

Energy in Transition

MENAT's Transformation: Vol 1, 2019



In partnership with
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Publishing

Thegulfintelligence.com

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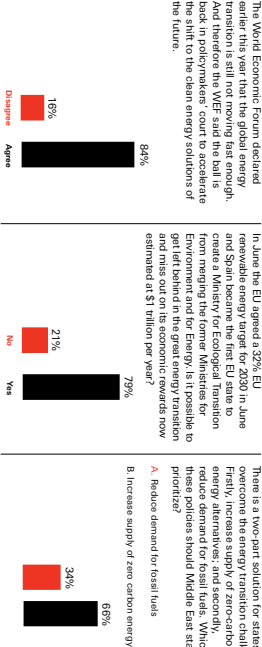
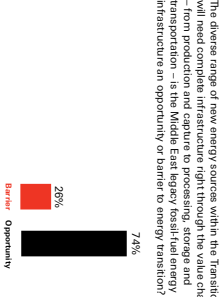
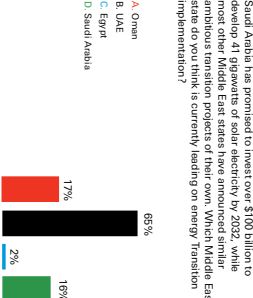
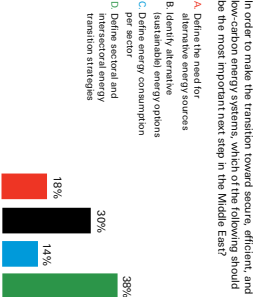
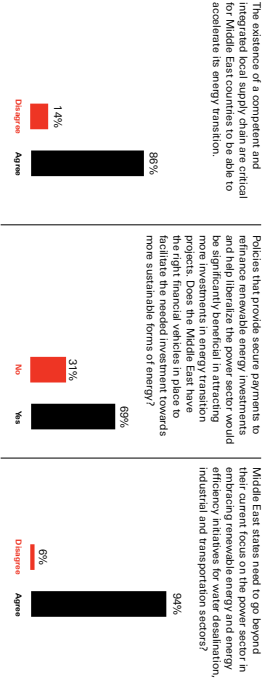
Middle East

Energy Transition Survey

Think Global & Act Local to Accelerate Impact!

Our Survey polled 600 regional stakeholders from industry, government and academia in December 2018 on what next steps are required to accelerate the region's energy transition.

"Some 86% of respondents identified that it was critical for the Middle East to develop competent and integrated local supply chains to propel their energy transformation. Some 69% said they were confident the region had the right financial vehicles in place to facilitate the needed investment towards more sustainable forms of energy."





Keep the Green Dollars Coming

BY ZOE KNIGHT
Group Head, Centre of Sustainable Finance, HSBC



Have no doubt: the energy transition is expensive business. Investor confidence is pivotal to meeting a target that the world cannot afford to miss: the sustainable implementation of the Paris Agreement. What is one key ingredient to build investor appetite? Transparency. We are all still figuring out what good

decarbonization looks like, so bolstering clarity will improve forecasts and risk-reward profiles. Meeting the goals of the energy transition and the Paris Agreement requires a greening of the global financial framework through easy communication and deep-collaboration. These off-used

\$300bn
For the fifth consecutive year, global clean energy investment exceeded the \$300 billion benchmark, reaching \$322 billion in 2018, detailed Bloomberg New Energy Finance (BNEF).

words can easily lose meaning. But there is no time for slack schedules: the environmental clock is ticking too loudly. One major step that requires both is greater clarity on the Paris Agreement, which details the need for a more consistent, collective progress towards achieving its purpose and long-term goals. This process is called the global stocktake and is due in 2023. Success at navigating the myriad of nuances in every company, country and region to achieve this goal means the effectiveness and timeliness of this process in just four years will be key to setting the global tone going forward.

Investment in the energy transition is proceeding on more than one front: technological, financial, economic and environmental forecasts – for both fossil fuels and renewables – are as accurate as possible. Having such signposts will help investors move step-by-step through what is largely uncharted territory and enable them to mitigate the assumed risks, such as stranded assets and the physical implications of climate change (forced migration, natural disasters). In turn, this frees up capacity for investment in the energy transition. The changes will play out and the best financial instruments to help the energy industry adapt. This will help relieve an unenvying guessing game, which risks putting even budding climate finance pioneers on the back foot.

GREEN FUTURE

Momentum towards the energy transition is certainly growing. In the GCC alone, investment in clean energy has tripled in the last five years. Energy has made striking gains. Among other renewable and energy efficiency targets, clean energy must account for 44% of the UAE's energy capacity by 2050. Saudi Arabia is aiming for 30% of generation from renewables and others (mainly nuclear) by 2030 and Kuwait is aiming for 15% in the same year. Green goals form a cornerstone of countries' National Visions and all signed on the Paris Agreement. The region's significant starting conditions are nationally determined contributions (NDCs). For example, Saudi Arabia's NDC included the aim of becoming a global technology leader in carbon capture and storage (CCS) – a move that can help showcase the region's innovative spirit. And the UAE already surpasses close to 70% of the installed solar PV capacity in the GCC and has managed to attract some low-cost solar PV projects without offering

Achieving renewable energy deployment targets would reduce emissions by 136 million tonnes of carbon dioxide, according to IRENA.

subsidies, according to Abu Dhabi-based International Renewable Energy Agency (IRENA). This is monumental in a region where subsidies have long been intertwined with economic growth. IRENA highlights how progress has elevated from small-scale pilot projects to almost 70MW of new power generation capacity and record-breaking bids in renewable energy auctions in the UAE and Saudi Arabia. Such auctions also

have been a key driver in the region's conventional energy technologies, an impressive step-change for the historical epicentre of fossil fuels. Geography is a major ace card in the region's clean energy game. Aside from abundant sunshine, GCC countries – particularly Kuwait, Oman, and Saudi Arabia – have good wind resources that are being affordably leveraged with the deployment of higher turbine towers and longer blades.

Adding renewable energy deployment targets would reduce emissions by 136 million tonnes of carbon dioxide, according to IRENA. It would also create more than 220,500 direct jobs in a region that forms part of the Middle East and North Africa (MENA), which the International Labor Organization (ILO) said retains the highest rate of youth unemployment worldwide. And water withdrawal for power generation would also fall by 11.5 billion litres (1.7%), critical for a region facing water scarcity challenges. The cost of investment in clean energy is well contained – it far exceeded – by the above benefits. The equation is simple: the world needs the energy transition, the energy transition needs investors and investors need transparency. Lift the veil and the funds will flow more easily, truly a win-win.

-8%

While total global green energy investment reached \$300 billion last year, it was still 8% down on 2017, according to Bloomberg. The growing momentum of emerging markets in this field. Why? In short, the magnitude of change incurred by the great energy transition takes some time to get used to.

3%

What investment rose by 3% was the need for more green offsets, well below the world's highest year. Money committed to smart materials and electric vehicle company startups also increased. BNEF reported.

-24%

Solar commitments declined by 24% to \$150.5 billion in 2018, according to BNEF, even though the world's solar public capacity meant the 100GW barrier was broken for the first time.

12%

The decline in solar is in part due to sharply declining capital costs and BNEF's global benchmark for the cost of installing a megawatt of capacity fell by 12% in 2018. The 100GW capacity is a glint of PV modules on the world market.

\$21bn

The value of sustainability and SDG bonds issued in 2018 – a staggering 11% year-on-year rise. Climate bonds data revealed.

\$1.6trn

Carbon Tracker warned that fossil fuel companies risk wasting \$1.6 trillion of expenditure by 2025 if they base their business on emissions policies already announced by governments instead of international climate goals.

A Complementary Blend

Fossil Fuels & Renewables in the 21st Century

BY H.E. SAIF HUMAID AL-FALASI
GCCO, ENOC Group; former Technical Advisor for Deputy CEO ADNOC;
former Deputy General Manager, ZADCO; former Head of Reservoir
Engineering, ADMA-OPCO



The oil and gas markets that have been the wind in the sails of the Middle East's economic growth since the mid-1900s are charting a new course. A new era beckons as rising populations and obligations to the Paris Agreement mean an 'energy basket' will be the mainstay of the 21st century. BP's 2050 Energy Outlook foresees the Middle East's energy consumption up to 2040. A multi-faceted energy basket, which utilises both fossil fuels and renewable energy is a proactive approach to meet this demand at an affordable cost.

The UAE Energy Strategy 2050 illustrates how the future energy mix will have a low-carbon theme: the country's 'basket' will comprise 38% gas, 44% clean energy, 6% nuclear, and 12% coal. Efforts to increase low-carbon and coal energy will be a key focus. The strategy, with significant changes already under way, The UAE government aims to invest AED 600 billion (\$163 billion) by 2050 to meet the growing energy demand and ensure a sustainable growth for the country's economy, while strategies to mitigate the negative impacts of climate change and build a green economy are two threads of the Sustainability theme at GCCO 2020. As a natural gas producer and exporter, the UAE's pioneering dedication to a low-carbon future – it will be the Middle East's first nuclear power plant when it starts coming online later this year. But leveraging renewable energy does not translate into fossil fuels being a 'sunset industry', ready to fade into history books. Oil and gas will remain an integral part of the global energy mix for at least four more decades.

"The UAE Energy Strategy 2050 illustrates how the future energy mix will have a low-carbon theme: the country's 'basket' will comprise 38% gas, 44% clean energy, 6% nuclear, and 12% clean coal."

"It is far too early to write the obituary of oil, as growth for trucks, petrochemicals, shipping and aviation keep pushing demand higher," said Dr. Fahih Binul, the International Energy Agency's (IEA's) Executive Director. The agency's World Energy Outlook 2017 report details how oil demand will continue to grow up to 2040, although at a steadily decreasing pace. But other sectors – namely petrochemicals, trucks, aviation and shipping – are projected to add 105 million barrels a day total by 2040.

FRIENDS, NOT FOES

Renewables will play a complementary, rather than competitive, role to fossil fuels in the foreseeable future. But there is no doubt that energy and economic security in Dubai and beyond relies on the prosperity of both. BP Energy Outlook anticipates that the Middle East will remain the world's largest oil producer and the second largest oil exporter. The region will account for over 34% of global liquids production and 20% of gas production by 2040. At the same time, he share of non-fossil fuels in the Middle East's primary energy demand mix increases from 1% in 2017 to 13% in 2040. While non-fossil fuels account for a smaller percentage in 2040, the figures still mark a steady growth rate when considering it will require new

technologies, policies and a societal shift in the way energy is consumed. It would be a mistake to discount the importance of renewables.

Gulf countries' innovative plans to merge both camps – fossil fuels and renewables – are already paying off in the field of enhanced oil recovery (EOR) technologies. Projects centered on a win-win scenario are helping reduce emissions and streamline operational costs. The UAE's first EOR project, aimed at increasing the life of the oil field and avoiding today's oil prices. One illustration of how the two camps blend their operations lies to the east. Once fully operational, Oman's Miratsh solar thermal plant will generate 6,000 tons of steam per day via 36 glasshouses to support state-owned and Shell-led Petroleum Development Oman's (PDO) existing Thermal EOR technology at the Ararat field. The \$500 million project came on stream in 2017 and has the potential to make a 38% saving of natural gas at the field.

Nurturing talent to drive this new blend of energy innovation in the 21st century will climb higher on energy companies' agendas. Critical and imaginative thinkers with fluency in the digital tools of the 4th Industrial Revolution will be integral to carving out the new status quo. Mastering the rapidly growing digital tool box – from predictive analytics, big data

Green targets

The UAE formally ratified the Paris Agreement in September 2016. The Agreement is the world's most comprehensive deal to mitigate the negative impacts of climate change and marks the biggest rise in political momentum for positive change since the Kyoto Protocol was signed in 1997. Efforts to put down the finer details of each country's commitments are discussed throughout the year and at the United Nations Framework Convention on Climate Change, held annually in the fourth quarter. Looking ahead, energy companies will have to frequently review their roadmaps to accommodate the increasingly strict rule book.

~~2°C~~

Improved energy efficiency will play a vital role in meeting the Paris Agreements long-term goal of keeping the increase in the global average temperature to well below 2°C above pre-industrial levels.

2016

Progress is under way. The Netherlands' Environmental Assessment Agency said the level of CO2 emissions in the world's biggest emitting nations either fell or were static in 2016, in large part due to energy efficiency.

28%

The global population will rise to 9.7 billion from today's 7.6 billion—a 28% climb. Affordably meeting energy demand while hitting low-carbon targets could become harder, not easier. Proactive efforts are vital.

2,100

Waste Heat Recovery project at the ENOC Refinery saved natural gas consumption equivalent to AED2.7 million a year. Flue gas temperatures were reduced from 250°C to 150°C, ensuring more efficient energy usage over the lifetime of the naphtha hydrocrack treatment plant. It also includes an annual reduction of CO₂ emissions by 10,000 tons, equating to removing 2,100 cars from the roads for one year.

"Collaboration, transparency and innovation will enable energy companies to surf the waves of positive change, rather than being submergred by them."

Efficiency ethos must gain pace

Energy efficiency represents a key release valve on the burgeoning pressure to meet rising demand. Energy intensity – measured as the amount of primary energy demand needed to produce one unit of gross domestic product (GDP) – fell by 1.7% in 2017, the slowest rate improvement this decade. Why? Global energy demand rose by 1.9% in 2017 – the fastest annual increase since 2010. This meant that the forces driving up energy demand, led by strong economic growth, outpaced progress on energy efficiency.

2040

By leveraging the range of cost effective energy efficiency opportunities widely available today, energy intensity would improve by around 3% per year between now and 2040.

\$500bn

Efficiency gains alone could allow the world to extract twice as much economic value from the energy it uses compared to today. Doing so would reduce energy bills for consumers by more than \$500 billion per year and lower pollution levels.

4.5x

The economic efficiency of renewables improved in 2017, spurring investors' appetite. In emerging markets, the average size of awarded solar PV projects in auctions rose by 4.5 times while that of onshore wind rose by half between 2013-2017.

3%

In the past, there has been a roughly linear relationship between upstream costs and oil prices. When prices spiked, so did costs, and vice versa. What the IEA now notes is a decoupling. While oil prices have more than doubled since 2016, global upstream costs have remained substantially flat. Companies appear to have learned to do more with less.

09

A member of the ENOC Group, the Dugas Waste Water Treatment project has purified waste water so that it can be used for irrigation. Water saving of more than 26 million liters per year is equivalent to reducing water demand for 60 households in Dubai.

12.7bn

The planet's oil wells will produce 12.7 billion gallons a day of water by 2020, according to Total. This equates to an average of three to five barrels of water for every barrel of oil produced.

14%

MENA will have the greatest expected economic losses from climate-related water scarcity by 2050, at up to 14% of GDP.

WATER SCARCITY:

Reversing the Narrative

Water scarcity has been highlighted by the World Economic Forum (WEF) as one of the greatest global risks to economies, environment and people. Strategies to reuse and recycle water used during operations will increasingly become a priority for energy companies.



There are No More Detours

The Energy Transition is Here to Stay

BY RAOUL RESTUCCI

Managing Director, Petroleum Development Oman; former head of Economics and Planning, Qatar Petroleum; former Executive Vice President for Middle East, Russia and CIS, of Shell E&P Middle East



Fossil fuels are not going away – they will remain an integral part of the energy mix for many decades to come. OPEC's World Oil Outlook 2018 forecasts that oil demand will grow by 1.1 million bpd in the energy mix through to 2041. Increasing by 14.5 million barrels a day (b/d) to reach 111.7 million b/d by 2040, although the growth will decelerate over time. But rising energy needs, shifting supply such as the expansion of US shale oil, climate change pressures and technological innovation mean national oil companies (NOCs) must gravitate towards renewables for longer-term competitiveness and sustainability. Indeed, past courses in their right mind would have been to diversify into non-oil businesses and wellhead to build momentum and drive change. Oman is a prime example. The economic impact of the oil price volatility since 2014 has given more impetus to the need to diversify energy portfolios, while continuing to meet customer expectations with rising domestic and global demand. At the same time, there is the need to achieve greater efficiencies through new lease and digital technologies such as artificial intelligence (AI).

"The advent of the 4th Industrial Revolution – defined by emerging technologies such as automation, machine learning, artificial intelligence and data analytics – offers NOCs and other industry stakeholders many opportunities to operate as safer, more productive and environmentally responsible businesses."

10% of the country's total energy to be generated by wind and solar by 2025, PDO is already playing its part in supporting this aim by integrating solar into both our oil and gas fields, and in the industrial sector where we can leverage new technology and expertise to commercialize our services in areas, such as project management, engineering and design, in order to develop into a fully-fledged energy company. Our flagship Mirash solar energy project, being developed with GasSprint, is providing a highly reliable and sustainable development solution to our increasing energy needs. The project shows that producing steam with solar is now possible, and that we can use the heat to generate the steam gas for use in higher-value domestic and export options. We are also installing 11 megawatts (MW) of solar photovoltaic panels in our Muscat headquarters to provide power for offices, with surplus electricity being fed into the wider grid. We have just awarded a contract for a 100 MW independent power producer project in our fields to a Japanese-Oman consortium, which is a first for the country.

Products like this represent a good start, but there must be greater alignment and collaboration between Oman's public and private sectors to evolve towards a greener future. This is across all aspects, including strategy, research and development, technology, training, supply chain development and investment. I remain confident and excited about staying competitive and playing our part in meeting the challenges of the future.

solar swaps, for example, could generate the further investment courtesies like Oman need to fulfil private themes as fuels of renewable energy development and investment. The world is moving into the 4th Industrial Revolution – defined by emerging technologies like automation, machine learning, artificial intelligence and data analytics – offers NOCs and other industry stakeholders many opportunities to operate as safer, more productive and environmentally responsible businesses. At the same time, gas and its more pervasive deployment, is an enabler to the energy transition. The introduction of gas-

2040

Oil demand of 111.7m b/d is anticipated by 2040, according to OPEC's World Oil Outlook 2018. An increase of 14.5m b/d from 2018 oil demand will leave the largest share of the energy mix through to 2040.

11 MW

The size of an installation of solar photovoltaic panels at PDO's Muscat headquarters will be the size of an installation of 14.5m b/d from 2018 oil demand will leave the largest share of the energy mix through to 2040.

\$200bn

PDO's investments into green power producer project in PDO's fields with a Japanese-Oman consortium is scheduled for May 2020. PDPs in the Middle East.

2020

A 100 MW independent power producer project in PDO's fields with a Japanese-Oman consortium is scheduled for May 2020. PDPs in the Middle East.

2025

Oman's target date to generate 10% of its total energy mix through wind and solar through the Oman Government's Tareekh program.





NOCs are Learning the Ropes – Quickly.

BY ABD MALIK JAFFAR
Regional Director, PETRONAS Subsidiaries Middle East, PETRONAS,
Head Iraq, PETRONAS Carqill Iraq Holding; former Head of Projects
and Engineering, PETRONAS



Gone are the historical criticisms that national oil companies (NOCs) are reactive, not proactive. A new future is being given them in the fast-paced global energy portfolio. Frequent edits to Middle Eastern NOCs' mission statements over the last five years have resulted in a unique achievement: the world's biggest oil producing region is also a pioneer in renewable energy.

In the UAE alone, the Vision 2021 and National Agenda expects the OPEC member to generate 27% of its energy requirements from clean energy sources, reduce its per capita greenhouse gas emissions and achieve average oil consumption of five tons per person in 2030.

UAE Vision 2021 and National Agenda expects the country to generate from clean energy sources, reducing per capita greenhouse gas emissions and achieving average oil consumption of five tons per person.

\$13.6bn

The value of Dubai's Mohammed bin Rashid Al Maktoum Solar Park, the largest single-site solar park in the world that uses the independent power producer (IPP) model, producing 1,000 MW by 2020 and 5,000 MW by 2030. The AED50 billion (\$13.6 billion) project will achieve a reduction of approximately 6.5 million tons of carbon emissions annually.



“The top five NOCs worldwide account for more than half of global oil-proven reserves.”

78%

The reduction in ADNOC's zero-flaring between 1999 and 2010, falling between 1999 and 2010.

70%

Globally, NOCs have 86-90% of global proven resources and around 70% of total production.

2.1%

The rise in the global appetite for energy last year – more than twice the previous year's rate.

10%

Petronas' internationalization started in 1991 with upstream investments in Vietnam. The company is now present in more than 20 countries – approximately 10% of the world's nations.

chans in the UAE and the wider Middle East. Abu Dhabi National Oil Company (ADNOC) reduced its zero-flaring by 78% between 1999 and 2010 and Dubai-based ENOC launched the first solar-powered service station in the UAE last year, with more to come.

Politically-backed with relatively deep-pockets, NOCs have the resources and political clout to establish and manage a blend of fossil fuels and renewables into one mix.

NOCs' appetite for stepping outside their comfort zones has become increasingly common, reaffirming leaders that they will be integral players in this new chapter. Take the birth of 'international NOCs' over the last two decades, for example. They have leveraged their cross-border influence to become progressively influential players in the global energy market. International oil companies (IOCs), Chinese companies CNOC and CNPC – with approximately one-third of foreign production – have implemented overseas strategies since the early 1990s, mainly in Asia and Africa, while Petrobras expanded internationally after the Brazilian oil company deregulation in 1997.

In 1997, in Asia, Malaysian Petronas' internationalization started in 1991 with upstream investments in Vietnam and the company is now active in more than 20 countries – approximately 10% of the world's nations. Similar patterns are noted in most major NOCs, including those in the Middle East.

With 86-90% of global proven resources and around 70% of total production, NOCs' expansion has affected the entire industry and resulted in a highly concentrated resource base. The top five NOCs worldwide account

for more than half of global oil-proven reserves. Such reserves are mostly located in OPEC member countries (72%), with Venezuela and Saudi Arabia at the top of the list.

But as the global energy mix evolves to have fossil fuels and renewables as two sides of the same commercial coin, NOCs are being forced to change their strategies to help sharpen their game.

First up is agility, giving organizations better chances to survive in a fast-changing ecosystem. Second is early positioning in segments that are gradually displacing current products and services, such as the rise of renewables and shifting consumption habits. Also on the list are customer-centric business models, digitalization, fast adoption of new technologies, horizontal collaboration and the use of data to develop highly diversified portfolios. Embracing these core principles will create a stronger and more diverse energy market, which is vital to coping with intensifying demand. The International Energy Agency (IEA) said in March 2018 that the global appetite for energy in 2017 rose by 2.1% – more than twice the previous year's rate.

NOCs are gatekeepers to arguably the most precious asset a country has, energy. As such, they have the access and resources to lead the global energy transition has thrown up many question marks that demand answers with clear parameters. How to manage R&D for innovative technologies and policies, bolstering talent creation and how best to divide investments into the two 'camps' of fossil fuels and renewables, for example. NOCs must use their influence as a backbone for those

meant in ambiguity to find their way.



Saudi Arabia

The Kingdom's Energy Transition Finally Starting to Shape Up

BY BRUNO BRUNETTI
Managing Director, Head of Global Power Strategy, Analytics, S&P
Global Platts, former Managing Director, Global Power, PIRA Energy
Group, former Research Associate at Cammina and CERFA (IHS Markit)



Saudi Arabia's quest to diversify its power generation mix away from traditional sources – most notably crude – is now more clearly shaping up. Significant power demand growth and historically low domestic energy prices has made this task quite challenging, but efficiency gains in the power sector have helped to subsidize energy price environment.

A high penetration of electricity in the residential and commercial sector (the residential sector alone accounts for more than 48% of the total, with another 30% from commercial and government sectors) led to steep growth for total power demand over the past decade (5.8% per annum). Peak demand also grew by almost 7% on average over the same time period.

according to data from the electricity regulator Electricity & Cogeneration Regulatory Authority (ECRA).

Peak demand has already reached 62.26 gigawatt (GW), against an average power dispatch on the order of 54 GW. This requires large spare capacities to meet the demand, which is not always reflected in fairly low. As a form of congestion, peak demand in Europe is only 40% higher than average demand. Poor utilization of thermal assets has become a challenge for utilities in Europe as well (or even in the US), but unlike Saudi Arabia, power demand in those countries has already stabilized, or is even shrinking.

Saudi Arabia's government reform of electricity prices started in 2015 and the changes in behavior were nearly immediate. Electricity demand growth slowed to 0.7% year-on-year in 2016 (down from 4.8% growth in 2015), with peak demand down by 2.3% year-on-year – the first decline in more than 20 years.

While Saudi Arabia's electricity demand is still growing, the number of total customers is fairly low. As a form of congestion, peak demand in Europe is only 40% higher than average demand. Poor utilization of thermal assets has become a challenge for utilities in Europe as well (or even in the US), but unlike Saudi Arabia, power demand in those countries has already stabilized, or is even shrinking.

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“Although Saudi Arabia will aim at further attracting energy intensive industries, more efficient uses in the residential sector could limit the demand growth, especially at peak hours.”

Databases showing the commissioning of a number of large units in sight. Almost 20 GW of new plants are set to come online within the next 2-3 years, or nearly a quarter of the country's installed capacity. At the same time, the government's diversification mix is flat with the new projects coming online, the role of high sulfur fuel oil (HSFO) and gas are set to get stronger in the generation mix at the expense of crude. The increased ability to burn HSFO is occurring at a critical time in the oil industry. The International Maritime Organization's (IMO) 0.5% cap on sulfur in shipping fuel comes into effect on the 1 January 2020. S&P Global Platts Analytics' study, "Shipping Green: Shores near a sea change," shows that the world is likely to fully transform the volumes of HSFO produced by the world's refineries into low-sulfur fuel.

Saudi Arabia's strategy to move away from crude in the power sector could not have happened at a better time, as the world will have an increased surplus of HSFO. We expect Saudi Arabia's HSFO burn in the power sector to increase by roughly 200 million barrels a day (bbl) through 2020 as a result of the new facilities refitted, with

additional switching potential away from crude estimated at 100-200 million bbls in 2020 due to the upcoming IMO regulations. The recent commissioning of the 1.2 GW CCQ Thermal at Shuaiba port also shows a wider energy strategy. This plant offers an interesting example of integration of CSP (Concentrated Solar Power) with a thermal plant, as a CSP unit complements the gas turbine that generates electricity. Similarly, the 500 megawatt (MW) Duha Green Power plant in Saudi Arabia is another example of an integrated Solar Combined Cycle (SCCC) in the Western region. During the daylight hours, solar complements gas, while at night, the gas turbine provides the baseload power. This reduces the volumes of HSFO produced by the world's refineries into low-sulfur fuel.

Saudi Arabia's strategy to move away from crude in the power sector could not have happened at a better time, as the world will have an increased surplus of HSFO. We expect Saudi Arabia's HSFO burn in the power sector to increase by roughly 200 million barrels a day (bbl) through 2020 as a result of the new facilities refitted, with

5.8% Saudi Arabia's power demand has grown by 5.8% per annum over the past decade, according to the Electricity & Cogeneration Regulatory Authority (ECRA).

2020 The increased ability to burn high sulfur fuel oil (HSFO) is occurring just in time: the International Maritime Organization's (IMO) 0.5% cap on sulfur in burner fuel, down from 3.5%, comes into effect on the 1 January 2020.

Falling Cost of Solar Harnessing Opportunities

BY ADMAN Z AMIN
Director-General Emeritus; Former First Director-General of the International Renewable Energy Agency (IRENA); former Head of the UN System Chief Executives Board for Coordination (CEB); former Director of the United Nations Environment Programme's (UNEP) New York Office; former Special Representative of the UN Secretary-General; former Trustee and Member of the Board of Directors of the Cambridge, UK-based World Conservation Monitoring Centre



The global energy system is witnessing rapid and disruptive change. This transformation driven by renewables is fundamentally reshaping the way we generate, store, transport and use energy. It is also transforming us to a low-carbon energy system, which brings new economic opportunities. Solar energy is at the heart of this transformation, and falling costs are underpinning its remarkable growth.

Solar photovoltaic (PV) module prices have declined by more than 81% since 2009 and the average cost of power from utility-scale PV modules has fallen by 73% since 2010, bringing it in line with the price of coal-fired electricity. Furthermore, solar PV costs are expected to halve again by 2020, bringing average costs significantly below traditional energy. This has fuelled unparalleled expansion in solar PV capacity from less than one gigawatt (GW) in 2000 to almost 300 GW worldwide in 2017. Last year, installed capacity grew by 32%; China alone added 54 GW of solar PV. Beyond PV, concentrated solar power (CSP) holds tremendous potential. CSP plants are being developed in large numbers, with strong CSP projects commissioned between 2020 and 2022 will have dropped within the fossil fuel power generation cost range.

These cost reductions present an opportunity to accelerate solar energy deployment in the pursuit of numerous objectives, from economic development and diversification to enhancing energy security and addressing climate change in

few regions is this opportunity greater than in the Middle East. With some of the lowest prices for solar achieved through auctions in the region, countries are seizing it.

The UAE is spearheading some of these developments. In Abu Dhabi, a 360-megawatt (MW) solar PV auction in 2016 resulted in a record low price of USD2.4 cents per kilowatt-hour (kWh), while in 2017 Dubai awarded a bid to build a 700 MW CSP plant which will generate electricity with storage for USD7 cents per kWh. Once complete, these projects will help the UAE achieve its energy strategy to cut carbon dioxide emissions by 70% and generate 44% of its power from renewable energy by 2050.

In 2017, Saudi Arabia unveiled ambitious plans to scale up renewables as part of its economic diversification strategy under its Vision 2030, setting a 9.5 GW of renewable energy capacity target by 2030. Also in late 2017, the Kingdom received record low bids for its first utility-scale solar project.

Morocco is close to the completion of the second phase of the Noor Solar Complex, a 2,100 MW CSP plant, which is a world record. The plant will generate 510 MW of CSP offering up to seven hours of storage. In addition to 70 MW of solar PV, a third phase is scheduled to add further generation capacity. The project supports Morocco's ambition to generate more than half of its electricity from renewables by 2030, thus reducing its reliance on expensive and volatile fossil fuel imports. Similarly, in Egypt, the Beldian Solar Park, currently under construction near the city

81% The drop in solar photovoltaic (PV) module prices since 2009.

Solar PV costs are expected to halve again by 2020, bringing average costs significantly below traditional energy.

700 MW

A concentrated solar plant in Dubai, which will be the world's largest on completion. Such projects will help the UAE achieve its energy strategy to cut carbon dioxide emissions by 70% and generate 44% of its power from renewable energy by 2050.

1,650 MW

The combined electricity capacity of the 32 power plants that will comprise the Beldian Solar Park in Egypt.

of Aswan, will soon be the biggest solar installation in the world, adding 32 power plants to the 1,620 MW of solar PV already in place. By mid-2019, the full capacity of the plants will have a combined electricity capacity of 1,650 MW. These examples are representative of the regions' desire to seize the opportunities presented by solar energy. As renewables continue to reshape both Middle Eastern economies and energy systems, further cost declines foreseen in solar power will only serve to accelerate energy transformation in this region and around the world.





The Paris Agreement: Why the Middle East is a Key Stakeholder

BY MARIA VAN DER HOEVEN
Senior Fellow at Clingendael International Energy Programme (CIEP),
Former Executive Director, International Energy Agency (IEA), Former
Minister of Education, Culture and Science, Netherlands; Former
Minister of Economic Affairs and Energy, Netherlands



Every Middle Eastern country, even war-torn Syria, has now signed the Paris Agreement, a cooperation within the United Nations Framework Convention on Climate Change (UNFCCC). The Agreement starts in 2020 and tackles issues such as dealing with greenhouse gas emissions and reducing fossil fuel subsidies. In recent years, countries have submitted their clean energy plans known as National Determined Contributions (NDCs). Energy consumption patterns in the various Arab countries are about to change, as consumption needs to gradually become more environmentally-friendly. This is not only driven by the policy choices formulated in the NDCs of states in the region, but also by the

technological change that will result from shifting energy policy preferences worldwide. The Paris Agreement has given renewed impetus to the development and adoption of clean energy production, conversion, transport and storage technologies. This is relevant for the Middle East for several reasons. First, the region's energy importing regions move away from the combustion of carbon-intensive fossil fuels, this could affect global fossil fuel balances and could negatively impact trade balances of exporting countries. At the same time, such a shift can create opportunities in the Middle East with respect to exporting clean energy carriers in efficient, innovative and perhaps unforeseen ways. The development of

hydrogen, among others, as a clean energy carrier may prove vital here. Energy use today generally results in unabated CO₂ emissions. Energy efficiency improvement is therefore widely regarded as an essential measure to contain the growth of energy demand. According to IEA, the World Energy Outlook 2019, the IEA's latest estimates the potential for savings from energy efficiency at 21% of projected total primary energy supply by 2025. Due to an abundance of energy resources in the region, energy efficiency has historically not been the policy priority that it has been in some of the world's energy importing regions, such as Europe and Japan. Also, at a share of 30% of combustion for power

“The Middle East is well positioned to play a relevant role here on the global stage. But regional cooperation is essential in order to integrate all the options in new value chains, strengthen the knowledge base, develop and scale-up technologies and ultimately satisfy shifting consumers preferences.”

generation is high in the region, while it is often regarded as uneconomic and environmentally unattractive elsewhere. Ongoing research on the relevance of relative prices of different energy carriers, such as oil, gas, coal, wind and solar, and how such prices come about suggests that this can be addressed. Energy efficiency is not a goal in itself. Rather, carbon efficiency could also prove to be a useful metric, particularly for countries that possess abundant fossil energy resources. If domestic energy resources are harnessed while the negative impacts are reduced, such resources can continue to underpin the regional economy and contribute to people enjoying years of economic growth and rising living standards. Improving energy efficiency and reducing carbon footprint are essential to improve sufficiently over time however. For instance, through the adoption of carbon capture, utilization and sequestration (CCUS) approaches. Additionally, hydrogen as an emerging energy carrier, could prove to be vital. The Middle East's enormous, impressive renewable energy projects are realized at ever lower cost levels, contributing to an affordable and clean electricity supply in the region itself. But for clean energy exports to materialize, production must be scaled up and long-distance electricity transport remains challenging. Fortunately, while transport of hydrocarbons and CO₂ overseas is well-known territory across the globe, pilot projects for shipping hydrogen over long distances are in the making. Further development and adoption of renewable hydrogen technologies may turn out to be an essential enabler for future clean energy exports from the region. Renewable energy production, renewable hydrogen and carbon chemistry and the closing of carbon cycles could come together. The Middle East is well positioned to play a relevant role here on the global stage, but regional cooperation is essential in order to integrate all the options in new value chains, to strengthen the knowledge base, develop and scale-up technologies and ultimately satisfy shifting consumers preferences in traditional and new markets.

1st

The Paris Agreement is the world's most comprehensive and truly integrated agreement to mitigate the negative impact of climate change. It is a landmark agreement established in the French capital in December 2015 marked a major step on from the Kyoto Protocol, signed in the Japanese city of the same name in 1997.

184

So far, 184 of the 197 Parties to the convention supporting the Paris Agreement have ratified their commitments.

21%

The World Bank estimates that the potential efficiency savings of projected total primary energy supply for the Middle East and North Africa by 2025 could reach 21%.

Clean Hydrogen

Next Step for the Middle East?

BY NOBUJO TANAKA
President, The Sasakawa Peace Foundation; Former Executive Director of the International Energy Agency (IEA)



"The IEA has always underestimated the increase of renewable energy sources, so a zero-carbon society may come much earlier than expected."

The European Union (EU) is the first governance aspects of the companies they put their money into.

institution which officially introduced the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). Many European corporations are diverting coal-related activities. The IEA Sustainable Development Scenario said that if governments are ambitious enough to achieve net zero emissions by

2060, a peak demand of coal happens right away and it must happen by the early 2020s for oil. Natural gas will continue to be used to replace coal, but once coal is gone, gas will need to 'decarbon' itself. The way forward to avoid fossil fuels becoming stranded assets is carbon capture and storage (CCS) through enhanced oil recovery (EOR) and hydrogen technologies.

Chiyoda Corporation is a leading engineering company in Japan which is developing 'SPERA Hydrogen' – a business model for storing and transporting hydrogen by utilizing the organic chemical hydride method. The

140e

The future of global
corporations that have spread
across the globe, including
Microsoft, Amazon, Google,
Facebook, Apple, and others.
These companies are the
major players in the
global market.

\$2trn

Investment needed to
replace the infrastructure
needed to support the
growth of the global
economy.

\$163bn

Investment needed to
replace the infrastructure
needed to support the
growth of the global
economy.

SPEEA Hydrogen process is as follows: Methoxybenzyl alcohol (MBA), which is produced from turpentine and styrene, can be safely and economically stored and transported by conventional trucks and rail tankers. Subsequent to MBA and hydrogenation, clean hydrogen is added to turpentine to make MCH, which can then be transported by a regular tanker to the exporting country. When MCH reaches its destination, it can be dehydrogenated with a special catalyst and reactor to produce clean hydrogen, fuel cell vehicles or power generation. Turpentine can then be transported back to the Middle East. There are different technologies for hydrogen storage and transportation, such as liquefied hydrogen or liquid ammonia. Such hydrocarbons (LHV), which are abundant in the Middle East, can also produce clean hydrogen gas. The SPEEA Hydrogen process is a solution for the Middle East to convert clean hydrogen by hydrogen.

Technology & the Transition of Energy: What's Next?

BY LORD ADAM TURNER

Chair of Energy Transition Commission; member of the House of Lords; Senior Fellow at the Centre for Financial Studies; former Chair Financial Services Security, UK; former Chair UK Climate Change Committee; former Director General of the Confederation of British Industry; former Vice-Chairman of Merrill Lynch Europe; and author of several books in the field of Economics and Finance



The impact of new technology on energy is going to be bigger than what most people currently realize. Over the next 10 to 15 years, we are heading towards a new energy paradigm. Renewables and for decades with the fossil fuel together. Renewables will start to compete with oil in electric vehicle (EV) markets. Simultaneously, the power of technology is bringing down the production cost of fossil fuels. Accordingly, the attitude of pension funds and other institutional investors in fossil fuel companies is changing.

We are going to see investors tightening their focus on the strategies that oil and gas companies are pursuing, with a lot of

pressure on those still invested in thermal coal to get out. Fossil fuel companies will be scrutinized on how robust their strategies are, not just for the cycle over the next year or two, but for the longer term. For example, as all the oil and gas companies like Total and Shell making strong statements about how the balance of their business between fossil fuels and renewables will shift over time. Thermal coal use is incompatible with the Paris Agreement commitments; the developed world must get out of burning coal in power stations as quickly as possible.

The Energy Transition Commission (ETC) is currently working with the Indian





Government on how rapidly they can move beyond coal. What does that beyond the 40 gigawatts (GW) of coal power stations already under construction there, there will probably be no more coal-fired power stations built thereafter.

As chair of the UK's Climate Change Committee, in charge of our decarbonization program in the UK, if you'd asked me back in 2008 how we should take the carbon out of electricity production, most of the speakers would have said, "Renewables."

Those are renewables, fossil fuels with carbon capture and storage (CCS), and some nuclear. But the facts have changed. Since 2008, the cost of solar has dropped by 90%, lithium-ion batteries by 80%, and onshore wind by 75%. I did not anticipate those changes, but they create a new reality, to which many people have not yet woken up.

The short-term impact of these changes

"Fossil fuel companies will be scrutinized on how robust their strategies are, not just for the cycle over the next year or two, but for a longer term."

on the oil price may be negligible, but by 2030 they will be very significant.

In particular, EVs are going to happen far faster than people realize. With the declining price of lithium-ion batteries, it might be cheaper to buy an EV by 2025 than an internal combustion engine, as well as being much cheaper to run it. Oil will retain its other uses such as for petrochemicals and heavy transport, like

trucking and aviation. But the impact of the new technologies will gather pace over time.

Solar is a huge natural resource in the Middle East. In countries like Saudi Arabia and others, such as Mexico and Chile, we have seen solar power winning auctions at below 2 cents per kilowatt-hour (kWh). Coal just can't compete with that, even before you take into account its environmental impact. And while the sun doesn't shine, natural gas and power storage are still pretty much the only options with short-term flexibility provided by batteries, and gas turbines providing seasonal backup but

turning sufficiently few hours that the average carbon intensity of electricity is still very low. ETC analysis shows that it will be feasible within 15 years, and far earlier in some favored regions, to build power systems based almost entirely on renewables at total cost well below coal-based systems. As renewable electricity

prices collapse, there is also huge potential for green hydrogen, produced by electrolysis, to play a major role in the decarbonization of fertilizer and steel production, long-distance trucking and shipping.

In the short term, oil prices look to be supported at \$50/bbl or maybe slightly above due to the balance of current supply and demand and the reasonable effectiveness of current OPEC and non-OPEC policies. So far, oil hasn't given the US shale oil a run for its money, and their decreasing production costs – many of which are below \$50/bbl – the

moment it goes above \$70/bbl, you are going to see more supply coming on stream and prices coming back down. The other main factor to impact oil prices short-term is of course what happens in China and with Chinese demand. The buoyancy of the Chinese economy in the last two years has

surprised the World Bank. The International Monetary Fund (IMF) and all the major forecasters. Before 2016, rapid Chinese growth was underpinned by rising bank and non-bank credit provision, but with the inevitable consequence that leverage was rising to potentially unsustainable levels. Since 2016, policy has switched to provide financial stimulus with the fiscal deficit as a percentage of GDP rising from close to 0% in 2014 to almost 4% today.

China has never as effectively struggled to the global market and is a key reason why oil and other commodity prices recovered in 2017. The key question now is whether the Chinese authorities can put in place the policies to support continued strong growth, at say 6% per annum, over the next 10 years. My judgment is that they probably can, but there could certainly be bumps along the road. Plus, any significant slowdown of Chinese growth, even if only temporary, will lead to lower oil prices.

40 GW

The volume of coal power stations already under construction in India, likely the last run.

90%

The drop in the cost of solar since 2008. China's onshore wind has fallen by 80%, and onshore wind by 75%.

2025

The year it might be cheaper to buy an electric vehicle than an internal combustion engine, as well as being much cheaper to run it.

Electrifying the 21st Century

Wiring a New Norm

BY JOE AINC
President & CEO
GE Gas Power Systems, GE Power MENA & South Asia



136. That's the number of years since inventor Thomas Edison unveiled a world-changing energy innovation – the first commercial power plant. And it's also the number of years until the world will be in the midst of another evolution that will affordably meet low-carbon targets and the rapidly rising demand of 26% between 2016 and 2026.

The magnitude and location of electricity demand growth aren't the only things transforming the 21st century power landscape. At the highest level, change is being driven by three powerful trends: the emergence of digital technologies, the arrival of increasingly affordable distributed energy resources, and the maturation of renewable energy and energy efficiency. Traditional and emerging, physical and digital, large and small – all are converging to create a new 21st century power network.

The benefits are almost immeasurable. Essentially, as more sustainable, intelligent and customizable energy solutions become available, so will more low carbon and national growth opportunities. In the U.S., that means the ability to support the power sector and the nation's economic diversification detailed in National Visions, respectively. But there's another key driver: improving energy security and therefore quality of life.

Laudable progress is already being made. Last August, Abu Dhabi's renewable energy company, Masdar, signed an Engineering, Procurement and Construction (EPC) contract to build the Dhofar Wind Power Project, marking the first large-scale wind farm in Oman

"Laudable progress is already being made. Last August, Masdar signed an Engineering, Procurement and Construction (EPC) contract to build the Dhofar Wind Power Project – the first large-scale wind farm in Oman and the GCC."

and the GCC. Saudi Electricity Company (SEC) has started operating a Combined Cycle power plant in Makkah's Eastern Province, and the world's first gas turbine made in Saudi Arabia. The project was rolled out of GE's manufacturing facility in Dammam with more than 140 local suppliers and a 70% local Saudi workforce. The latter is especially valuable to supporting the national goal of Saudization. And in the UAE, the Haseyan project in Dubai will be a 2400 megawatt (MW) capacity coal-based power plant when construction wraps up in 2023 – the largest coal power plant in the region. The \$3.4 billion project will play a key role in supporting the country's Clean Energy Strategy 2050, which aims to diversify sources of power generation to incorporate 44% clean energy, 38% gas, 12% coal and 6% nuclear across the UAE by 2050.

But ensuring long-term energy security means much more progress is required in the Middle East and beyond. More out of the box thinking will increase the number of innovative technologies and progressive

policies in the ever-growing measure of energy efficiency. For example, the number of electric vehicles (EVs) on the road in the U.S. is projected to reach 31 million in 2017, with 126 million EVs by 2030, according to the International Energy Agency (IEA) in January. But heightening ambitions and strengthening policy, as per the EV30@30 Scenario could see 220 million EVs on the road within the same period – a staggering 63% more.

GE technology already helps create one-third of the world's electricity, equipping 90% of power transmission utilities, 90% of energy storage plants and 90% of powerhouses, roughly 90% of the globe's nations. With such responsibility, we must not simply keep pace with demand but rather anticipate it, to ensure energy security. Other players, big and small, must adapt the same proactive mindset. Succeeding in this new, networked energy landscape requires the nimbleness of a start-up, and the wisdom of experience feeding into each other. There are no limits to innovation and there is plenty of room for everyone. We're just getting started.





Digital Technology Adoption

Unlocking Efficiencies in Industry

BY MORGAN ELDRED
Managing Partner, Digital Energy, former Research Director,
Gartner, former Head of Strategy & Risks, Maersk Oil, former Capital
Projection Manager, Shell



Energy transition within the Middle East will be accelerated through three key digital technology trends: the industrial digitalization (IIoT), energy efficient digital (EED), and smart digital (SD). Recent advancements in the IIoT, although primarily created outside of the energy industry, have been adopted by energy firms into their own operations, leading to breakthroughs in efficiencies. The main focus has been on reducing the energy that facilities require for heating, cooling, ventilation and lighting. Other users have been to measure and optimize the energy used for extraction and

processing energy and for transportation of structural materials within the supply chain. A American Council for an Energy Efficient Economy (ACEEE), has estimated potential savings of 12%-22% of all energy consumed through the use of the IIoT. For example, Germany's Daimler reported a 30% improvement in energy efficiency for its robot systems, while Canadian Forest Products reported a 15% reduction in energy consumption by applying real-time alerts that indicate usage outside of anticipated norms. The biggest reference case however is how

BlackHills Farms in New Zealand, which has managed a 50% reduction in cost in a time over a year as a result of lower energy and water consumption. The IIoT is a collection of technologies through the integration of sensors, cyber physical systems and smart algorithms. Energy companies require new energy efficient digital architectures to leverage this integration. The IIoT within the energy sector has primarily focused on increasing the reliability and integrity of physical assets. Typical implementation to date has focused on

“A digital trend that has tremendous benefits in enabling today's energy transition? Additive manufacturing, also known as 3D printing. Investment is on the rise on research and development in this area.”

reduced maintenance and improved safety. Emerging aspects like acoustic monitoring of steam traps, condition monitoring of pumps and heat exchanger performance – all wirelessly connected. Other areas include supervisory control, data acquisition and analytics systems, providing cost-effective installation and paybacks of less than six months. Case studies have indicated the difference in operating costs associated with IIoT implementation is about \$123 million per year for a 250,000 barrel a day (t/d) facility. Operations are not operating as well as they could. The overall financial impact could run into billions of dollars annually.

Within the IIoT, new software tools focused on energy facility management – open loop and closed loop. In the former, optimal set points manually

indicate the optimization variables and can achieve energy-cost reductions of 3%-8%. In the latter application, set points are sent directly to each optimizable variable and can achieve energy-cost reductions of 6%-15%.

Another digital trend that has tremendous benefits in enabling energy transition is that of additive manufacturing, also known as 3D printing. Investments for research and development in this space are about \$1.2 billion per year for a 250,000 barrel a day (t/d) facility. Operations are not operating as well as they could. The overall financial impact could run into billions of dollars annually. Within the IIoT, new software tools focused on energy facility management – open loop and closed loop. In the former, optimal set points manually

12%-22%

The potential savings of energy consumed through the use of the IIoT by the American Council for an Energy-Efficient Economy (ACEEE).

50%

The cost reduction that BlackHills Farms in New Zealand achieved in just over a year.

30%

The improvement in energy efficiency Germany's Daimler has reported for its robot systems. Canadian Forest Products also reported a 15% reduction in energy consumption by applying real-time alerts that indicate usage outside of anticipated norms.

Energy Transition

Aspiration and Reality

BY DR. CAROLE MAKHLE
CEO of CRYOOL Energy, Member of the Governing Board of the Natural Resource Governance Institute, Visiting Lecturer at the Business School of the University of Oxford, Honorary Professor of Surrey, and Saint Joseph University (Beirut). Recipient of Honorary Energy, Mines & Renewable Energy



“For the first time in history, the world is moving into a more diversified energy landscape where no single fuel is dominant.”

The topic of energy transition has caused an explosion of interest in recent years. It is the concept of a greener future through renewable forms of energy, such as biobutels, solar, wind, nuclear and hydrogen. The Intergovernmental Panel on Climate Change (IPCC) said emissions from industrial processes and fossil fuels such as coal, oil and natural gas were responsible for an estimated 65% increase in global greenhouse gas emissions in 1970-2010. The energy transition towards renewables – and it comes with unique challenges and considerations.

Firstly, there is an equally important transition taking place which is often overlooked. Traditionally, one fuel has dominated the world's energy mix until another fuel has taken over. Coal, for example, replaced traditional biobutels and oil replaced coal in the revolution. More than half of the world's energy became kero. Since the first oil shock in the early 1970s, its dominance has been gradually eroded as the share of natural gas has expanded. More recently, renewable energy has made its presence more notable. The main shift now is that over the next few decades, the world is moving into a more diversified energy landscape where no single fuel is dominant for the first time in history. Secondly, energy transitions take

time to fully develop. It can take several decades to get the right infrastructure in place, change behaviors, develop policies and regulations. Plus, the relative price signal of different energy sources should be taken into account.

Third, a joint report by the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA) in 2017 shows that the energy transition towards a greener future is consistent with limiting the rise in global temperature to well below two degrees Celsius. The report explores various low carbon technologies

and also reassesses the role of fossil fuels in this effort. The oil and gas companies are making in reducing the environmental impact of their activities and products – all while remaining competitive – should not be underestimated. Manufacturers of conventional internal combustion engines are placing equal emphasis on making their cars more environmentally friendly. Advances in such areas will surely improve on current carbon emission levels. But at the same time, they will

also delay the progress of green energy dominance.

Finally, for some countries, the energy transition may simply backfire. This is because the transition from fossil fuel dependent economies, including the Gulf countries, investments in alternative sources of energy still have a very long

payback period and will continue to require strong government support for the foreseeable future. The problem here is that financial investment has to be funded by oil and gas revenues in petroleum-dependent economies with a dominant public sector. Even when more resources are allocated to renewable energy, it is still being triggered by explicit or implicit government backing. The result is a vicious cycle – to sustain a clean energy transition requires more, not less, hydrocarbon investment and production for as long as clean energy is not cost competitive. To facilitate the energy transition in such economies, economic diversification should therefore be the primary goal of governments before committing to ambitious clean energy plans.

78%

The increase in total renewable energy installations from 1970 to 2010 (65%) industrial processes and fossil fuels such as coal, oil and natural gas, detailed the Intergovernmental Panel on Climate Change IPCC.

17%

The growth rate of renewable power worldwide in 2017. 17% higher than the 10% average and the largest increment on record, according to BP.

80 GW

The target of combined renewables capacity across all countries in the region by 2030 based on countries' National Visions.

80 GW

The combined increase in renewables capacity across all countries in MENA by 2030, based on countries' National Visions.

www.erya.org/mena



Underpinning ‘Solar Arabia’ with Petrodollars

BY GAURAV SHARMA
Independent Oil Analyst & Editor, Columnist – Commodities, Oil & Gas and Investing, former Business Editor, IB Times UK, Newsweek Media Group; former Oil Markets Analyst & Desk Editor, Sharecast; former Oil & Gas Analyst/features Writer, UJ Global



The oil price climate is relatively benign at the moment for Gulf crude producers. The days of three figure oil prices may well return in the near future, but the oil market has been relatively stable. Intermediate have oscillated in the \$60-\$80/bbl range for most of 2018. The upper cap of the range marks the highest prices on record since the fourth quarter of 2017. For many powerbrokers in the GCC with low carbon and regional energy diversification targets, nothing could be better.

While an inexorable march to a low carbon economy is visible in the Middle East, policymakers have the comfort of

knowing that demand for oil will continue to grow over the coming decades. States by the International Energy Agency (IEA) expect oil demand will accelerate. Over the next 20 years, the IEA predicts that every two cars is electric, crude demand would keep growing. That's because much of the demand is driven by aviation and petrochemicals, not by automobiles.

The concept of ‘Solar Arabia’ bankrolled by petrodollars is gaining currency. The theme first promoted by policymakers in Saudi Arabia has actually been adopted in earnest by the government of UAE and is the subject of much naval gazing in the

GCC. A cursory look around Dubai and Abu Dhabi would reveal both emirates increasingly peppered with solar panels, arrays and greenhouses. The UAE's plans in this regard are ambitious. The GCC is the first subsidies during the oil price slump of 2015-2016.

The UAE is also in the process of building the world's largest single-site solar thermal plant, which will combine a central tower and parabolic trough technology to harvest energy from the sun, store it in molten salt and produce steam to generate power. The lead sponsor – Dubai Electricity & Water Authority (DEWA) – is aiming for

“The concept of a ‘Solar Arabia’ bankrolled by petrodollars is gaining currency. The theme first promoted by policymakers in Saudi Arabia has been adopted in earnest by the government of the UAE.”

700 megawatts (MW). It claims the plant will deliver electricity 24 hours a day at a levelised tariff of USD/3 cents per kilowatt-hour (kWh), which can “compete with fossil fuel generated power without subsidies.”

It demonstrates policymakers’ willpower as well as international and regional collaboration, with both China's Silk Road Fund and Saudi Arabia's ACWA Power taking being stakeholders in the project. The 7.2 GW project, which is to be a first-of-its-kind, was announced in 2020 as a deemed a target year for wholesale energy diversification. More so, if the regional leader UAE is used as a benchmark with its commendable initiatives being miles ahead of what's afoot elsewhere in the GCC.

Of course, few can dwarf Saudi Arabia's grand plans for 7.2 gigawatts (GW) of solar power by 2018, and a whopping 700 GW by 2030, with a project price tag of \$200 billion.

In March 2018, it inked a Memorandum of Understanding (MoU) with Japan's SoftBank to develop the grand project that is a hundred times larger than anything being planned anywhere in the world. In fact, going by Bloomberg New Energy Finance's (BNEF) data, the project would be bigger than the entire solar power generation capacity of France.

Softbank's Vision Fund will invest \$1 billion in phase 1 of the project with not the rest of the announced investment will come from. Realistically, it cannot be bankrolled by Saudi petrodollars alone. Furthermore, it would require Riyadh to handle the incremental wage. That is not to suggest that it cannot be done. However, healthy skepticism is needed until the first gigawatts reneup the Saudi grid before 2020, and by extension much of the GCC.

700 MW

The aimed capacity of the world's largest single-site solar thermal plant to be built in the desert. The lead sponsor will deliver electricity 24 hours a day at a levelised tariff of USD 7.3 cents per kWh.

Even if one in every two cars is electric, the IEA believes that crude demand would keep growing.

Lowest-Cost Oil Producers Manage Resources Like Any Other Commodity

BY SIR MARK WOODY-STUART

Chairman of the Global Compact Foundation, Chairman of the Board of Directors of the International Chamber of Commerce, Chairman of the Board of Directors of the UN Global Compact, Former Chairman & Managing Director of Royal Dutch Shell, Former non-Executive Chairman of Anglo American plc



"Instead of comfortably sharing a reliably growing pie, all producers will have to compete for a finite market."

For normal commodities like iron ore or copper, the lowest-cost producers command the largest market share. Oil is no exception. In the early 1980s, because the lowest-cost producers restrained their production, keeping the price of oil well above the marginal cost of supply, this enabled cycles of higher-cost non-OPEC developments, successively in the UK, North Sea, Alaska, North Slope, deep-water offshore and most recently shale oil production.

With continued growth of demand, low-cost middle East producers have been able to supply the world's growing domestic social and development income requirements without growing market share. Time and again, the bulk of volume growth has been taken up by non-OPEC producers. The great energy transition that is now underway may be about to change this approach.

Different analysts' estimates on when peak demand for oil will occur vary by several decades. But there is some agreement that the world may be on the verge of falling into the same trap for oil that it has already fallen into for coal. Instead of comfortably sharing a reliably growing pie, all producers will have to compete for a finite market. Of course, even when oil demand is flat, significant new development will still be needed to offset the decline of older fields. However, it does mean that in the longer term, all producers will compete for market share of fixed or reducing demand.

In the short term, the picture is complicated by the very large number of higher cost non-OPEC projects that were cancelled in the light of the 2014-2015 oil price downturn.

The downturn and the energy transition have also had a significant impact in the thinking of the private sector. Despite the recovery in price, companies are now increasingly only prepared to sanction projects that will deliver a return on capital well below \$50. As we have seen in the past this caution may be short lived, but it provides an opportunity for truly low-cost producers to invest to increase capacity. So, what is holding them back? There are two factors.

First, low-cost producing countries face increasing demands on revenues, not only to meet the investment needed to transform their economies, but also to satisfy the needs of the growing urban and middle class segments of the population. Second, OPEC's low-cost producers are understandably concerned that signalling a willingness to invest to increase capacity and thus potentially market share will have a net negative effect on oil prices and so have a

This is a familiar dilemma for low-cost producers of other commodities. Hence, the good news for low-cost of producers

is the existence of a tried and tested roadmap.

First, there must be a willingness to invest in new capacity that may not be immediately required, or that is brought on stream in a phased way. Saudi Arabia has long adopted this policy in the interests of market stabilization. Second, there must be a clear signalling of the capacity to make such investments in the form of a credible commitment, sending a clear warning to higher cost producers. Plus, it communicates a carefully expressed desire to maintain prices and production discipline.

The moderate approach should be coupled with a more aggressive willingness to utilize spare capacity whenever necessary to prevent a sudden increase in prices, linked to a cautiously upward movement of market share.

Third, there must be a willingness to be closed again in the context of an organization like OPEC and the need for cohesion, such an approach has been practised for many years with some success by major commodity producers, admittedly with occasional price dips caused by misjudging the situation. I comment this approach to all truly low-cost oil producers. They have earned higher cost producers for too long.



70%

The proportion of global energy investments that will be government-driven, meaning energy decisions will be primarily government-led, according to the IEA's World Energy Outlook 2018.

\$11bn

Investments in renewables across the world in 2013, up from \$1.2 billion in 2008 – a nine-fold increase in just eight years.

13%

Percentage of EVs that the World Energy Council said will be on the road in 2040, compared to the current 1%.

