Atahualpa is well-known to Ecuadoreans. Apparently the last Inca emperor was garroted by Spanish conquerors in 1533. The battle is depicted in this sketch.

speculation about the possible location of his mausoleum,” he continued, explaining several of these theories. “None of these versions are backed up by historical fact and that is why they are all different.

“The reason behind these speculations is simple, only (Inca general) Rumiñahui and perhaps a few other leaders of the resistance of Quito shared the secret of the location of the tomb.”

The last emperor of the Incas represents a famous and fascinating piece of Ecuadorian history. Atahualpa was apparently garroted by Spanish conquerors in 1533. Legend has it that Francisco Pizarro — who began the conquest of the Inca Empire — offered to spare Atahualpa’s life and grant him freedom in return for a room filled with gold and two adjoining rooms of silver. Pizarro took the deal and treasure streamed in for the next three months carried by Inca peasants, as agreed. However, the Inca people were becoming agitated, as their leader still had a strong influence on them from his prison cell, and Pizarro had Atahualpa killed before the room could be filled.



Supposedly, Inca general Rumiñahui was travelling with a massive amount of the remaining treasure (one estimate is 750 tons of worked gold, another is 70,000 man-loads) on his way to the capitol, Cajamarca, when he got word of the death and diverted the caravan up into the Llanganates mountains.

Some of his soldiers are supposed to have unearthed the body of Atahualpa in Cajamarca, buried in a Christian ceremony, and taken it with them to mummify it after Inca tradition.

Rumiñahui is thought to have secretly taken the body to its final resting place, where it has remained until this day, possibly hidden somewhere deep in this forbidden jungle.

Duverneuil stated: “When he learned about the execution of Atahualpa, Rumiñahui knew that the Spaniards, who were heading in the direction of Cuzco, would eventually try to capture Quito and its gold. That is why, according to Cieza de Leon, he removed the rest of the gold from Quito and hid it somewhere, quite possibly along with the mummy of Atahualpa as required by Inca rituals.”

It seems that Rumiñahui first took the body to Pillaro, the general’s domain and birthplace, known as the door of the Llanganates, he said. “We know for a fact there was an Inca road that used to cross this area.

“The mummy had to be placed in a mausoleum made of stones. The Incas also believed that the Sun God (Inti) could resurrect them as long as their body was preserved ... as per the tradition, other mummies... might be with his.”

‘Guaca de los Llanganates’

An old text talks about the ‘Guaca de los Llanganates’. A guaca is a tomb or burial site of the ancient Indians. Various ancient texts support the idea that Atahualpa is indeed buried in the area.

“We know that Atahualpa’s body was removed from its original grave, mummified, brought to Rumiñahui in Riobamba (close to Llanganates), that the gold and the other mummies were removed from Quito before the Spaniards arrived, that Rumiñahui fought his last battles in the Llanganates, that this area would

Left: Two members of a group investigating an unusual structure buried deep in the Ecuadorian jungle stand near a waterfall which runs down its left side.

be a perfect location to hide Atahualpa's hoard, that Inca ruins of temples and roads have been discovered in the same area, and that the site we found is natural, but could have been a perfect place to create a mausoleum, and that many legends also locate the tomb in the Llanganates," summarized Duverneuil.

The Treasure of the Llanganates, as the gold is called, has remained one of the world's greatest undiscovered treasures. However, many believe the horde comes with an ancient curse and many have died in their attempts to find it.

The legend says that some decades after the death of Atahualpa, a poor Spanish adventurer known as Valverde married an Inca princess from the area. Supposedly she told him where the treasure was and Valverde returned to Spain a rich man, having only taken a small part of the treasure.

On his death bed, he wrote Valverde's Path (Valverde's Derrotero), which lays out the way to the treasure via various landmarks. He bequeathed the document to King Charles V of Spain upon his death.

An expedition was set up at the time, and promising evidence found, but the Franciscan monk organizing the expedition, Father Longo, mysteriously disappeared one night and the search was abandoned for a further 100 years.

Exploring fact and fiction

In the late 1700s, Don Guzmán, a local miner, completed a detailed treasure map, then also disappeared. Many years later, in 1860, a British botanist, Richard Spruce, stumbled upon Valverde's Derrotero, as well as Guzmán's map, while investigating rare plants in the region and published it in a well-known journal, setting off a treasure-hunt fever.

Captain Barth Blake and Lieutenant George Edwin Chapman joined Spruce and seem to have uncovered the lost stash. They wrote a letter describing the riches ... but both men died before they could claim their stake. And so it has been with many explorers who followed the same dire fate over the years in search of the gold.

A recent article in an Ecuadorian newspaper stated that some researchers who had studied the case of Atahualpa were skeptical of the latest discovery. Meanwhile, medical historian and journalist, Mark

Honigsbaum, author of the book *Valverde's Gold, In Search of the Last Great Inca Treasure*, stated: "Certainly, this looks like a genuine site, but without knowing the provenance of the story and the precise location of the ruins I would be loath to comment — other than to say that the history of the Llanganti treasure is littered with claims that on closer inspection have turned out to be spurious.

"We are dealing with the frontier land between fact and fiction," Honigsbaum admitted in an earlier article. "We know Atahualpa's gold existed because it is recorded in the Spanish chronicle and it is recorded that a large convoy of gold was on its way from Ecuador. After that, the best and most persistent stories revolve around the Llanganates."

After Fenton showed local preservation authorities his visual evidence at the end of 2013, "we



The team will try to map the entire area and use georadar technologies to determine if there are any cavities behind the rocks (image: A.D.A.P).

have been able to convince local authorities to organize an official inspection of the site," commented Duverneuil.

Duverneuil's team — composed of Ecuadorians, French, British and American members — was due to travel to Peru to look at other archaeological sites, starting in mid-February. A stop was then planned for Cajamarca, the city where Atahualpa was executed by the Spaniards, with the goal to then return to the Llanganates and complete the non-invasive survey they started.

For the mission in Ecuador, they would be accompanied by an American anthropologist and with the help of local authorities they planned to document a new site.

"We will try to map the entire area and use georadar technologies to determine if there are any cavities behind the rocks. We will also try to explore and map the Inca road that passes near the site."

Duverneuil's team is connected with the Aerial Digital Archaeology and Preservation research group, whose goal is to provide non-invasive technology and expertise to archaeologists, anthropologists and local authorities. "We use technologies such as drones, LIDAR and ground-penetrating radars."

Some archaeologists believe the site may be even older than Atahualpa — perhaps a remnant of little-known pre-Inca cultures from before 500 BC — based on rudimentary tools found there.

In any case, the upcoming research is sure to be exciting and may facilitate the parting — if only to a small degree — of the curtain obscuring one of history's major riddles. ❁

Mediterranean Knights reign supreme in African Nations shootout

Libya wins first-ever international soccer prize



Libyan football entered the history books in early February when the country's soccer supremos showed they were penalty kings with nerves of steel in winning the 2014 African Nations Championship (CHAN 2014).

The victory sparked joyous celebration on the streets of the capital, Tripoli, and in other cities in the North African OPEC Member Country. The victorious players were also greeted by delighted supporters upon their arrival at the team's hotel in Cape Town, South Africa.

During the match, huge crowds gathered at squares in Libya's major cities, such as Tripoli and Benghazi, to watch their team. In Tripoli, fans even defied a downpour to watch the game on large screens in cafés.

And moments after the victory, even more fans took to the streets, sounding their car horns and letting off fireworks, celebrations which continued well into the night.

In a prolonged nail-biting final, the Mediterranean Knights of Libya edged clear finalist favourites, the Black Stars of Ghana, 4–3, in a shootout after the match at Cape Town stadium failed to produce a goal after 120 minutes of regulation and extra time.

The crowning glory for Libya was particularly sweet as it atoned for the loss to the same opponents on home soil over 30 years ago in the final of the main Africa Cup – AFCON 1982 – held in Tripoli. Ironically, Ghana won that title 7–6 on penalties.

And in beating Ghana, Libya managed to win its first major soccer trophy in the international arena, giving a huge boost to domestic sporting hopes at a time when the country is still trying to find its feet after years of turmoil and civil unrest.

That turmoil was quickly forgotten when the triumphant Knights returned home with their winning trophy. The moment everyone had been waiting for came on February 3 when the squad flew in to Benghazi, the second-largest city in Libya.

Progress to the quarterfinals

According to the *Libya Herald* newspaper, thousands of fans descended on Benina International Airport to welcome their heroes and security personnel had a tough time keeping the huge crowd back as fans raced on to the runway chanting “Libya, Libya”.

The team later held a procession through some of the city’s principal streets, before leaving for Tripoli the following day. There they were welcomed at Mitiga International Airport by government officials, including Minister of Youth, Abdul Salam Guaila.

In the competition, Libya were positioned in Group C. The Knights got their campaign off to a perfect start with



All lit up ... the scene of Libya’s victory — Cape Town stadium.

a 2–0 win over Ethiopia. But then they had to come back from a goal down to draw with Ghana 1–1. Against other Group challengers, Congo, the score finished 2–2. But the Knights had done enough to progress to the quarterfinals as Group runners-up to eventual finalists, Ghana.

The 11-metre success in the final was actually a familiar story for the Libyan sharpshooters who, in the quarterfinals and semifinals, had to get their team through on penalties against Gabon (4–2) and Zimbabwe (5–4), respectively.

For Ghana, the outcome of the final represented more penalty pain. The West African country was knocked out in shootouts in the semifinals of last year’s main Africa Cup and the quarterfinals of the 2010 World Cup. However, the Blackcats were victorious in one shoot-out — in the South African Championship semi-final, when they put out Nigeria on penalties, 4–1.

And if not for the local unrest, Libya could have been celebrating its success in front of a home crowd. It was originally down to host the 2014 Championship, but had to hand it over to South Africa because of the unstable domestic situation. However, all going well, Libya will now stage the 2017 competition.

Libya’s coach, former Spanish manager and midfielder, Javier Clemente Lazaro, said after the final that the win was good for the Libyan people, for the growth of the sport and for social stability.

“I have put a lot of passion into this team — they have played with enthusiasm and pride and they fully deserved this trophy,” he was quoted as saying.



Nail-biting tension for Libyan soccer fans watching the penalty shoot-out final in a cafe in Benghazi.



Ghana's midfielder Jordan Opoku (l) vies with Libya's forward Mohamed Elgadi (r) during the African Nations Championship final.

He pointed out that the tournament had really offered an excellent platform to Libya's up-and-coming young players. "Most young players really got a massive foundation from this tournament."

Clemente continued: "I hope winning this trophy has been massive for Libya and its people. I want to give credit for winning this trophy to the hard work of the players. They have gained a lot of experience from this tournament."

A crowd of just under 17,000 watched the tense, but exciting final, played in front of FIFA President, Sepp Blatter, who later handed out the winning medals, and Confederation of African Football President, Issa Hayatou.

As for the game, with both teams entering the fray unbeaten, it was understandably a tight match, with the two sides squandering good chances to seal a win in regulation play.

There was also an element of tiredness about the players, who were tested to the full, having competed in six matches in 20 days throughout the tournament, including playing extra time in each of the semi-finals (Libya also in its quarterfinal), as well as the final.

The first half of the final was an evenly contested affair, with little to separate the two sides, and also not much in the way of goalmouth action.

Ghana were very strong in midfield and their players

Libya's goalkeeper Nashnush saving what would have been a certain goal during the tense final with Ghana.



created a string of short passes, but Libya's defence remained strong and worked hard around captain Ali Salama. And anything they could not deal with was scooped up by goalkeeper Mohamed Abdaula.

At the other end, Libya's Elmutasem Abushnaf failed to keep his shot low and on target after working his way to the edge of the Ghanaian penalty box.

This was before some neat exchanges allowed Ghana's Theophilus Anobaah to turn inside the Libyan box, but Ahmed Trbi recovered in time to stop a shot on goal. As the half ended, Ghana were more in the ascendancy.

In the second half, Libya pushed more players forward and there were chances at either end, but it was Ghanaian substitute Yahaya Mohamed who came closest to breaking the deadlock with an attempted back kick. He didn't quite connect and Ahmed Almaghasi cleared the danger.

Libya's defence remained strong

The game then went into extra time with the Knights having a great opportunity to score three minutes in. But Abuschnaf sent a five-yard header over the bar after a great cross from Elmehti Elhouni.

Ghana were within a whisker of scoring just after the game moved into the second half when Abdul Mohammed saw his first time shot trickle past the far post.

Libya's Abuschnaf then headed over from close range and Abdelsalam Omar should have put the Knights ahead, but from a free header eight yards out, goalkeeper Stephen Adams pulled off a top save.

The Blackcats were again the more dangerous team in the closing stages, but could not force a goal, the two sides going into penalties for the second consecutive match. In the shootout, Stephen Adams, Ghana's goalkeeper, blocked two Libyan spot-kicks to send the shootout to sudden death after the sides were level at 3–3. Libya's goalkeeper, Mohamed Abdaula, also saved the first two Ghanaian penalties.

Ahmed El Trbi then stepped up to score for Libya, while Joshua Tijani pulled his penalty wide for the crucial miss, signaling the victory and causing jubilation among the Libyan players and fans.

Nigeria won the competition's bronze medal by beating Zimbabwe 1–0 in the match for third/fourth place. Zimbabwe had to play for 73 minutes with only ten men due to the sending off of Masimba Mambare in the 17th minute.

This year's tournament in South Africa was the third.

Finals	Cape Town Stadium, Cape Town
Host country	South Africa
Final attendance	16,505
Dates	January 11–February 1, 2014
Teams	16 (from 1 confederation)
Venue(s)	4 (in 3 host cities)

Final positions	
Champions	Libya (1 st title)
Runners-up	Ghana
Third place	Nigeria
Fourth place	Zimbabwe

Tournament statistics	
Matches played	32
Goals scored	73 (2.28 per match)
Attendance	296,440 (9,264 per match)
Top scorer (4 goals)	Bernard Parker, South Africa
Best player	Ejike Uzoenyi, Nigeria

It took place between January 11 and February 1 and was the first African Nations Championship tournament where all matches were considered full international matches.

The African Nations Championship has strict eligibility rules and only players who ply their trade in an African domestic league may participate.

Tunisia won the last Championship, which was held in Sudan, by beating Angola 3–0 in the final. 

Below: Champions! Libyan's team players celebrate their historic victory in Cape Town.



SKYWARD BOUND

— shaping a new skyline in the Middle East

*In a worldwide ranking that projects the 20 tallest buildings in the year 2020, at least three will be located in OPEC Member Countries. **Scott Laury** of the OPEC Bulletin takes you on a tour of these and other towering structures, which are redefining the parameters of the possible. Welcome to the era of the mega tall skyscraper.*

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It was not that long ago that people would travel far and wide to visit New York City and its spectacular urban landscape, with the main attraction being its shiny, silvery, colossal towers that came to be called skyscrapers.

Often filmed as dramatic backdrops to Hollywood films and television shows broadcast across the world,

tourists could be seen in midtown Manhattan looking up in awe at these giants piercing the sky above.

Millions upon millions per year would queue up, sometimes for hours at a time, just to take an express elevator to the top of the Empire State Building or the Chrysler Building for a view of a lifetime over the rooftops of the “city that never sleeps.”

Manhattan's famous art deco skyscrapers

The Chrysler Building was constructed in 1930 with a very modernistic art deco style of architecture. At 319 metres in height and with 77 floors, it reigned as the tallest building in the world, but only held that honour for one year.

Around ten blocks south, the infamous Empire State Building made its grand debut the year after, surpassing its neighbourhood rival by 25 floors and 62 m in height. At 381 m, it became the tallest building and the first to break the 100-floor mark, reaching 102 floors.

These buildings could be considered the grandfathers of the skyscraper and are surely considered classic masterpieces of modernist urban architecture. However, in terms of sheer height and floor space, the skyscraper has evolved rapidly since the turn of the century, reaching new limits never before considered possible.

A rapid evolution – upward

The scope of this evolution is mind-boggling. In the middle to late 1880s, the first skyscrapers were built in the United States, loosely defined as any building with ten to 20 stories. The advent of these higher structures was the result of an increased need for office space triggered by industrial and commercial growth, and the corresponding increases in population, especially in the cities.

By the late 20th century, use of the term skyscraper was expanded to describe buildings of exceptional height, usually more than 40 to 50 floors high. That trend has continued until today. Now we are even looking at skyscrapers that will surpass the one kilometre mark in height within a few years from now.

From super tall to mega tall

As these buildings have climbed higher and higher up towards the heavens, the Council on Tall Buildings and Urban Habitat (CTBUH), which rates and ranks the tallest skyscrapers around the world, has had to come up with two special definitions to categorize these soaring structures.

In past years, the term super tall was routinely used to describe buildings over 300 m high. But now, as towers rise to over twice that height, we are entering the era of the mega tall buildings, which describes skyscrapers reaching upwards of more than 600 m – twice as tall as the Eiffel Tower.

This elite club currently includes three buildings: The

Burj Khalifa in Dubai (UAE), the Shanghai Tower in China and the Makkah Royal Clock Tower Hotel in Mecca (Saudi Arabia). Get ready though, because this club is about to expand as more buildings reach new and record heights.

The tallest 20 in 2020

According to its December 2011 report *The Tallest 20 in 2020: Entering the Era of the Megatall*, CTBUH projects that by the year 2020, the 20 tallest buildings will all be more than 500 m tall. Of these, the tallest eight will meet the mega tall classification, some of them even towering more than one kilometre up into the troposphere.

Though the majority of these architectural wonders are being built in Asia, at least three of them will be located in the Middle East, all in OPEC Member Countries.

Burj Khalifa in Dubai

The sleek and elegant Burj Khalifa, already mentioned previously, has been the tallest building in the world since it was inaugurated in 2010. It is 828 m tall and has an almost unimaginable 163 floors of space, which is used for residential and business purposes.

It is designed to be the focal point of a large-scale development that includes 30,000 homes, nine hotels, three hectares of parkland, 19 residential towers, the Dubai Mall and a 12-hectare man-made lake.

This reigning king of the skies will not be on the throne for much longer, though, as buildings continue to climb higher and higher.

As in the world of extreme sports, where barriers are constantly being surpassed, the building of skyscrapers has entered the race and will achieve a new milestone with the construction of the Kingdom Tower in Jeddah, Saudi Arabia.

© Jeddah Economic Company/Adrian Smith & Gordon Gill Architecture

Above: A rendering of the Kingdom Tower in Jeddah.

Below: Burj Khalifa in Dubai.



The Kingdom Tower in Jeddah

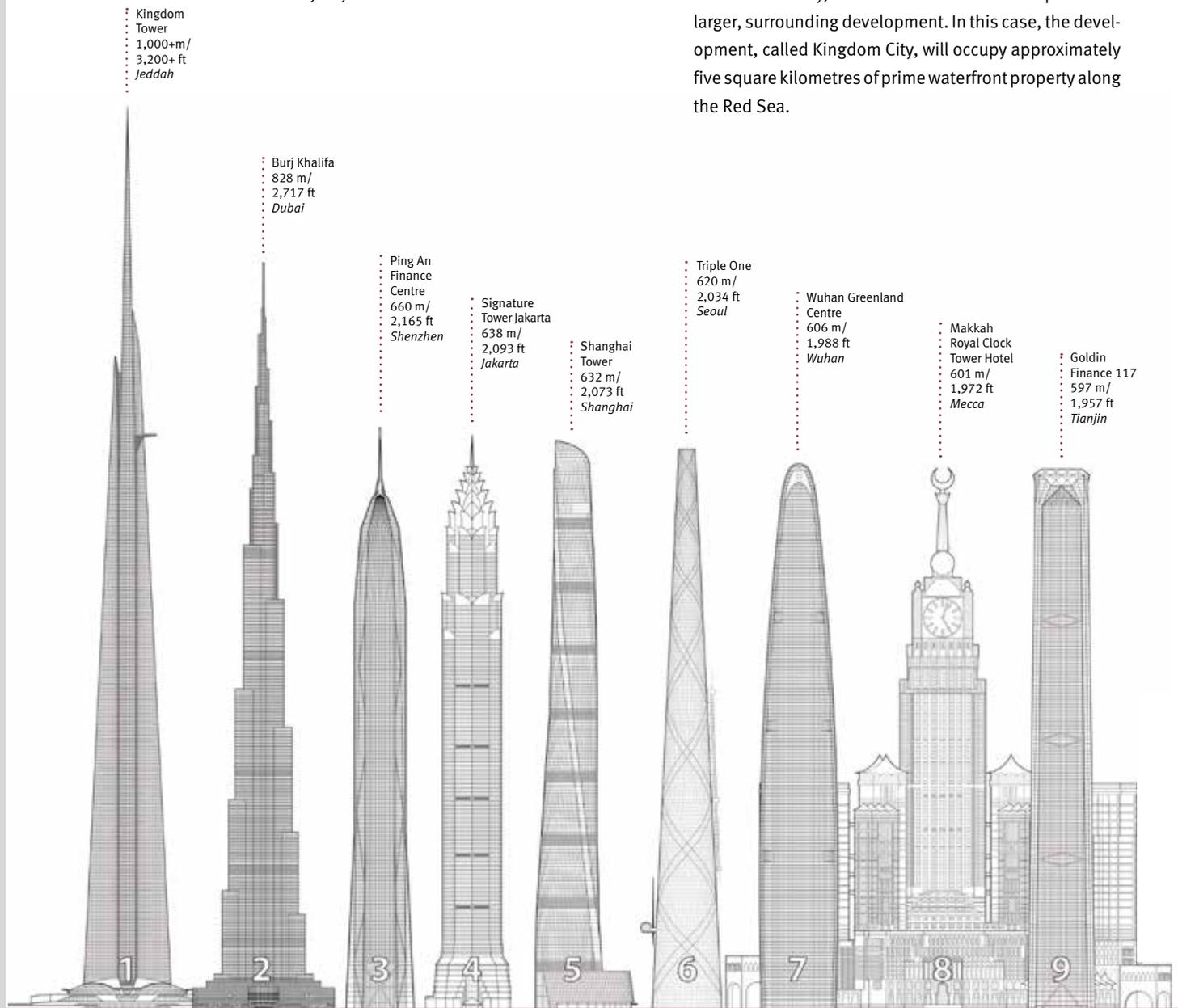
Construction began last year on this record-breaking feat of skyscraper innovation and is currently planned for completion in 2019. It will be the first-ever building to reach one kilometre in height. The 167-floor tower will house a luxury hotel, residential and commercial real estate as well as the world's highest observatory.

It's ultra-modernistic design with a triangular footprint and sharply pointed vertex is said to resemble a desert plant shooting upwards, symbolizing Saudi Arabia's growth and future, as well as Jeddah's role as a gateway to the holy city of Mecca.

A 23-hectare area called the Kingdom Tower Water Front District will surround the tower with public use areas, a shopping mall, as well as other residential and commercial real estate developments.

Another feature, most certainly not for the acrophobic, will be the so-called sky terrace, a circular, glass-floored balcony located 610 m high with a dramatic view looking out over the Red Sea. Access will be restricted solely to the penthouse on the 157th floor. The terrace was originally planned to be a helipad but was deemed inappropriate for this purpose.

As with some of the other signature buildings profiled in this story, the tower will be the centerpiece of a larger, surrounding development. In this case, the development, called Kingdom City, will occupy approximately five square kilometres of prime waterfront property along the Red Sea.



The 20 tallest buildings in 2020, as projected by CTBUH, eight of which can be classified as mega tall (above 600 metres).

Makkah Royal Clock Tower Hotel in Mecca

In 2012, Saudi Arabia won the claim to the second-highest building in the world with the opening of its spectacular Makkah Royal Clock Tower Hotel, which is 601 m in height and contains 120 floors.

It is part of the Abraj Al Bait Towers complex and is located adjacent to the world's largest mosque, Masjid al-Haram, and the Kaaba, one of Islam's most sacred sites. The complex was built as a part of the King Abdulaziz Endowment Project, which is aiming to

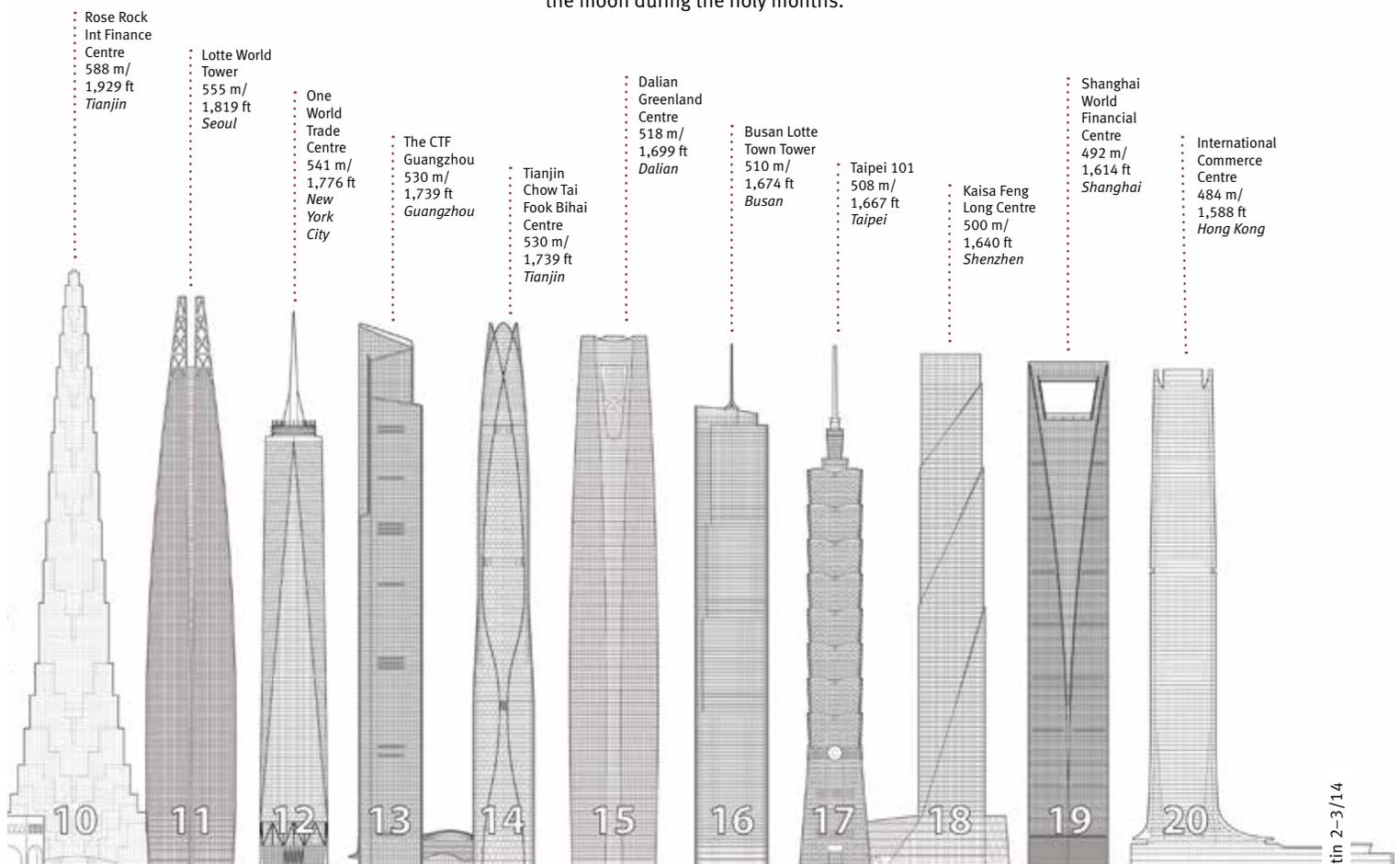


The Makkah Royal Clock Tower Hotel, with a height of 601 m, in Mecca, Saudi Arabia.

modernize the city to better host the millions of pilgrims that travel to Mecca each year for the Hajj.

In addition to its impressive height, the hotel tower is also the tallest clock tower in the world at 400 metres in height and boasts the world's largest clock face, which is reportedly visible from as far as 25 kilometres away. An observation deck is located at the base of the clock.

Other features of the mixed-use complex include a five-star hotel, residential towers, a 20-storey shopping mall, two heliports and a large prayer room that can host as many as 10,000 people. There is also a conference centre to host business meetings as well as an Islamic Museum and a Lunar Observation Center used to sight the moon during the holy months.



© Council on Tall Buildings and Urban Habitat.



Future tallest criteria

These spectacular buildings were included in the 2011 CTBUH study as they met the organization's *future tallest* building criteria, which means they were either already built, under construction or considered as a real proposal. Projects that were started and then halted were also included if there was a strong chance they would progress towards completion.

There are, however, several other very exciting projects in various stages of conception, construction or even suspension that are also located in OPEC Member Countries. If these buildings end up reaching fruition, they too will join the trend-setting skyline of the Middle East.

The Convention Center Tower in Doha

In 2007, construction began on the ultra-modernistic Convention Center Tower in Qatar's capital city of Doha. When completed, the obelisk-like building will be 551 metres tall and contain 112 floors.

Offices will be located in the lower portion of the tower and a hotel, apartments and penthouse suites on the upper floors. An exclusive private club will be located at the very top of the tower housed in a 60 metre high glass cylindrical structure elegantly wrapped in a helix shell reaching to the building's summit.

The Pentonium in Dubai

As if the Burj Khalifa were not enough, the United Arab Emirates is awaiting the arrival of yet another stunning skyscraper.

This one, called the Pentonium, is not as tall, but certainly shares the same splendour and post-modernistic grandeur of its cross-town peer in Dubai. The tower's name, Pentonium, derives from two words: penthouse and condominium.

Construction began in 2008 and, pending completion, the tower would be 516 metres high and contain 122 floors of residential space. This would make it the tallest all-residential building in the world.

Residents would benefit from amenities such as a swimming pool, a private cinema, a banquet hall, an observation deck, a health club and a business centre.

A boundless future

With the imminent arrival of the kilometer-tall Kingdom Tower, the skyscraper will reach new heights — literally. The question will then be: where do we go from here?

Well, the answer to that is: ever higher.

According to *Popular Mechanics* magazine, there are eight skyscrapers that, if or when they are built, would continue to raise the bar higher and higher for skyscraper construction. At least half of these would be located in OPEC Member Countries. Even if they never end up coming to fruition, it sure is fun to dream, and dream big.

Burj Mubarak al Kabir in Subiya, Kuwait

This silvery futuristic building in Subiya, Kuwait, is designed to rise to exactly 1,001 kilometres, an altitude poetically alluding to the Middle Eastern folk tale *One Thousand and One Arabian Nights*. Plans are for three interlocked towers or "blades" that form a pinwheel around a triangular central core that houses elevators and mechanical equipment.

The building is planned as part of a huge, long-term

development called the City of Silk, which would include a new airport and several industrial complexes. The City's four districts would comprise the financial district, the entertainment district, the cultural district and an environmental district. Plans also include a so-called Emerald Belt that would surround the City with ponds, lakes and parkland.

1 Dubai Tower in United Arab Emirates

A very unique, surreal-looking design concept would distinguish this three-pronged structure from its cross-town and cross-regional peers. Three towers would rise from a tripod base called a "saddle," ending up at three different heights: 600, 800 and 1,000 metres.

A canal would flow between the building's three legs, allowing boats to travel underneath. Sky bridges would connect the three towers together, facilitating movement and providing meeting places for residents.

Though this project has been placed on hold, the tower was planned to be part of a larger development called Jumeirah Garden City, featuring a hotel as well as residential, commercial, retail and entertainment space.

Nakheel Tower in Dubai

If completed, this mammoth building could reach a record height of 1,400 metres. The cylindrical structure would contain eight spires that emerge into a point at the very top of the building. Aspiring to create a multi-use 'vertical city', the design would accommodate as many as 15,000 people. The tower would have large built-in slats, allowing gales to pass through the structure, thereby increasing structural safety. Every 25 floors, sky bridges connect the two sides, providing a gathering place for inhabitants.

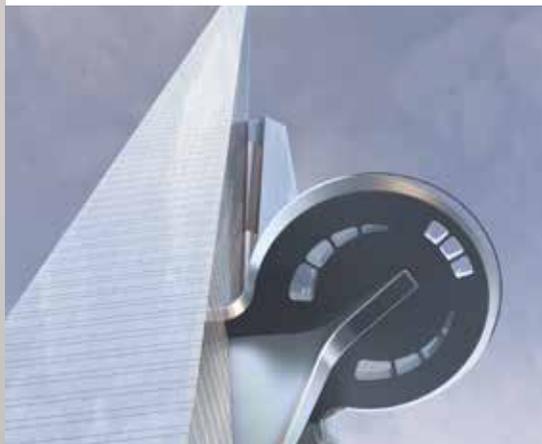
Al Jabar Tower (Millenium Challenge Tower) in Kuwait City

This gargantuan concept tower, if constructed, would break all records, rising to a mind-boggling 1,852 metres, or a full nautical mile.

To reach this level of altitude, the project's architect, Italian Omero Marchetti, would be required to use non-traditional materials that are high in volume and low in weight. The proposed design would feature a hexagonal snowflake-shaped base with a gradual tapering off into an obelisk form that culminates in a pointed pinnacle.



All images on this page © Jeddah Economic Company/Adrian Smith & Gordon Gill Architecture



The spectacular one-kilometer high Kingdom Tower, designed by architects Adrian Smith and Gordon Gill, is expected to be the highest building in the world by 2020.

The skyscraper: A brief history

The word skyscraper was first used in the 1880s to describe buildings of 10 to 20 stories that were being built in the United States in response to the expanding rate of commerce and the resulting need for urban development.

First safe passenger elevator — a game changer

In 1857, the first safe passenger elevator was installed at the Haughwout Department Store in New York City, enabling buildings to be constructed higher than ever before. From that time onwards, the erection of high-rise structures would continuously advance to new heights, never to look back again. By the late 20th century, the definition of the skyscraper changed to describe high-rise buildings of 40 to 50 stories or more.

From iron to steel

Though skyscrapers were first built on thick masonry foundations, that quickly changed, first to iron, then to steel. James Bogardus built the Cast Iron Building in New York City in 1848, using iron for the main structural frame and support for the upper floors.

In the 1860s, steel, being both stronger and lighter in weight than iron, was adopted as the main building material, facilitating the construction of higher buildings.

The first building to use a steel girder structure was William Le Baron Jenney's ten-storey Home Insurance Company Building, which was constructed in 1884 in Chicago.

Influenced by classic architecture

As far as architectural styles go, the first skyscrapers looked back in time for inspiration with influences ranging from ancient Greek and neo-gothic all the way to art deco.

A prime example is Manhattan's Metropolitan Life Insurance Building, from 1909, which was designed by Napoleon Le Brun to resemble the bell tower (Campanile) of Saint Mark's Basilica in Venice, Italy.

The Woolworth Building was designed by Cass Gilbert in a neo-gothic decor and opened in 1913 in lower Manhattan, across from City Hall. It was the corporate headquarters for the famous and ubiquitous line of budget retail shops, which came to be known as 'five-and-dime' stores.

The art deco period

In the 1930s, the art deco craze took hold, which can be seen in the architectural elements of the Chrysler Building (1930), the Empire State Building (1931) and the RCA Building (1931), all located in the heart of midtown Manhattan.

Though this style seems very retro today, at that time, it was perceived to be as avant-garde as the advanced technology used to build the structures themselves.

Arrival of the international style

In the decades after World War II, the international style was increasingly predominant, leaning towards a more sleek and simple style.

New York City's Seagram Building from 1958 and the Lake Shore Drive Apartments in Chicago, which opened in 1951, were early examples of this trend. The smooth and gleaming glass-covered lines of these buildings came to define the look of the ultra-modern urban skyscraper.



People-centric architecture

In the 1970s, efforts were made to introduce more people-friendly aspects into urban architectural planning. New zoning laws were passed, enabling parks and plazas to be developed in and around the skyscrapers, providing the general public with newfound urban spaces.

Signature properties, such as New York City's World Trade Center (1972) and Citicorp Center (1978), as well as Chicago's Sears Tower (1973), now called the Willis Tower, expanded this new concept to integrate shopping and entertainment opportunities at the ground level. This innovative concept has now become a hallmark of urban planning to this day.

Back to the classics

In the 1980s, skyscraper architecture took a slight detour back to the more classical style, perhaps a reaction to the stark austerity and efficiency of the international style.

One prime example of this is Phillip Johnson's AT&T Building, now the Sony Tower, which was built in 1984 on Madison Avenue in midtown Manhattan. It was renowned for its ornamental features harking back to Greek architecture, including an open pediment style at the top and an impressive seven-storey high, arched entranceway and interior atrium at the ground level.

Worldwide race to the top

In the last three decades, the trend of post-modernist skyscraper architecture has generally continued, with a construction boom coming predominantly from the Middle East and Asia, where some of the most spectacular new skyscrapers have been erected.



Skyscraper

construction in recent years could be characterized as the race to the top.

Not too unlike the United States and the Former Soviet Union battling to become the first nation to put a man on the moon, countries are seeking to gain prestige and publicity by building the tallest and most stunning structures in the world. And to the present, they have been successful at this.

But, just when you think you have witnessed the tallest building ever, there seems to be another, even taller one sprouting up somewhere else.

If this keeps up, one may start to doubt the old expression, *the sky is the limit*. ❁





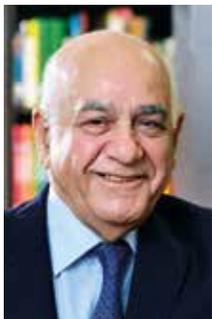
The Yas Hotel, which forms part of the stunning Yas Marina formula 1 racing circuit in Abu Dhabi, UAE.



Oil, car industries working hand-in-hand for the common good

Formula One: Much more than just a race

*On March 16, the beautiful city of Melbourne, Australia, was again host to the first race of the 2014 Formula One (F1) racing season. Eight months and 18 races later, the last of the season's circuits will be buzzing — at nighttime — in Abu Dhabi, capital of the United Arab Emirates (UAE). **Saadallah Al Fathi** (pictured), a former Head of Energy Studies at the OPEC Secretariat, who now lives in*



Dubai Emirate, is an avid F1 fan. But his background as an oilman and mechanical engineer gives him added impetus to look more closely at the inner workings of this fascinating sport, particularly as it applies to oil and especially with transportation set to continue taking the lion's share of global crude oil demand. But how could the antics of Sebastian Vettel, Lewis Hamilton and F1 be enhancing the development of the international oil sector? You would be surprised.

For the past five years, Formula One motor racing has grown to become a popular attraction for the sporting enthusiasts of the United Arab Emirates (UAE). And it has added yet another dimension to the OPEC Member Country that is fast developing, both in impressive infrastructure and worldwide popularity.

The first F1 race in the UAE took place on November 1, 2009, although the country earned the right to run the event in February 2007 after staging the Formula One Festival at the complex of the Yas Marina Circuit, which was designed by the famous Herman Tilke and built on Yas Island, close to the capital city of Abu Dhabi.

The complex attracted much attention at the time, what with its marvelous stands, hotels, restaurants, shopping malls and exhibition grounds.

In October 2013, the F1 race on Yas Island was the fifth held there and, as most everyone agrees, the event has got better year after year.

The rather unique Yas Marina 'day-to-night' sporting spectacle has always managed to produce a competitive race and the fans have enjoyed and are fully appreciative of the beauty of the purpose-built circuit and its environs.

Those who know me well are already aware that I am an avid fan of F1 — I have been since my time with OPEC in Vienna when I was invited to attend an F1 race at the Österreichring, near Zeltweg in Austria, in 1987. I only went because I was invited by friends in a major oil company, and, quite frankly, at that time I, like a lot of other people, thought that this type of sport was boring, only involving cars going aimlessly around a circuit.



The fuel specification of F1 cars in the 2014 season is not that far away from normal gasoline sold in public service stations.

How wrong could I have been! Once you see an F1 race and learn a little bit about the amazing feat of engineering involved, to say nothing of the complex and challenging rules associated with the sport, the picture changes dramatically. I have not looked back since and, with each passing year, I have tended to get more and more involved.

Of course, that first experience was made all the more complete with me, as a VIP, being able to tour the respective F1 garages, watching some of the preparations as the teams set up their cars and engines ahead of the race during which the thrills and excitement often raise the heartbeat.

Before my return to Iraq after my term at OPEC was completed I was lucky enough to see five more races at the Hungaroring in Budapest. I even managed to have pictures taken with British supremo Nigel Mansell and F1 legend Michael Schumacher, who is in my prayers today following his tragic skiing accident.

In any case, as an oilman and a mechanical engineer I soon discovered that there were more things in F1 that were of interest to me. At that time, most sponsors of F1 teams were the tobacco companies, although the oil companies were also present.

But the anti-smoking lobby — by regulation or simple awareness — drove the tobacco companies out of the sport. This left the oil companies together with the car industry, who were not in it just for any glamorous connection, public relations exercise or advertisements, but for the actual serious testing of the fuels and lubricants utilized by the sport in what is often referred to as a ‘mobile laboratory’.

Oil company involvement

There is hardly any major oil company that is not in one way or another involved in F1. They simply cannot afford not to be. The role of the oil companies even sometimes extends to partnerships with racing teams and engine manufacturers and the sponsorship of teams, or drivers, especially when oil prices are at a reasonably good level and stable, as today.

There was a time when Saudi Arabia was the main sponsor of the Williams team. Petroleos de Venezuela SA (PDVSA), the national oil company of Venezuela, sponsors a driver and is part sponsor of a team. Petronas of Malaysia is part owner of the Sauber team. And McLaren, the racing company founded in 1963, is now half-owned by the Bahrain Mumtalakat Holding Company.

The fuel used by F1 cars has evolved greatly over the years. There was a time when it was composed of a mixture of hydrocarbons and other chemicals, including tetra ethyl lead (TEL) to boost its octane content and counter the knocking tendency of the engine.

TEL use was gradually banned in most countries, due to its health and environmental effects, and F1 fuel discontinued its use in 1996. Then the race cars turned to a heavy type of fuel with a high content of aromatics to ensure the higher octane best suited to the high-compression ratio of the powerful engines used. And because it was heavy, the fuel tank size needed was smaller.

But this fuel was not friendly to the engine and as environmental awareness grew, it hit the F1 organizers, who then switched for a brief number of years to methanol, a light chemical compound which burns better than gasoline, but is poisonous and needs special handling and definitely a re-fuelling stop during any race.

Currently, F1 cars are powered by gasoline, which should be “predominantly composed of compounds normally found in commercial fuels.” The fuel is tested and approved before each race.

Looking at typical specifications of the fuel, it is actually not far away from the normal gasoline sold in public

service stations. There are, however, small variations in some parameters and the fuel supplier can play with the product within these limits to improve performance from one race to another.

Using the same gasoline as ordinary cars reduces its environmental impact and saves on the costs of the oil companies supplying the fuels, sometimes at no cost at all to the teams they support.

In a typical race, a car will consume around 75 litres of fuel for every 100 kilometers, or about 225 litres in a race. Of course, due to the set-up of the engine, the F1 car is probably 20 per cent more efficient than a normal car.

Therefore, for all the F1 events the total fuel for all participating cars in practice, testing and the actual race, is close to 200 cubic metres only, meaning that the environmental impact of such a quantity cannot be considered much, compared to the overall consumption of gasoline around the world, or in any one country.

The same goes for engine lubricating oils where advantages accrue to the oil and additive companies, in terms of research and testing that can be beneficial for the millions of ordinary cars used every day.

Reaping the benefits

The oil companies and engine manufacturers work together to reap the benefits from the results of the use of fuel and lubricating oil in this very demanding environment, in order to engineer better products and more durable engines for the future benefit of users.

Therefore, because the oil companies can be seen through the supply and quality of the oil products used in F1, these firms combine with racing teams to successfully resist the idea of a single supplier for fuels and lubricants, such as is the case with the tyres used.

Martin Whitmarsh, Chief Executive Officer of McLaren Racing, said: "Look at the post-tobacco era and probably one of the biggest sectors of investors into the sport is the petrochemical industry."

He continued: "You would not want to jeopardise that, so commercially it does not make sense (to have a sole supplier) and technically it does not either."

The automobile companies benefit from the results of race engine performance, where it is possible to transfer applications to the design and manufacture of ordinary

cars. There are few race teams that manufacture their own engines, but rely on famous engine suppliers specifically known for race engines, or have the desire to benefit from the development potential of race engines and to re-deploy the innovations into engines for ordinary cars, as well as the marketing advantage gained by the engine manufacturer through its association with the sport.

It takes many years to develop a successful road car but, in contrast, only a few months are needed, or available even, to develop a race car. Therefore, engine and car manufacturers consider F1 as a front-end engineering stage for their own cars, in addition to pushing their own products into race cars. Many innovations in race cars have found their way into ordinary vehicles, such as disk brakes and the anti-block system (ABS) of braking, although the latter is no longer used in F1 cars to make the races more competitive by relying more on the pilot's driving ability.

Over the years, and due to the visibility of the sport and its worldwide following, it has come under pressure to be a role model and become "green". For this purpose the International Automobile Federation (FIA) and the Formula One Teams Association (FOTA) introduced many initiatives a few years ago.

One important innovation that can be cited here is the Kinetic Energy Recovery System (KERS), which recovers braking energy and stores it for later use. This is not yet fully transferred to ordinary cars, but some suggest it will be employed in a decade or so, due to increasing fuel costs, environmental pressures and the need to increase efficiency.

The promise of a cleaner engine for the 2013 season was already in place when the season started with a target to cut emissions by 15 per cent and to improve the target over the coming years. Even biofuels may be blended with the gasoline in the future as is the case with ordinary cars in some countries. This is already happening in the United States with respect to Indy car racing.

In its quest to keep the sport exciting, F1, while preserving the speed of the cars, has concentrated its efforts on safety, reducing costs and enhancing environmental protection. As the most demanding of all motorsports, it



Many leading oil companies sponsor F1. Pictured is Nico Rosberg of the Mercedes team.

F1 racing in 2014 entered an exciting new era with completely new turbo-charged engines, that are more environmentally friendly.

mobilizes the best specialists to achieve its objectives through research and development.

Starting from the 2014 season, the 750 horsepower naturally aspirated V-8 engines of 2.4 litres capacity will be replaced by 1.6 litre turbocharged V-6 engines of 600 horsepower. Mercedes, Ferrari and Renault are developing the new turbo engines and are working closely with their chosen oil company. Through the turbocharger, the engine will be more efficient and therefore the fuel is to be limited to 100 kg per race. Up until this year, it was unlimited, but on average 160 kg was used per race. To accommodate the turbocharger and energy recovery systems, the allowable weight of the car is to be increased from 640 to 690 kg, including the driver.

To reduce cost further, the 2014 regulations prohibit the use of exotic materials in engine construction and have limited its revolutions per minute. Also, each racing car is allowed the use of eight engines only during the whole season.

Although the race fuel used will have a limited impact

on the environment, due to its modest quantity, the reduction is symbolic to show that the sport cares about the planet. This is contrary to what some suggest. It is also a signal to the automobile manufacturers that the energy recovery systems can be used in their models, thus downsizing engines and reducing fuel consumption.

Finally tyres, named by some as the single most important variable in racing, have often become race deciders, especially in recent years. Development goes hand-in-hand between racing teams and the manufacturer, where the sport's governing body has limited the tyres used to a single supplier, enabling every team to be treated equally.

Tyre combinations

Tyres are manufactured with many compounds to suit race conditions and their use is governed by complex rules. Teams must use a combination of two types of tyre in a race, according to the classification of super soft, soft, medium and hard compounds. Again the experience gained is used in manufacturing road car tyres.

From 1998 to 2008, the tyres used in F1 were not "slicks" (tyres with no tread pattern) as they used to be before and as is the case in other racing series. Instead, each tyre had four large circumferential grooves on its surface, designed to limit the cornering speed of the cars. Slick tyres returned to F1 in the 2009 season.

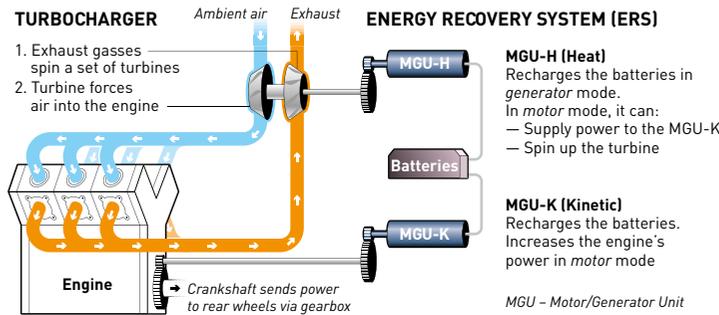
Racing safety is important and is a result of the car's design and the materials used in its construction. Carbon-carbon disc brakes are used for reduced weight and increased frictional performance. To meet the maximum allowable weight of the car, carbon fibre is widely employed in their construction, but due to its cost it has not yet been employed in commercial vehicles. But this does not rule it out in the future.

In modern racing, the ability and courage of the driver is beyond anything else — it is what provides the sport's popularity and excitement. However, the management of the racing team is a vital component for success. The engineers, mechanics and computer specialists in the pit play an increasingly important role with the powerful software that is available to them.

To carry out this work efficiently, a racing car may have more than 100 sensors fitted to its bodywork, all designed to gather information on a real-time basis, which is analyzed in the pit or back at racing team headquarters. It is on this information that instructions are given to the driver to adjust race strategy and squeeze fractions

The new F1 engine and Energy Recovery System

With this year's new regulations, Formula One engines have seen their size cut from 2.4 litre V8 units to 1.6 litre V6 units. Power output from the smaller engines will remain comparable to the bigger predecessors, with the return of turbochargers and the introduction of the new Energy Recovery System.



HOW THE ERS WORKS

A sophisticated energy management system balances fuel and battery power consumption throughout a race

Braking	Exiting a corner	Accelerating	Overtaking
<p>MGU-K charges batteries using car's forward momentum</p> <p>Turbo MGU-H Batteries MGU-K Wheels</p>	<p>MGU-H brings turbine up to speed to match driver's throttle re-application to eliminate "turbo lag"</p>	<p>MGU-H supplies power to the MGU-K, charges the batteries if necessary</p>	<p>MGU-H and batteries supply power to MGU-K to produce additional 160 bhp (brake horsepower)</p>
<p>What is turbo lag? A slight delay that occurs between the driver pressing the accelerator and the turbine spinning up to its optimal rotational speed</p>			
<p>Source: Renault Sport F1 F. Chan, 27/02/2014</p>			



of a second from lap times. The sensors are even helpful in assessing damage to a car involved in an accident and can even advise what corrective measures to take. These types of sensor are increasingly finding their way into commercial cars in the form of on-board diagnostics.

The F1 software and experience, with its various sensors and data points, is also deployed in many industries — it even helps with the control of traffic in San Francisco Bay, or with the landing of aircraft at Heathrow where McLaren racing is helping in both applications. The same racing company is even reported to be working with an oil and gas company to optimise the path to drill through a combination of other wells.

But some teams, such as Williams, are not so enthusiastic in exporting their experiences and want to concentrate solely on racing, although it must be said that their hybrid engine technology is being tested on buses.

To keep a racing car firmly on the track, aerodynamics are employed to generate great down force, while also keeping drag reasonably limited. Today a Drag Reducing System (DRS) is employed in racing cars, but its use is limited to certain locations of a circuit and can be used only when cars are overtaking. For these purposes, racing companies have invested heavily in wind tunnels for testing scaled models to optimize the forces on their cars. The same technology is applicable for road vehicles, although the main aim is strictly to reduce drag and improve fuel efficiency. Aerodynamic expertise is also required in the development of wind turbines and airplanes.

Computer simulations

But to reduce cost further and gain time, F1 is now utilizing Computational Fluid Dynamics (CFD), in addition to, or rather instead of, costly wind tunnels. CFD has been known for many decades, but without powerful computers its use was limited. The computer simulations in racing car design using CFD is now possible, due to the availability of super computers. This technique is also applicable in many industrial and civil applications that gain a windfall from the F1 experience and its investment in CFD, in association with scientists and universities.

A case study was carried out by the Lotus Renault racing company for Nissan to demonstrate the power of CFD's optimisation technique for road car design. By using the CFD software, the external shape of an existing Nissan

model was modified to reduce drag by over four per cent and hence increase efficiency.

Daniel Bell, Senior Lecturer in Thermo-fluids at Oxford Brookes University, said: "Methods developed by F1 teams for applying CFD to simulate performance can be seen filtering down into passenger car development, where more complete and detailed simulations are helping to improve safety, as well as efficiency."

Some racing and car companies, such as Mercedes, Ferrari and McLaren, are also benefitting from the production and sales of very sporty models, in addition to the luxury that appeals to those who can afford it. Since the late 1980s and 1990s, these companies brought out competing road-going supercars, while challenging for the F1 championship again.

Nevertheless, some consider the sport a waste of money, especially with costly circuits and elaborate installations that are not often used. But many circuits do make a profit by finding activities around the year and not just for the F1 race weekend. Other types of races can be conducted at these circuits and even public drivers are allowed on race tracks for a fee when no other activity is taking place.

Of course, the general economy does benefit a great deal as advertising companies, hotels, airlines and tourism thrive because of racing events held the world over.

Spending by teams is reported to be increasing from a published figure in 2006 where the total spending of all 11 F1 teams was estimated at \$2.9 billion. There has been many attempts in the past to reduce and regulate spending, but because of the opposition of some teams, these efforts were abandoned. However, the sport's governing body did agree recently, even with the opposition of some teams, to set a cap on spending, starting from the 2015 season, whereby a working group will be established to finalise the regulations governing the cost-cap regulations by the end of June 2014.

Poorer teams are suffering from the high costs and from trying to catch up with the big spenders. At the same time, if costs go on increasing it may affect the popularity of the sport by driving fans away.

There is one thing for sure, though — as long as costs are reasonable and all the development research in F1 serves the wider public with all its positive outcomes, racing will not only be exciting for the fans ... it will continue to be useful to all of us. 



Red Bull F1 reigning world champion, Sebastian Vettel of Germany.



OFID committed to alleviating energy poverty

Paraguay's electrical power paradox

The alleviation of energy poverty is a priority area for the Vienna-based OPEC Fund for International Development (OFID). Already, in the past two years (2012–13), the institution's energy sector approvals across all financing mechanisms have amounted to over \$915 million, resources that are financing a broad range of projects. In keeping with the launch on January 1, 2014, of the United Nations 'Decade of Sustainable Energy for All' initiative, the OPEC Bulletin is serializing articles depicting the different countries OFID is helping with energy loans. The second such article features Paraguay.

by Damelys Delgado, OFID Information Officer

Since 1977, when its construction began, over 17 million people have visited the Itaipú dam in Paraguay. It is a magnificent structure and a magnet of interest to tourists the world over. Standing 65 stories high, its construction required the effort of 40,000 men working over seven years to build what is effectively the world's largest renewable clean-energy generator.

With this masterpiece of modern engineering, Paraguay became one of the largest exporters of hydroelectric power in the world. Paradoxically, the landlocked country of 6.6 million people has one of the lowest levels of electricity consumption in Latin America.

"That is exactly why people usually refer to Paraguay as one of the greenest countries in the world," according to Rómulo Martínez, OFID Public Sector Operations Officer in charge of Paraguay's projects.

"It not only has one of the world's largest working sources of hydroelectricity, but also makes one of the smallest carbon footprints, mainly because of its relatively small size and population," he pointed out.

The dam, owned by Paraguay and Brazil, was built to harness the immense water resources of both countries. It has the capacity to generate 14,000 megawatts of electricity.

Together with Argentina, Paraguay also co-owns the Yacyretá dam, site of another major hydropower plant, with a capacity of 3,200 MW. Both Itaipú and Yacyretá are on the Paraná River, which is second in length only to the Amazon.

Paraguay is the sole owner of the Acaray hydroelectric dam, which has a much lower capacity of 210 MW and supplies three per cent of the country's electricity demand.

The excess energy produced at the bi-national power plants of Itaipú and Yacyretá is immense in regional terms and is exported to neighbouring countries. For Paraguay, the surplus represents 30 times the electricity consumption of its industrial sector.

The World Bank has estimated that Paraguay's domestic electricity consumption per capita — of 1,000 kWh/year — is equivalent to one-third of the consumption levels of Brazil and Chile.

While Paraguay is blessed with an abundant hydro-power generation capacity, key weaknesses in its transmission and distribution hinder economic productivity in both the country's rural and urban areas. Export prospects are also constrained.

Electricity provision is deficient in both quality and reliability, with high system losses. With transmission systems operating close to their technical limits, voltage fluctuations and outages are commonplace, especially

OPEC Fund for International Development (OFID)

during warm weather, heavy rain and thunderstorms.

November 19, 2013, was a typical example. A one-day storm battered 12 departments, out of a total of 17, affecting up to 100,000 users.

Speaking to the press, Víctor Romero, President of Paraguay's National Electricity Administration (ANDE), disclosed that 90 per cent of the country's distribution system comprised bare overhead wires.

"We are working now on the possibility of replacing them with insulated overhead wires," he stated. To do so countrywide would require an investment of \$1.5 billion.

ANDE is responsible for the entire Paraguayan electricity sector, operating the electricity market, including tariff set-up, generation, transmission and distribution, as well as carrying out research into financing options. Its mandate is to provide an electricity service to all eligible customers.

In 2009, the Administration submitted a ten-year master plan with three broad objectives: reducing power loss in distribution and transmission; expanding transmission system capabilities; and enhancing efficiency and revenues by increasing the export capacity of ANDE to neighbouring countries.

The costs associated with the master plan have been estimated at \$1.3bn, with relatively little of the necessary financing yet secured. The country thus relies heavily on multilateral institutions, like the World Bank, OFID, the Andean Development Corporation (CAF) and other regional players.

In 2010, the government of Paraguay declared a state of emergency in the electricity sector. As the responsible party, ANDE was called upon to obtain long-term financing to guarantee uninterrupted, reliable access to electricity services, with regional integration and socio-economic development as its main priorities.

Within this framework, ANDE established a programme in which the major investments included the construction of a new high-voltage transmission, along with the strengthening of the existing system in the eastern and central regions.

Jointly with CAF, OFID is supporting the National Interconnected Electricity System Upgrading Project,



which is being managed and executed by ANDE and covers the eastern and central regions of Paraguay.

The main objective of the scheme is to improve the availability, reliability and quality of electrical power to poor and rural communities in 14 regional departments in the eastern region.

This represents almost 40 per cent of the country's total area and 97 per cent of the 6.1 million population. The 500,000 inhabitants of Asunción, the capital city in the central region, will also benefit from the upgraded system.

The project consists of the construction of a 220 kV transmission line with substations from Itakyry to Salto del Guairá in eastern Paraguay, and two new tranches of 66 kV transmission lines, also equipped with substations and complementary/adaptation works for the future construction of a 500-kV line. These will connect one of the largest generating units in the south — the Yacyretá power plant — with the country's capital.

OFID's support will help stabilize the power load on the national grid, thereby enhancing the reliability of the transmission systems and reducing losses.

The project is an important step towards the eradication of energy poverty, which paradoxically, is still affecting some parts of Paraguay, especially given the increasing domestic demand, which stands at 2,300 MW.

According to Martínez, the OFID/CAF response was particularly timely, considering the need for the country to be better prepared for the new 300-km, 500-kV transmission line, which will connect the border with Argentina to the Asunción area. The line, the largest in the country, is planned to enter into operations by 2018.



Students and professional groups wanting to know more about OPEC visit the Secretariat regularly, in order to receive briefings from the Public Relations and Information Department (PRID). In some cases, PRID visits schools to give them presentations on the Organization and the oil industry. Here we feature some snapshots of such visits.

Visits



Students from the Bohdan Hawrylyshyn Charitable Foundation, Ukraine, visited OPEC on February 10, 2014.



Students from the Graduate Institute, Geneva, Switzerland, visited OPEC on February 17, 2014.



Students from the Europaeische Akademie Bayern, Germany, visited OPEC on February 24, 2014.

Global oil demand in 2014 could be better than expected

February 2014

The likelihood for upward adjustments to world oil demand growth in 2014 is currently higher than existing projections, following the improvement seen in OECD oil demand, according to OPEC's *Monthly Oil Market Report (MOMR)* for February.

The Secretariat publication stated that 2014 world oil demand growth could be subject to some revisions, but the potential of the forecast for OECD oil demand was leaning to the upside, with improving economic conditions in the United States and Europe possibly turning out to be better than expected.

"However, downside risks still remain from fiscal issues in some OECD countries," said the *MOMR's* feature article.

For the non-OECD countries, it added, risks were skewed to the downside, due to fiscal and monetary issues, especially in some countries in Other Asia and Latin America.

The report forecast that world oil demand would grow by 1.1 million barrels/day, compared with the estimated 1.0m b/d a year ago.

In reviewing the global oil demand trend, it observed that, with the exception of 2008 and 2009, world oil demand had grown for the past 25 years.

"Within this period, the long-term trend suggests that oil demand growth typically follows the development of economic activities," it maintained.

It said the steady increase in world oil demand was driven by the combined effects of a growing world population and rising per capita income levels in the developing countries, despite increasing energy efficiency in

the advanced economies and growing concern in the developing nations as well.

Most incremental demand had been seen in non-OECD countries – led by China, India and the Middle East – while OECD demand had declined during the same period after peaking in 2005.

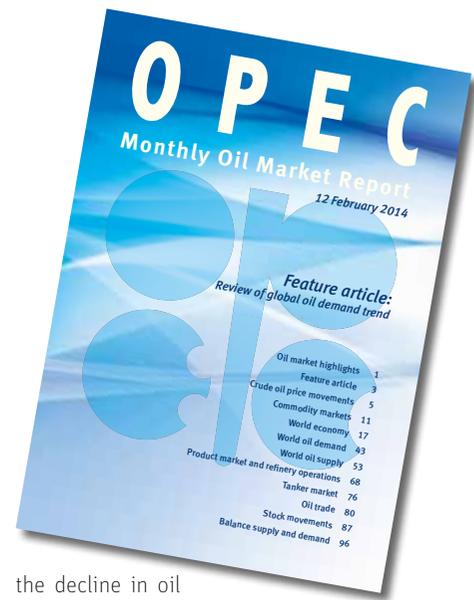
The *MOMR* said expected world economic growth this year, estimated at 3.5 per cent, compared with 2.9 per cent last year, would be associated with higher demand growth; however, the pace of this growth would vary within the economies.

"Furthermore, demand growth could be capped by the implementation of government policies that seek to not only increase efficiency for oil usage, but also encourage a shift away from oil to alternative fuels in a number of sectors, including transportation."

The article noted that the decline in global oil intensity was expected to accelerate in both the OECD and non-OECD regions, with the US and China leading the decrease, each at their respective pace.

"The rise in fuel efficiency standards, combined with the substantial oil-to-gas substitution in the US, on the one hand, and on the other hand, the transformation of China from an industry to a service-oriented economy, along with increasing concern about pollution, will impact oil intensity in both countries, albeit at different magnitudes," it contended.

As a result, said the *MOMR*, world oil demand in 2014 was projected to see some improvement, but would remain below potential growth, as rising economic activities counterbalanced



the decline in oil intensity.

Within the OECD regions, oil demand in 2014 was expected to decline by 100,000 b/d; however, growth was mixed within the regions.

In the OECD Americas, industrial fuels would be the driving force behind expected growth of around 100,000 b/d, in line with the anticipated improvement in industrial activities.

The *MOMR* said that in OECD Europe, the contraction in demand in 2014 would likely continue to ease as experienced in the second half of last year.

In the OECD Asia Pacific, the flourishing petrochemical industry would partly offset losses from direct fuel and crude oil burning for electricity generation, due to substitution in favour of gas and coal.

The article said that in the non-OECD region, the bulk of the 1.2m b/d growth expected in 2014 would originate from China and the Middle East.

In China, the transportation sector would dominate oil consumption, while in the Middle East, industrial activities and the petrochemical sector would lead to increased oil usage.

In Other Asia, India was projected to return to its more typical oil demand growth levels, in line with expectations for higher economic growth, with the transportation sector accounting for most of the increase.



MOMR oil market highlights ...

February 2014

The **OPEC Reference Basket** declined by almost \$3 to \$104.71/barrel in January amid bearish sentiment. ICE Brent futures dropped 3.2 per cent to \$107.11/b following a 2.5 per cent gain a month earlier. Nymex WTI also lost three per cent to average \$94.86/b, following a steep gain of more than four per cent in December. The Brent-WTI spread narrowed slightly to \$12.25/b.

World economic growth projections for 2013 and 2014 remained at 2.9 per cent and 3.5 per cent, respectively. The 2014 forecast for the OECD was revised up by 0.1 percentage points (pp) to two per cent, compared to 1.2 per cent in 2013. In contrast, China's growth for 2014 was revised down by 0.1 pp to the 2013 growth level of 7.7 per cent, while India's 2014 forecast remained at 5.6 per cent and at 4.7 per cent for 2013. The recent trend confirmed the acceleration in economic growth in the OECD, compared to a slow-down in the emerging economies.

World oil demand growth for 2013 was revised up by 30,000 b/d to stand at 1.0m b/d, mainly based on upward revisions for

the OECD Americas and Europe. For 2014, world oil demand growth is expected to increase to around 1.1m b/d, revised up by 50,000 b/d from the previous month.

Non-OPEC oil supply growth in 2013 was estimated at 1.28m b/d and expected to increase slightly to stand at 1.29m b/d in 2014, with growth mainly in the United States, Canada and Brazil, while Norway, the United Kingdom and Mexico are seen declining. Output of OPEC NGLs is expected to increase by 150,000 b/d in 2014. In January, OPEC crude production, according to secondary sources, averaged 29.71m b/d, up 28,000 b/d from a month earlier.

Oil product markets in the US strengthened in January, supported by severe winter weather, which caused a spike in heating fuel demand, and port operational problems, which affected supply. Meanwhile, European margins remained impacted by low domestic demand and a lack of export opportunities, while in Asia, refinery margins continued to recover on stronger seasonal demand, mainly from the petrochemical sector.

In January, dirty **spot freight rates** continued rising on average by 27 per cent from the previous month, with Suezmax and Aframax rates increasing, while VLCC freight rates dropped. This came on the back of weather delays and tight vessels' supply. Clean tanker spot freight rates decreased, except for tankers trading on the NW Europe-to-US route.

OECD commercial oil stocks fell in December, driven by the decline in both crude and products. Crude showed a surplus of 41m b over the five-year average, while products indicated a deficit of 110m b. OECD commercial stocks stood at 56.7 days of forward cover. Preliminary data for January indicated a drop in US commercial stocks, predominantly in products, driven mainly by rising demand for heating oil.

Demand for OPEC crude remained unchanged from the previous report at 29.9m b/d in 2013, a decrease of 500,000 b/d from the previous year. In 2014, required OPEC crude is forecast at 29.6m b/d, also unchanged and down by 300,000 b/d from a year earlier. 

The feature article and oil market highlights are taken from OPEC's Monthly Oil Market Report (MOMR) for February 2014. Published by the Secretariat's Petroleum Studies Department, the publication may be downloaded in PDF format from our Website (www.opec.org), provided OPEC is credited as the source for any usage. The additional graphs and tables on the following pages reflect the latest data on OPEC Reference Basket and crude and oil product prices in general.

OPEC remains upbeat about global economic recovery

March 2014

The assumption that the global economy will see a gradual recovery in 2014, led by growth acceleration in the major OECD economies, remains valid.

That is the view put forward by the OPEC Secretariat in its *Monthly Oil Market Report (MOMR)* for March.

It said that this more optimistic outlook was despite the softening economic indicators seen at the beginning of the year, particularly in the United States and China, which had highlighted some fragility in the on-going momentum.

“However, some of this might be explained by temporary factors, such as the extremely cold weather in the US and reduced economic activity, due to the Chinese New Year holiday,” said the report in a feature article.

It noted that, additionally, anticipation of a sales tax increase in Japan, the on-going challenges in domestic consumption in Brazil, and recent developments in Ukraine had added to the year’s growth risk.

The MOMR said that, on the positive side, the recovery in the Euro-zone, although gradual, seemed to be on track, while India’s economy also appeared to be continuing to recover from the low growth levels seen in the past year.

Looking at its forecasts, the report reiterated that the global economy was expected to rebound from last year’s GDP growth of 2.9 per cent to 3.5 per cent in 2014, unchanged from the initial forecast.

“OECD economies will contribute most of the increase, with growth improving from 1.3 per cent in 2013 to 2.0 per cent in 2014.”

The MOMR observed that US GDP growth

was now forecast at 2.7 per cent this year, compared to 1.9 per cent in 2013, supported by the underlying growth dynamic, which gained traction in the second half of 2013, along with the achievement of an agreement on fiscal issues.

It stressed that equally important for the OECD’s recovery was the rebound in the Euro-zone.

“The most pressing sovereign debt issues in the peripheral economies have been overcome and supportive measures for some vulnerable parts of the banking system make it more likely that the region will reach growth of 0.8 per cent this year, following last year’s contraction of 0.4 per cent.”

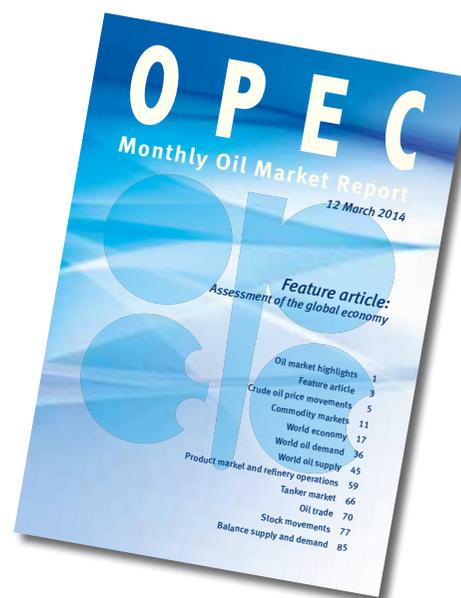
In Japan, said the MOMR, stimulus efforts had a positive impact on GDP growth in 2013 and some of this momentum was expected to continue into the current year, although the effect of the April sales tax increase remained uncertain.

Growth in Japan was expected at 1.5 per cent in 2014, slightly lower than the 1.6 per cent seen in the previous year.

The report pointed out that China was now forecast to expand at 7.6 per cent in 2014, almost at the same level as in the past year. The country recently announced its growth target of 7.5 per cent.

“Achieving this target will depend on balancing growth requirements with efforts to enact planned reforms, particularly in the financial sector,” observed the article.

It noted that India was on the path of recovery from relatively low growth in 2013 and was



forecast to grow by 5.6 per cent in the current year, with most recent indicators confirming this forecast.

The Russian economy was expected to see 1.9 per cent growth this year, although the report stated that recent developments had highlighted several uncertainties.

“This rising risk of a slowdown in growth in the emerging economies has been mirrored in the foreign exchange markets in recent months. This has been partly triggered by the US Fed’s tapering of monetary stimulus, leading to a reassessment of emerging market fundamentals, which resulted in an outflow of foreign investment,” it maintained.

The MOMR said that with the expectation of a further reduction of US monetary stimulus and a more accommodative approach by central banks in Europe and Japan, a likely appreciation in the US dollar may impact commodity markets globally.

“While many challenges remain, the expected improvement in the global economy is also resulting in higher oil demand as growth in global oil consumption is forecast at 1.1 million barrels/day in the current year, compared to 1.0m b/d in 2013.

“In the light of the prevailing uncertainties, a key determinant for this increase in world oil demand will be the pace of growth in the emerging economies,” it concluded.

MOMR oil market highlights ...

March 2014

The **OPEC Reference Basket** edged up by 70¢ to settle slightly above \$105/b in February, as cold weather, supply disruptions and geopolitical factors helped to push oil markets higher. The Nymex WTI front-month contract gained a hefty \$5.82 to average \$100.68/b, while ICE Brent futures rose by \$1.72 to \$108.84/b. The Brent-WTI spread narrowed sharply to \$8.15/b.

World economic growth for 2013 and 2014 remained at 2.9 per cent and 3.5 per cent, respectively. The 2014 forecast for the OECD was unchanged at 2.0 per cent, compared to 1.3 per cent in 2013. In contrast, China's growth for 2014 was revised down slightly to 7.6 per cent, just below estimated 2013 growth of 7.7 per cent. India's forecast remained at 4.7 per cent for 2013 and 5.6 per cent for 2014. The ongoing trend of accelerating economic growth in the OECD amid a slowdown in the emerging economies has been confirmed by the latest data.

World oil demand growth for 2013 was revised up by 70,000 b/d to stand at 1.05m b/d. Upward revisions were seen

in OECD Americas and Europe, reflecting stronger-than-expected seasonal demand for the fourth quarter of last year. Africa was also higher, due to baseline effects. For 2014, global oil demand is seen rising by 1.14m b/d, following an upward revision of 50,000 b/d.

Non-OPEC oil supply is expected to increase by 1.31m b/d in 2014, following estimated growth of 1.33m b/d in 2013.

Growth is seen mainly coming from the US, Canada, and Brazil, while Norway, the UK and Mexico are seen declining. In February, OPEC crude oil production, according to secondary sources, averaged 30.12m b/d, up by 259,000 b/d from a month earlier.

Oil product markets in the Atlantic Basin received support in February from reopened gasoline arbitrage to the US East Coast, which allowed European margins to rebound sharply. In the US, refining margins weakened as the decline in middle distillates and fuel oil cracks offset gains in gasoline. In Asia, refinery margins recovered further as markets temporarily tightened, due to refinery disruptions and the start of seasonal maintenance.

In the **tanker market**, dirty spot freight rates declined in February by an average of 39 per cent from the previous month. The drop was mainly due to the start of the refinery maintenance season, surplus tonnage supply, improved weather conditions in the Turkish Straits, and lower tonnage demand. Clean tanker spot freight rates dropped on average by 6.0 per cent in February.

OECD commercial oil stocks continued to fall in January after a sizeable decline in the fourth quarter of last year. Crude and products showed a deficit of 19m b and 123m b, respectively, compared to the five-year average. In February, US total commercial oil stocks increased, but remained 32.0m b below the five-year average, with crude some 8.0m b above the seasonal norm.

Demand for **OPEC crude** for 2013 and 2014 was revised up by 100,000 b/d to stand at 30.0m b/d and 29.7m b/d, respectively. Compared to the previous year, demand for OPEC crude is expected to decline by 300,000 b/d in 2014, following an estimated drop of 500,000 b/d in 2013. ❧

The feature article and oil market highlights are taken from OPEC's Monthly Oil Market Report (MOMR) for March 2014. Published by the Secretariat's Petroleum Studies Department, the publication may be downloaded in PDF format from our Website (www.opec.org), provided OPEC is credited as the source for any usage. The additional graphs and tables on the following pages reflect the latest data on OPEC Reference Basket and crude and oil product prices in general.

Table 1: OPEC Reference Basket crude oil prices
\$/b

Crude/Member Country	2013											2014		Weeks 5-9/14 (week ending)				
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Jan 31	Feb 7	Feb 14	Feb 21	Feb 28
Arab Light – Saudi Arabia	113.95	107.61	101.97	101.06	101.30	105.03	108.09	109.48	107.14	104.84	108.07	105.74	106.30	105.38	103.66	106.25	107.69	107.59
Basrah Light – Iraq	110.48	104.17	98.22	98.23	98.94	103.24	106.07	106.61	103.69	101.63	105.12	102.70	103.38	102.42	100.98	103.38	104.59	104.57
Bonny Light – Nigeria	118.69	110.57	105.17	105.83	106.12	110.21	113.62	114.30	112.44	111.47	113.11	110.26	110.77	110.81	109.59	111.11	111.38	111.00
Es Sider – Libya	116.29	108.37	102.22	102.63	103.07	107.91	111.07	111.60	108.74	107.57	110.41	107.86	108.47	108.41	107.29	108.81	109.08	108.70
Girassol – Angola	116.22	109.48	103.84	103.69	104.23	107.55	110.80	112.13	110.20	108.83	111.31	107.96	109.54	108.49	107.30	109.62	110.75	110.50
Iran Heavy – IR Iran	112.24	105.47	99.71	99.72	100.61	103.65	107.06	109.15	107.69	106.87	108.96	104.89	104.96	104.75	102.43	105.00	106.47	105.94
Kuwait Export – Kuwait	111.79	105.17	100.07	99.82	100.22	103.22	106.47	108.02	106.13	104.73	107.30	103.79	104.17	103.51	101.55	104.16	105.64	105.33
Marine – Qatar	110.94	105.36	101.55	100.22	100.20	103.34	106.67	108.15	106.61	105.83	107.76	103.95	104.91	103.79	102.44	105.04	106.42	105.73
Merely* – Venezuela	101.94	98.55	93.84	94.02	95.37	95.68	98.06	97.85	96.80	94.83	96.61	93.72	94.00	94.21	92.80	94.09	94.87	94.25
Murban – UAE	113.92	108.45	104.46	102.83	102.61	105.58	109.18	111.14	110.13	109.36	111.22	107.66	108.69	107.54	106.14	108.72	110.22	109.68
Oriente – Ecuador	103.41	100.86	95.56	96.40	96.01	99.54	98.24	100.43	95.16	89.72	96.56	93.44	97.44	95.00	95.41	97.84	99.18	97.34
Saharan Blend – Algeria	116.99	108.87	102.97	102.83	102.07	107.56	111.87	112.95	111.04	109.27	112.66	109.96	110.52	110.51	109.34	110.86	111.13	110.75
OPEC Reference Basket	112.75	106.44	101.05	100.65	101.03	104.45	107.52	108.73	106.69	104.97	107.67	104.71	105.38	104.68	103.10	105.43	106.65	106.35

Table 2: Selected OPEC and non-OPEC spot crude oil prices
\$/b

Crude/Member Country	2013											2014		Weeks 5-9/14 (week ending)				
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Jan 31	Feb 7	Feb 14	Feb 21	Feb 28
Minas – Indonesia ¹	119.62	109.47	101.25	99.11	103.19	103.38	105.55	114.38	106.98	104.28	106.38	110.60	108.46	112.62	108.18	109.62	109.00	107.03
Arab Heavy – Saudi Arabia	110.15	103.16	98.50	98.98	99.64	101.78	105.33	106.72	105.04	104.90	106.77	102.21	102.34	102.04	99.77	102.37	103.87	103.33
Brega – Libya	116.49	108.62	102.67	103.03	103.27	108.11	111.52	112.15	109.29	108.17	111.01	108.46	109.12	109.01	107.94	109.46	109.73	109.35
Brent – North Sea	116.29	108.37	102.17	102.53	102.92	107.96	111.27	111.90	109.04	107.97	110.81	108.26	108.87	108.81	107.69	109.21	109.48	109.10
Dubai – UAE	111.25	105.55	101.68	100.30	100.32	103.52	106.81	108.28	106.70	105.95	107.80	104.01	105.04	103.84	102.47	105.07	106.57	106.03
Ekofisk – North Sea	117.68	110.43	103.53	103.60	103.79	108.77	112.54	113.69	110.28	108.88	111.85	109.06	110.06	109.33	108.22	110.37	111.11	110.53
Iran Light – IR Iran	114.68	108.52	101.27	100.98	101.73	105.54	109.17	110.47	108.19	106.52	108.98	105.33	106.47	105.47	104.10	106.55	107.79	107.43
Isthmus – Mexico	113.44	109.86	105.48	105.48	104.08	109.18	109.09	106.80	99.84	93.83	98.39	96.35	100.47	96.56	98.51	100.49	101.35	101.51
Oman – Oman	111.25	105.56	101.72	100.46	100.35	103.53	106.94	108.56	106.78	105.95	107.83	104.01	105.04	103.84	102.47	105.07	106.57	106.03
Suez Mix – Egypt	111.68	104.23	99.12	99.89	100.13	105.41	108.08	108.36	105.72	105.15	107.56	103.02	104.77	103.77	102.75	104.88	105.97	105.50
Urals – Russia	114.51	107.01	102.06	102.52	102.74	108.06	110.75	110.92	108.28	107.73	110.44	106.40	107.43	106.74	105.47	107.51	108.60	108.16
WTI – North America	95.31	92.87	91.97	94.60	95.74	104.51	106.55	106.26	100.41	93.76	97.72	94.90	100.78	97.20	97.87	100.20	102.45	102.58

Note: As per the decision of the 109th ECB (held in February 2008), the OPEC Reference Basket (ORB) has been recalculated including the Ecuadorian crude Oriente retroactive as of October 19, 2007. As per the decision of the 108th ECB, the ORB has been recalculated including the Angolan crude Girassol, retroactive January 2007. As of January 2006, monthly averages are based on daily quotations (as approved by the 105th Meeting of the Economic Commission Board). As of June 16, 2005 (ie 3W June), the ORB has been calculated according to the new methodology as agreed by the 136th (Extraordinary) Meeting of the Conference. As of January 2009, the ORB excludes Minas (Indonesia).

* Upon the request of Venezuela, and as per the approval of the 111th ECB, BCF-17 has been replaced by Merely as of January 2009. The ORB has been revised as of this date.

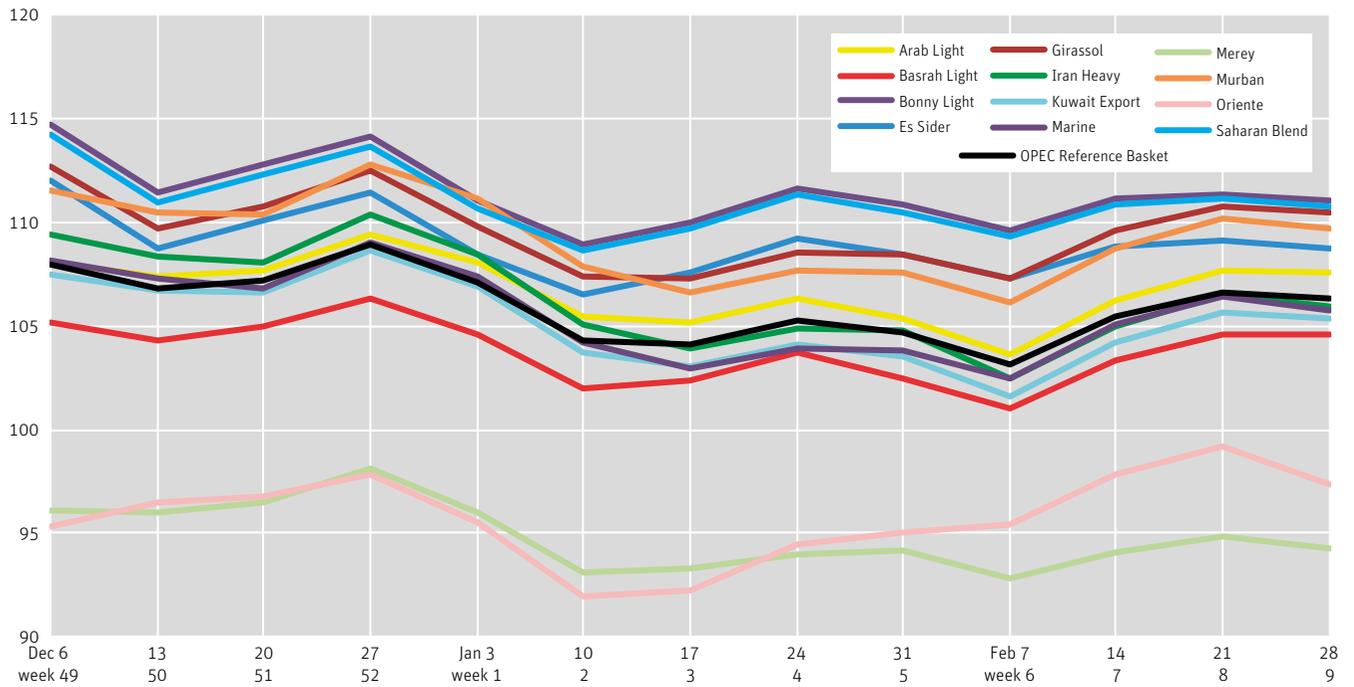
1. Indonesia suspended its OPEC Membership on December 31, 2008.

Brent for dated cargoes; Urals cif Mediterranean. All others fob loading port.

Sources: The netback values for TJL price calculations are taken from RVM; Platt's; Secretariat's assessments.

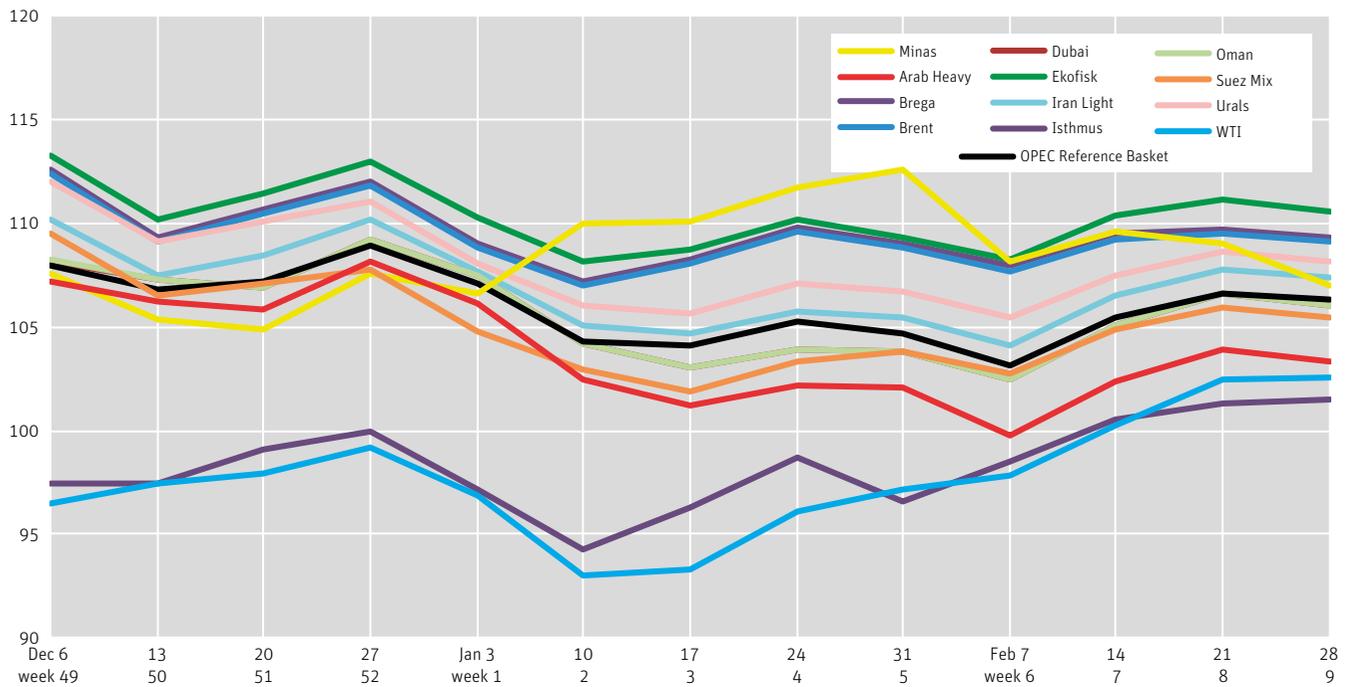
Graph 1: Evolution of the OPEC Reference Basket crudes, 2013-14

\$/b



Graph 2: Evolution of spot prices for selected non-OPEC crudes, 2013-14

\$/b



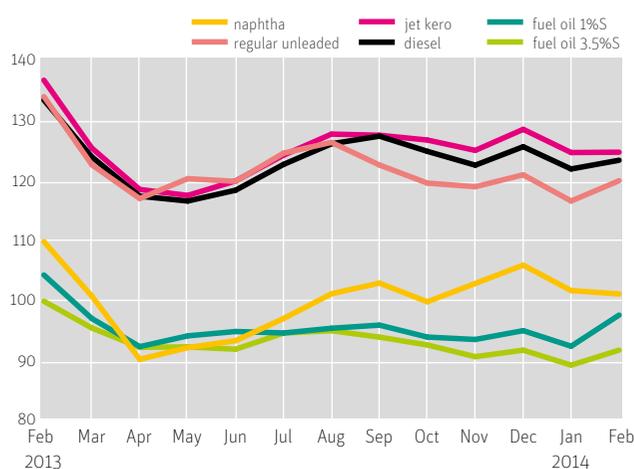
Note: As per the decision of the 109th ECB (held in February 2008), the OPEC Reference Basket (ORB) has been recalculated including the Ecuadorian crude Oriente retroactive as of October 19, 2007. As per the decision of the 108th ECB, the basket has been recalculated including the Angolan crude Girassol, retroactive January 2007. As of January 2006, monthly averages are based on daily quotations (as approved by the 105th Meeting of the Economic Commission Board). As of June 16, 2005 (ie 3W June), the ORB has been calculated according to the new methodology as agreed by the 136th (Extraordinary) Meeting of the Conference. As of January 2009, the ORB excludes Minas (Indonesia).

Upon the request of Venezuela, and as per the approval of the 111th ECB, BCF-17 has been replaced by Mery as of January 2009. The ORB has been revised as of this date.

Table and Graph 3: North European market – spot barges, fob Rotterdam

\$/b

	naphtha	regular gasoline unleaded	diesel ultra light	jet kero	fuel oil 1 per cent S	fuel oil 3.5 per cent S
2013						
February	109.76	133.87	133.30	136.61	104.22	99.85
March	100.70	122.54	123.85	125.31	96.98	95.40
April	90.19	116.92	117.31	118.43	92.30	92.19
May	92.13	120.23	116.51	117.44	94.09	92.26
June	93.29	119.78	118.31	119.85	94.82	91.87
July	96.98	124.48	122.60	124.14	94.57	94.55
August	101.10	126.26	126.03	127.64	95.36	94.95
September	102.87	122.50	127.30	127.45	95.88	93.88
October	99.76	119.49	124.77	126.65	93.89	92.58
November	102.81	118.89	122.47	124.93	93.49	90.63
December	105.86	120.87	125.54	128.43	94.96	91.72
2014						
January	101.62	116.51	121.84	124.57	92.37	89.22
February	101.07	119.89	123.29	124.63	97.55	91.72



Note: Prices of premium gasoline and diesel from January 1, 2008, are with 10 ppm sulphur content.

Table and Graph 4: South European market – spot cargoes, fob Italy

\$/b

	naphtha	premium gasoline 50ppm	diesel ultra light	fuel oil 1 per cent S	fuel oil 3.5 per cent S
2013					
February	106.55	130.68	133.96	104.50	98.87
March	97.68	120.98	122.98	96.03	94.69
April	87.46	116.61	116.12	91.59	90.74
May	89.61	116.33	115.82	94.14	90.75
June	91.01	116.40	117.70	95.54	91.90
July	94.51	121.89	122.76	94.27	93.85
August	98.53	124.28	125.75	95.63	94.35
September	100.74	119.30	126.39	96.39	94.09
October	97.78	114.49	125.15	93.94	92.18
November	100.56	112.43	123.29	93.94	91.29
December	102.81	115.53	126.27	95.90	90.93
2014					
January	98.76	113.28	123.07	92.94	90.16
February	98.45	116.41	124.05	98.88	91.58

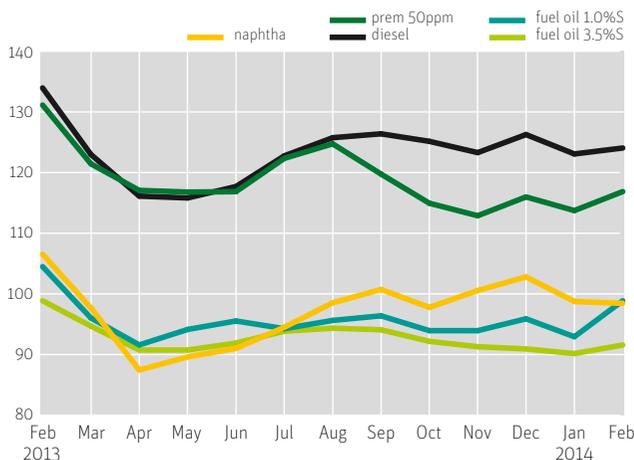
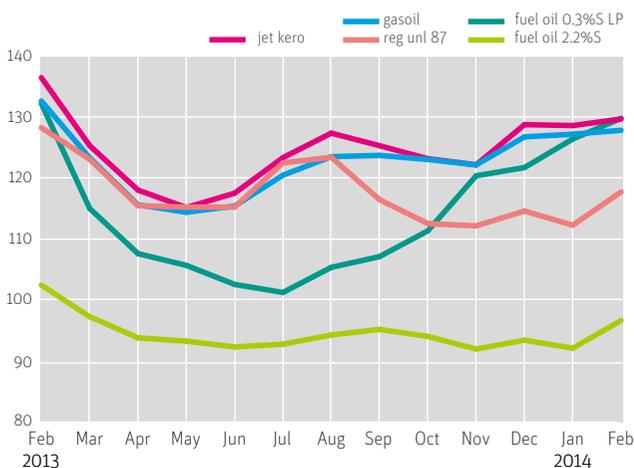


Table and Graph 5: US East Coast market – spot cargoes, New York

\$/b, duties and fees included

	regular gasoline unleaded 87	gasoil	jet kero	fuel oil 0.3 per cent S	fuel oil 2.2 per cent S
2013					
February	128.24	132.63	136.47	132.23	102.34
March	123.04	123.26	125.29	114.95	97.15
April	115.39	115.54	117.97	107.52	93.67
May	115.16	114.32	115.10	105.59	93.12
June	115.17	115.34	117.45	102.46	92.17
July	122.43	120.42	123.30	101.13	92.62
August	123.37	123.47	127.33	105.26	94.14
September	116.39	123.67	125.27	107.03	95.06
October	112.46	123.00	123.13	111.27	93.90
November	112.08	122.11	122.12	120.32	91.83
December	114.52	126.72	128.73	121.67	93.28
2014					
January	112.20	127.16	128.58	126.38	91.97
February	117.66	127.80	129.67	129.77	96.51



Source: Platts. Prices are average of available days.

Table and Graph 6: Caribbean market – spot cargoes, fob

\$/b

	naphtha	gasoil	jet kero	fuel oil 2 per cent S	fuel oil 2.8 per cent S
2013					
February	127.69	133.53	136.72	99.34	96.50
March	119.80	123.60	125.96	94.15	91.25
April	97.11	116.33	119.14	90.67	87.48
May	93.77	115.81	116.04	90.12	86.64
June	88.24	117.61	117.88	89.26	84.81
July	105.97	121.79	123.23	90.10	85.10
August	107.39	125.58	127.83	91.94	86.94
September	106.06	124.68	124.38	94.10	89.10
October	104.98	123.37	122.88	91.43	86.43
November	103.69	120.25	119.92	89.69	84.69
December	113.46	124.38	125.53	91.69	86.69
2014					
January	110.69	121.90	123.68	89.50	84.50
February	107.77	122.19	126.34	92.60	87.60

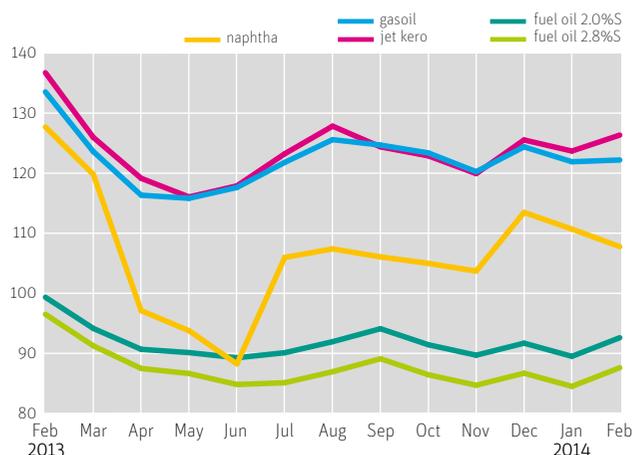


Table and Graph 7: Singapore market – spot cargoes, fob

\$/b

	naphtha	premium gasoline unl 95	premium gasoline unl 92	gasoil	jet kero	fuel oil 180 Cst	fuel oil 380 Cst
2013							
February	111.89	132.98	129.78	132.75	133.77	102.05	101.44
March	102.09	124.00	120.78	123.64	123.50	99.53	98.49
April	93.43	113.95	110.77	116.77	116.20	96.42	95.45
May	93.56	114.40	111.08	116.72	115.37	95.87	94.19
June	94.16	117.85	114.75	119.28	116.75	96.81	93.38
July	97.70	121.73	118.79	123.14	121.18	95.23	93.15
August	101.01	117.11	114.67	124.14	124.73	97.82	94.46
September	102.76	117.31	114.28	123.57	123.87	96.30	94.48
October	100.20	114.36	111.60	123.89	123.08	96.88	95.69
November	103.69	114.89	111.94	123.34	122.63	96.32	93.88
December	107.53	118.66	115.81	126.33	126.68	97.02	94.92
2014							
January	104.47	117.98	114.66	121.56	121.63	96.46	94.56
February	102.37	119.71	116.70	123.53	122.78	96.29	94.83

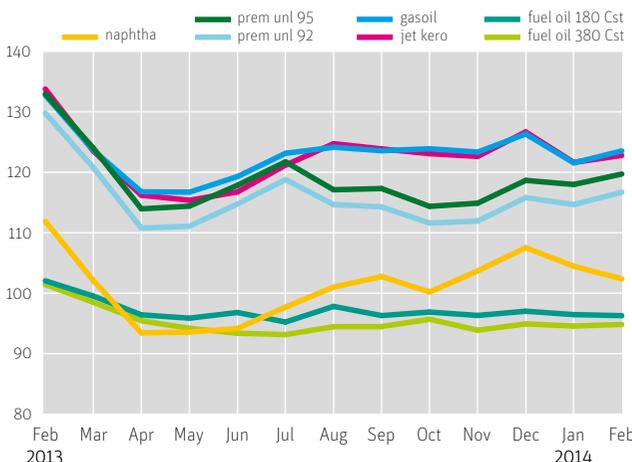
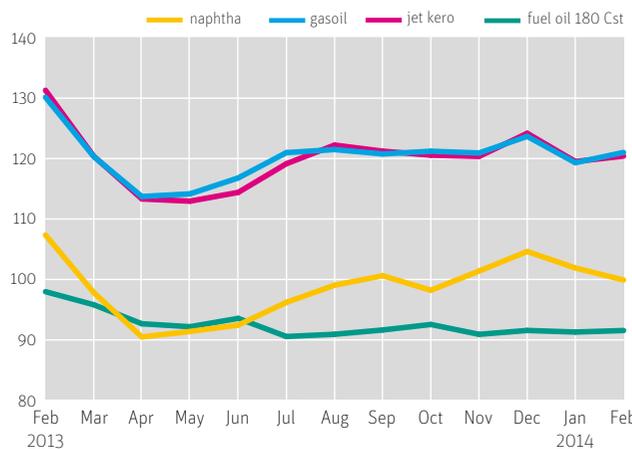


Table and Graph 8: Middle East Gulf market – spot cargoes, fob

\$/b

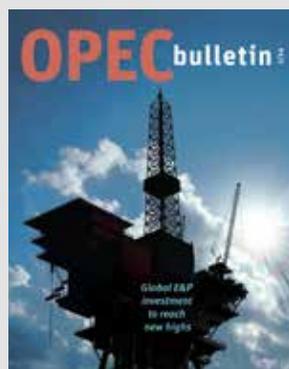
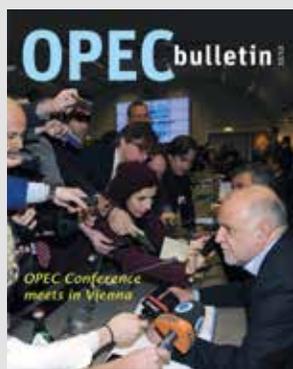
	naphtha	gasoil	jet kero	fuel oil 180 Cst
2013				
February	107.36	130.14	131.30	97.98
March	97.85	120.35	120.40	95.82
April	90.49	113.72	113.32	92.67
May	91.39	114.16	112.95	92.18
June	92.45	116.79	114.40	93.56
July	96.21	120.98	119.14	90.56
August	99.05	121.49	122.23	90.93
September	100.62	120.76	121.22	91.64
October	98.21	121.21	120.56	92.55
November	101.39	120.92	120.35	90.92
December	104.63	123.67	124.18	91.56
2014				
January	101.90	119.31	119.51	91.30
February	99.91	121.01	120.40	91.55



Source: Platts. Prices are average of available days.

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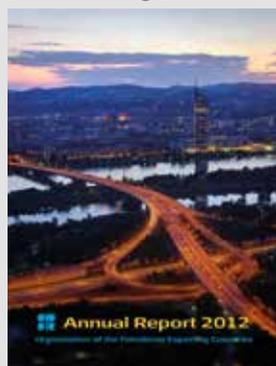
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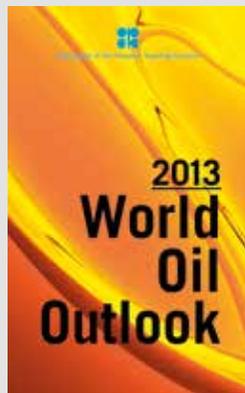


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