Multiplier Effect
An innovative approach adopted by the Ministry of Oil & Gas in the marketing of the Sultanate’s natural gas assets has led to a flurry of high-profile agreements envisioning large-scale investments in integrated energy developments.

A ‘Made in Oman’ biofuel
A young Omani scientist and her team at Sultan Qaboos University are making headway in the commercialisation of a ‘green’ fuel synthesized from waste date seed pits.

Transforming the heavy oil value chain
Oman’s hosting of the World Heavy Oil Congress in September has immensely positive implications for the nation’s ongoing quest to optimise recovery from its heavy oil fields.
Upstream - Midstream - Downstream

Gas & LNG Middle East Summit

29-30 October 2018
Oman Convention & Exhibition Centre
Muscat, Oman

Under the patronage of:

His Excellency,
Dr. Mohammed bin Hamad Al Rumhy
Minister of Oil and Gas, Sultanate of Oman
Editor's word

Multiplier Effect
An innovative approach adopted by Oman’s Ministry of Oil & Gas in the marketing of the Sultanate’s natural gas assets has led to a flurry of high-profile agreements envisioning large-scale investments in integrated energy developments

A sustainable model for job creation in the Oil & Gas sector

The Economics of Oil and Gas in Oman
Government revenues from Oil & Gas as a percentage of GDP stood at 22.2 percent in 2017 and accounted for 72.9 percent of total government revenues

Towards a Low-Carbon Future
Oman is preparing to embrace an exciting low-carbon future

A 'Made in Oman' biofuel
The humble date, long touted in the Arab region as the ‘fruit of paradise’ for its health-enhancing benefits, has yielded another of its treasures

Global energy transformation: A roadmap to 2050
Renewable energy needs to be scaled up at least six times faster for the world to start to meet the goals set out in the Paris Agreement

Cooling Down

BP outlines commitment to low carbon future
BP aims to generate sustainable reductions of 3.5 million tonnes of annual CO2 equivalent greenhouse gas emissions throughout its businesses by 2025

Delivering a solar hub based on sustainable in-country value

SolaRISE: Desert lab for solar technologies

Wetlands in the Omami desert
A deal to expand the Nimr Water Treatment Project (NWTP) will lift the processing capacity of this award-winning facility by more than 50 per cent to 175,000 cubic metres per day

Why Oil and Gas-rich Gulf Arab States are turning to coal

EOR: Old Challenge, Fresh Eyes

NOCs must take integrated approach to oil & gas management
Uncertain oil & gas markets have forced NOCs to rethink their approach to portfolio management, says Strategy& study

IMO 2020: New fuel options gain pace

Blockchain boosting the Gulf’s energy credentials

An invigorated and enlarged mandate for OPAL

OPAL Oil & Gas Conference 2018

Oman hosts World Heavy Oil Congress

PDO institutes In-Country Value (ICV) Awards

Economic diversification to shape a sustainable future for Oman
Siemens is in a strong position to understand the Sultanate’s requirements. Today, the Company is actively supporting Oman’s diversification plan and executing a number of the most important projects in different sectors

Raising the bar in service delivery
Greetings!
In this edition of OPAL Oil & Gas, we turn our attention to certain nascent developments that promise to dramatically alter the Oil & Gas landscape as we know it. Renewable and alternative energy development, coal power generation, waste-to-energy, and even Electric Vehicles – concepts that were only bandied about until recently – are set to become a reality in the Sultanate in the coming years. These initiatives will have game-changing ramifications for Oman’s Oil & Gas sector, as policymakers and thought-leaders seek to factor in these new realities into their future vision for this industry. Of course, no one is in doubt about the continued primary of the Oil & Gas industry in driving economic growth over the foreseeable future. However, climate change, sustainability and green energy are dictating a rethink of our current business model, globally and locally.
Oman is playing its part in this mind-set change as well. Take the example of young Omani scientist Dr Lamya Al Haj of Sultan Qaboos University, who made Oman proud with her successful synthesis of the first ever sample of biofuel made from waste date seed pits. Her team is now looking to commercialise production of this ‘Made in Oman’ green fuel. Indeed, these are interesting times for the domestic Oil & Gas industry! But as HE Salim Al Aufy, Under-Secretary of the Ministry of Oil & Gas, as affirmed in these pages, we are not entirely out of the woods yet, although crude prices may have climbed to 4-year peaks. Until international prices achieve an equilibrium dictated primarily by market fundamentals and not geopolitics and global tensions, Oman has no choice but to continue to ‘stay the course’, he says. By this, he means that we should continue to maintain high activity levels, promote operational and fiscal efficiency, and eliminate waste. Neither can the industry afford to ease up on the pace of Omanisation & Training, ICV, and Localisation, he Under-Secretary stresses.
OPAL is itself taking on some of these national objectives. As the executive leadership firms up its mandate for the next three years, it is soliciting member and stakeholder feedback on any shortcomings and challenges that it should address as the Voice of the Oil & Gas industry. Please feel free to email us (at the address listed here below) with your thoughts on what may be included in OPAL’s new mandate, among other topics of interest or concern.
Together We GROW

2011
Established as In-Country Value company

3030
Community Shareholders

8
Oil & Gas locations

1200
Direct Employees

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- Provide holistic services in
  - Engineering
  - Construction
  - Project Management field
Market highlights

Snapshot of events, trends and developments characterising the ebb and flow of activities across Oman’s pivotal oil and gas industry:

Oman crude averages $72.64/b in August

The average price for Oman Crude Oil Future Contracts at the Dubai Mercantile Exchange (DME) witnessed a price drop by 0.7 per cent in August, compared with corresponding figures for July, according to the monthly report of the Ministry of Oil and Gas (MOG).

The official selling price for Oman Crude Oil during August 2018, for the delivery month of October 2018, settled at $72.64, which was lower by 53 cents compared with July trading prices. The trading price ranged between $70.00 per barrel and $76.29 per barrel, the report said.

The Sultanate’s production of crude oil and condensate throughout August 2018 amounted to 30,209,500 barrels, representing a daily average of 974,500 barrels. Oman crude oil exports during August 2018 reached 25,208,088 barrels, representing a daily average of 813,164 barrels.

The proportion of China’s import of Omani crude oil declined 2.85 per cent to 80.66 per cent, compared to that of July 2018. It remained however at the top of the importing countries of Oman crude export. In contrast, imports by Japan rose 3.39 per cent on m/m basis, whilst imports by Myanmar fell by 0.36 per cent. Imports by buyers in the Indian-Subcontinent remained stable.

Crude Oil Prices witnessed a fallback during August 2018 futures trading compared with July 2018 for the major crude oil benchmarks around the world. The average price for West Texas Intermediate crude oil at the New York Mercantile Exchange (NYMEX) reached $67.27 per barrel, down $2.23 compared with the previous month’s trading. While the average price for North Sea Brent mix at the Intercontinental Exchange (ICE) in London amounted to $73.84 per barrel, down by $1.11 compared with July 2018.

[17 September 2018]

Dear readers,

Your feedback is very important to us. Starting from the next issue, OPAL Oil & Gas will include a dedicated section where your thoughts on topics covered in this issue, as well as issues of relevance to the Oil & Gas business, will be featured. Please feel free to also send in your suggestions on how we can improve the overall content.

Contact us by email or Twitter.

opalmag@opaloman.org
@opal_oman
Petrogas Rima LLC operates the Rima Satellites Small Fields in accordance with the Rima Satellites Small Fields Service Agreement dated 25th of February 2008, with Petroleum Development Oman LLC (PDO) and in conjunction with Oman Oil Company Exploration and Production LLC (OOCEP) as per a joint operating agreement dated 15th of June 2008.

Since Petrogas Rima took over in 2008, all commitments as per the agreement have been achieved through focused drilling, well reservoir management, application of appropriate technologies and Improved oil recovery. In the process, surpassing production targets every year since 2008 and achieves a high percentage of Omanization.
PDO SHOWCASES ENERGY MANAGEMENT CAMPAIGN

Hundreds of people flocked to an event staged by Petroleum Development Oman (PDO) at Muscat Grand Mall to showcase the Company’s Estidama (Sustainability) energy management campaign.

The educational programme included live discussions with visitors, answering questions and offering information on how to become part of the change towards greater environmental conservation and sustainability.

Students were invited to participate in a workshop with Greek artist teacher Kostis Grivakis, who gave a hands-on art course throughout the event held over two days on how to use plastic waste and turn it into art products. Visitors also had the opportunity to experience virtual reality with videos highlighting the ocean of plastic waste.

The event in the mall’s central atrium also featured the five young project winners of PDO’s Renewable Energy Awards, a nationwide PDO-sponsored contest which takes place annually under the auspices of the Ministry of Education.

The 2018 winners are:

- **First place:** “Tarsheed” Application by Reem Ahmed Mohammed al Qassabi and Rayyan Ahmed Mohammed al Qassabi of Hasfa bint Omar Basic Education School.

- **Second place:** Aloe Vera Makes Safe Environment in the Oil Sector by Elaf Yahya Ahmed Al Kindi of Hasfa bint Omar Basic Education School.

- **Third place:** Sustainable Drying Oven by Manal Abdulmunem al Afari al Hinaei of Aisha bint Talha Basic Education School.

- **Fourth place:** Truck Eraser by Taghreed Hamad Saleem al Rahbi of Al Shawamikh for Basic Education School.

PDO’s ‘Estidama’ campaign is dedicated to building a positive environmental culture across Oman by focusing on six main pillars: renewable energy, people, energy efficiency, environment, energy saving and economy. [16 September 2018]

UAE minister visits DME

HE Suhaib al Mazrouei, the UAE’s Energy and Industry Minister, visited the Dubai Mercantile Exchange (DME), the premier international energy futures and commodities exchange in the Middle East. DME is a joint venture between Dubai Holding, Oman Investment Fund and CME Group.

The visiting dignitary was given an overview on DME’s vision and objectives, and attended the pricing window which is used by Oman and Dubai governments, and recently adopted by Saudi Aramco, to calculate Official Selling Prices for customers.

HE Al Mazrouei said: “We are proud to see such successful businesses operating from the UAE and we are sure that the experience DME have gained over the past decade is an asset for all of us. We congratulate DME on all the milestones realized since inception, and on its latest achievement with Saudi Aramco adopting DME Oman in their pricing formula.”

Launched in 2007, DME has rapidly grown into a globally relevant exchange. Its flagship Oman Crude Oil Futures Contract (DME Oman) contract is now firmly established as the most credible crude oil benchmark relevant to the rapidly growing East of Suez market. Reflecting the economics of the Asian region like no other contract, and the largest physically delivered crude oil futures contract in the world, DME Oman is the world’s third crude oil benchmark and the sole benchmark for Oman and Dubai exported crude oil.

Global financial institutions and energy trading firms including Goldman Sachs, JPMorgan, Morgan Stanley, Shell, Vitol and Concord Energy also hold equity stakes in the DME.

2nd PHASE OF SHELL INTILAAQAH’S ‘ASPIRE & INSPIRE’ PROGRAMME ENDS

Shell Intilaaqah, in collaboration with the Public Authority for Small and Medium Enterprises Development (Riyada), successfully concluded its second phase of the ‘Aspire and Inspire’ programme for this year.

Entitled, ‘How to Become a Successful Business Owner’, the workshop series shed light on the essential steps every entrepreneur needs to address and implement before undertaking a venture. 100 participants attended the workshop series from Muscat, Al Dakhiliyah, Al Batinah, and Dhofar.

Certificates of completion were awarded to participants from Muscat by Dr. Ahmed Al Ghassani, CEO of Riyada and Muna Al Shukairi, General Manager - External Relations and Social Investment Lead at Shell Development Oman.

During the workshops, Aspire and Inspire’s team of qualified experts shared insights with participants on how to ensure the viability of any business. The experts also underscored the importance of a business plan in executing a strategy for starting a venture and the resources required for achieving business goals.

The Aspire and Inspire programme third phase is scheduled for October 2018 and will be conducted over 12 days in a number of Governorates including Muscat, Al Dakhiliyah, Al Batinah, and Dhofar. The phase includes Specialized Training courses. Covering a number of areas such as Marketing, Human Recourses, Finance, Product Pricing, and Human Resource Management, the course is built to help participants acquire the necessary knowledge to run their future businesses successfully. It also offers participants the skillsets required to identify the target market, product development, and getting introduced to the Omani labour law. [17 September 2018]
Our people, our standards and our commitment are major contributors to our success
SHELL EXPANDS ‘SOLAR IN SCHOOLS’ PROJECT

Shell Development Oman continues to power the Sultanate with renewable energy with the addition of two new schools as part of its “Solar into Schools” programme, bringing the total number to five. Using the first of its kind, bifacial solar photo-voltaic (PV) panels, Al Asmaa bint Al Harith, an all-girls school and Kaab bin Barsha, a boys school in the North Batinah Governorate are now operating using solar energy. As part of its gift to the nation, Shell Development Oman helps schools meet their power demands and evokes curiosity in renewables amongst the younger generation.

“Solar into schools not only makes the schools eco-friendly but helps reduce operating costs. It provides them with a long-lasting source of energy that will power them for generations to come,” said Muna al Shukaili, General Manager, External Relation & SI lead at Shell Development Oman.

“It also gives us a wonderful opportunity to provide local SMEs with a platform for training, coaching and funneling new business collaborations. As a result, we are contributing to the growth of the solar industry, raising awareness on energy transition among school children and the community at large, and diversifying of the economy. A win for all.”

[11 September 2018]

BUSINESSGATEWAYS ROADSHOW SPOTLIGHTS ADVANTAGES OF JSRS CERTIFICATION

The pivotal importance of the Joint Supplier Registration System (JSRS) as an online platform bringing together Omani Suppliers for industry level procurement opportunities was highlighted at a recent roadshow organised by businessgateways, the implementer of JSRS, at Knowledge Oasis the Muscat (KOM).

Emphasizing the strength of interest in the platform, more than 140 executives representing Oman’s Oil & Gas Operators, Main Contractors, & Omani SMEs attended the event. The Joint Supplier Registration System (JSRS) is a ‘single window’ industry level supplier certification system initiated by Oman Ministry of Oil & Gas that is built & operated by businessgateways hosted on the portal www.businessgateways.com. Suppliers of products & services must mandatorily be JSRS Certified in order to bid for tenders floated by any of Oman’s Oil & Gas Operators. The JSRS’ popularity as a credible procurement platform has also seen the formation of the Buyers Community which consists of large corporate buyers from other industries also, who now use the JSRS Certified suppliers for their regular procurement. Since the project initiation in 2014, the JSRS has attracted more than 7000 suppliers who are certified so far from Oman and 90+ countries.

[29 July 2018]

ICV forum moots localization of Omani industry and services

Retaining more of the wealth of the oil and gas industry in Oman would benefit from greater collaboration between the sector and academia in order to encourage a culture of entrepreneurship amongst graduates, according to the recommendations tabled at the latest PDO Majlis stakeholder engagement session.

In a wide ranging discussion on In-Country Value (ICV), the critical need for proper governance and executive leadership commitment to drive ICV forward was also highlighted.

The event, at the Crowne Plaza in Suwar, was sponsored by HE Ahmed al Dheeb, Under-Secretary of the Ministry of Commerce and Industry, and its theme was “In-Country Value: The Road To Localising Omani Industry and Services.” It was attended by key public and private sector decision makers, oil and gas industry professionals, entrepreneurs, academics, researchers and students.

PDO External Affairs and Value Creation Director, Abdul-Amir Abdul-Hussein al Ajmi said: “This was our third PDO Majlis engagement and it provided an excellent forum to discuss how we can do more to create jobs for Omani nationals, boost training and skills, build local supply chains and diversify the nation’s economy, and how to replicate successes achieved in the oil and gas industry in other sectors.”

An interactive panel debate and question and answer session covered areas such as the role ICV plays in boosting sustainable development, support for small and medium enterprises (SMEs), key ICV enablers, challenges and best practice and how to further raise awareness of the topic.

PDO’s Abdul-Amir al Ajmi was joined by other guest speakers at the event including Orpic Corporate Support Services General Manager Dr Hilal al Hina, and Sohar Industrial Area Director General Abdulqader al Balushi. The forum was moderated by PDO External Affairs and Communications Manager Mohammed al Ghareebi. [10 September 2018]
Since 1926, our people and technology have been able to solve any oilfield challenge.

Combining our people’s ingenuity and industry-leading technology has been our approach for more than 80 years. We recruit people from around the world—developing their talents through local and international experience. With 125 research, engineering, and manufacturing centers located worldwide and the industry’s largest training commitment, our goal is to continually deliver new technology to meet every reservoir challenge.

Find out more at slb.com
PDO FUNDS RO 3.5M WORTH SOCIAL INVESTMENT PROJECTS

Petroleum Development Oman (PDO) signed 10 Memorandums of Understanding (MoUs) for social investment projects totalling more than RO 3.5 million. The MoUs aim to benefit Omani communities across the Company’s concession area through social investment initiatives in different fields including education, safety, infrastructure and non-governmental organisation (NGO) support.

The MoUs were signed in an official ceremony attended by guest of honour HE Dr Madiha bint Ahmed Al Shibani, Minister of Education, at PDO’s Knowledge World venue in Muscat. Among the initiatives, PDO will construct 12 wings for female students in seven schools in Al Wusta, one in Al Dakhilya and four in Dhofar. Each wing will consist of eight classrooms, two offices, two teacher rooms, a football playground, a school canteen and supporting facilities, which will help to boost female education and inclusion.

The Company also recently completed the building of a new school in Al Zahiya, and started building one in Dhabboon and a school extension in Hamra Al Duru. The signing of the MoUs also underlines PDO’s commitment to support NGOs, acknowledging their important role in sustaining community development.

One agreement was signed with the Oman Association for the Disabled aiming to improve their important role in sustaining community development. One agreement was signed with the Oman Association for the Disabled aiming to improve their important role in sustaining community development. One agreement was signed with the Oman Association for the Disabled aiming to improve their important role in sustaining community development. One agreement was signed with the Oman Association for the Disabled aiming to improve their important role in sustaining community development.

Another was signed to renovate a rehabilitation centre for disabled children in the wilayat of Adam and another aimed at further building PDO’s relationship with Special Olympics Oman to support its activities for two years.

In addition, PDO will support the construction of two public majlis in Agareet and Rahab in the wilayat of Shaleem, which will provide venues for any official or social gathering. To date, the Company has already built more than 20 majlis across its concession area as important communal hubs for local residents. The Company will also continue its ongoing support for the community in Haima by funding the renovation of the camel race track there. [26 July 2018]

Omanoil introduces new e-payment app

Oman Oil Marketing Company signed an agreement with Thawani Technologies introducing the e-payment application “Thawani” in its service stations. With the new application customers will only need to scan the buyer’s Quick Response (QR) Code and enter the amount of payment required to complete the transfer process. The pilot project was held under the auspices of HE Eng. Salim bin Nasser Al-Aufi, Undersecretary of the Ministry of Oil & Gas, at Qurum Heights service station.

All ‘Thawani’ application users at the Oman Oil Qurum Heights service station will be able to keep their banking data completely private. Users will not have to share any card, bank, or account information at any point to complete transactions. The application complies with the Central Bank of Oman’s regulations as well as international PCI DSS standards for data integrity and secure encryption.

David Kalife, Chief Executive Officer of Oman Oil Marketing Company said, “Our partnership with Thawani Technologies means we are introducing Oman’s first of its kind e-payment platform in our service stations. This will elevate our customers’ experiences by bringing together flexibility, convenience and innovation at their fingertips. This is a major step forward in our customer-centric strategy to surpass their expectations by implementing smarter solutions for their everyday needs”. [28 July 2018]

DME LAUNCHES EIGHT NEW OIL CONTRACTS

Dubai Mercantile Exchange (DME), the leading international energy futures and commodities exchange in the Middle East announced on 4th September, the launch of eight new oil listings, following completion of the regulatory review.

Among the new products offered by DME is the Oman Crude Oil/Platts Dubai Crude Oil Futures contract (code DOP) which helps customers match their hedging exposure for crude from Saudi Arabia, the world’s largest exporter of crude oil. Saudi Aramco recently announced it is changing the way it calculates its Official Selling Price (OSPs) from 1 October, 2018, which will take the monthly average of DME Oman and Platts Dubai - creating a hybrid between the two major Asia benchmarks.

To complement the new crude oil hedging tool, DME is also listing the Oman/Dubai contract as a spread versus Brent futures and Asian refined products. The new listings will complement DME’s current suite of products, which includes the flagship Oman Futures contract, along with Dubai and Brent/Dubai futures.

Ahmad Sharaf, Chairman of DME, said: “The new listings are the next step in the natural evolution of the DME and exchange-traded products across the Asian markets, helping customers to hedge physical pricing exposure on both crude oil and refined products.”

DME is a joint venture between Dubai Holding, Oman Investment Fund and CME Group. Global financial institutions and energy trading firms including Goldman Sachs, JPMorgan, Morgan Stanley, Shell, Vitol and Concord Energy also hold equity stakes in the DME. [4 September 2018]
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BP inks supply chain pact in boost for Duqm SEZ

Energy major BP has awarded a new contract to Sumitomo Corporation Tubular Solutions Oman LLC (SCTSOL) for supply chain services which will result in a further boost to the expanding Duqm Special Economic Zone (SEZAD).

Building local content into our supply chain is a key focus area in BP’s procurement strategy and this contract will secure manufacture of piping and casing from Omani steel securing in-country pipe and casing support services.

BP expects to see increased efficiency in its drilling operations as a result of the move, which will see Sumitomo Corporation take over entire responsibility for inventory sourcing, management and delivery of casing, pipes and tubular for use in drilling of wells at the Khazzan field.

This builds on an existing supply agreement between BP and Sumitomo Corporation and will involve the transfer of operations to Duqm, where the array of logistics and materials handling facilities will be crucial to the success of the initiative.

Sumitomo Corporation will operate a ‘just in time’ service out of SEZAD, sourcing stock from Oman and Japan’s Nippon Steel Sumitomo Metal Corporation (NSSMC), holding it at SEZAD and supplying it to BP’s rig sites, as and when required. This should result in streamlined inventory for BP in the field and a more cost-efficient overall process.

BP is currently developing phase 2 of its Khazzan project, Ghazeer, which is expected to come onstream in 2021 and deliver an additional 0.5 bcf/d and over 15,000 bpd condensate production. Drilling on the first three development wells has begun, following appraisal drilling on Ghazeer last year. [28 July 2019]

Shell Oman welcomes 32 Omani summer interns

As part of its annual Summer Internship Programme, Shell Oman Marketing Company SAOG is providing on-the-job training and development opportunities for 32 Omani students from various local and international educational entities – Sultan Qaboos University, GUTech, Middle East College, Higher College of Technology, Scientific College of Design, Gulf College, and Caledonian College of Engineering as well as other international tertiary education institutes.

In addition to learning in a professional environment, the interns will gain exposure to the company’s culture, develop skills needed to excel in their career, and learn from mentors with long years of industry experience.

The interns have been placed in different departments within the Company, such as - Retail, Lubricants, Marine, Bitumen, Aviation, Legal, Commercial Fuel, Trade & Supply and Corporate Affairs.

Commenting on this initiative, Essam Al Busaidi, Human Resources & Administration Manager, said: “Shell Oman is dedicated to helping young Omani talents thrive as they progress to become contributors to the Sultanate’s future workforce. Internships, both in quantity and quality, have become important hiring criteria for students entering various industries. Through our Summer Internship Program, we look forward to training and developing the nation’s next generation of industry leaders and supporting students across the nation in their endeavor to explore and establish their interests and careers in the sector.” [5 August 2018]

Oman-Thai JV to set up $483m Duqm power project

Oman Oil Company (OOC), the wholly Omani government-owned energy investment vehicle, is partnering with Gulf Energy Development Public Company Limited (Gulf) – Thailand’s leading power utility – to set up a major gas-based power and water project at the Special Economic Zone (SEZ) in Duqm.

The proposed Duqm Independent Power & Water Plant Project will offer 326 megawatts (MW) of electricity generation capacity and 1,667 cubic metres/day of water desalination capacity. It will be the first gas-fired power and water project in Oman’s Wusta Governorate. Total investment in the project amounts to $483 million. A partnership agreement to this effect was signed by the two sides in Bangkok, Thailand on Thursday. Oman Oil Company and Gulf Energy Development were represented by their respective CEOs Eng Isam al Zadjali and Mr. Sarath Ratanaavadi at the signing. While OOC subsidiaries will hold a 55 per cent equity interest in the newly established project company Duqm Power Company, the balance 45 per cent will be owned by the Thai utility. Representing OOC’s interests in the project company are the Centralised Utilities Company (Marafaq) [51.1 per cent] and Oman Oil Facilities Development Company (OOFDC), [3.9 per cent]. The latter entities operate under Oman Oil Company’s Infrastructure Vertical headed by Oman Gas Company (OGC) – one of four verticals created as part of the Group’s landmark restructuring exercise undertaken two years ago.

Significantly, electricity and water output from the project has been earmarked for Duqm Refinery, which is currently under implementation at the SEZ with an investment of around $7 billion. Oman Oil Company is a 50 per cent shareholder in the 230,000 barrels per day capacity green-field refinery, with Kuwait Petroleum International (KPI) holding the balance 50 per cent.

Duqm Power Company, the owner and operator of the new power and water project, has already secured a 25-year power and water purchase agreement with Duqm Refinery, the partners stated. The project will be brought into commercial operation in three phases starting from July 2020 to May 2022 in sync with Duqm Refinery’s electricity and water consumption plan. [7 September 2018]
Oman’s Oil and Gas Sector Stakeholders Gathering: They Need You

The **OPAL Oil & Gas Conference** provides a great opportunity to get a comprehensive overview on the state of the industry, acquire and expand valuable business contacts in fuel and energy companies. This networking platform will discuss future or progress plans for Oman’s oil and gas sector from the enlightened perspectives of industry leaders.

By bringing experts from the whole value chain under one roof, you get to listen to the most crucial topics. Speakers from the following organizations will enlighten the attendees with their insight into the future of Oman’s oil and gas industry.

**Conference Session:**
- Digital Oilfields / Oil and Gas Digital Transformation
- Investment strategies and the way forward
- Transforming Oman’s Oil and Gas - Emerging Technologies
- Small & Marginal Oilfields developments
- Internet of Things (IoT) in Oil and Gas
- Women Role in Oil and Gas Sector
- Revamping HR in Oman’s Oil & Gas Industry

Network with professionals from Oman’s Oil & Gas Industry. Join us for the Gala Dinner on Tuesday 4 December 2018. Acquire industry acumen as H.E Salim Bin Nasser Al Auifi, Undersecretary, Ministry of Oil & Gas and the CEOs of leading oil and gas companies in Oman will be sharing their insights on forecast and action plan leading to 2020.

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Multiplier Effect

An innovative approach adopted by Oman’s Ministry of Oil & Gas in the marketing of the Sultanate’s natural gas assets has led to a flurry of high-profile agreements envisioning large-scale investments in integrated energy developments, says HE Salim bin Nasser Al Aufi, Under-Secretary of the Ministry of Oil & Gas.
A novel business and investment paradigm for unlocking Oman’s gas reserves is proving to be a new game-changer for the nation’s hydrocarbon industry.

Global energy heavyweights Shell, Total and Occidental Petroleum Corporation (Oxy) have already gravitated to this model, which espouses an integrated approach to gas development spanning the upstream, midstream and downstream components of the gas business chain.

Since the start of the year, three key partnership agreements have been signed on the basis of this integrated energy development model – a template that ensures the accelerated commercialisation of the Sultanate’s gas potential, but crucially, also contributing to wider economic growth.

Initial agreements signed in May this year have brought together Shell, Total and Oxy – along with state-owned Oman Oil Company – in an unprecedented partnership (not seen since the development of Oman LNG nearly a quarter century ago) to help monetise the nation’s gas reserves.

In a Memorandum of Understanding (MoU) signed by HE Dr Mohammed bin Hamad al Rumhy, Oman’s Minister of Oil & Gas, Shell Gas & Power Developments B.V. (Shell) and Total have broadly committed to participating in upstream gas exploration and development, gas-to-liquids (GTL), liquified natural gas (LNG) and renewable energies.

Total and Shell as operators will develop several natural gas discoveries located in the Greater Barik area on onshore Block 6, with respective shares of 25% and 75%, as per the agreement between both companies and before possible State back-in, with the objective of an initial gas production of around 500 MMcf/d and a potential to reach 1 bcf/d at a later stage.

Total, for its part, says it will use its equity gas entitlement as feedstock to develop a regional hub in Oman for Liquefied Natural Gas (LNG) bunkering service which will supply LNG as a fuel to marine vessels. This calls for the establishment of a new small-scale modular liquefaction plant to be built in Sohar port. The plant will comprise a 1 Mt per year train offering the flexibility for expansion as required by the development of the LNG bunkering market.

Separately, the Omani government also signed an MoU with Oxy and Oman Oil Company to explore investment opportunities in the petrochemical field. At the same time, the State Gen-
eral Reserve Fund (SGRF) – a sovereign wealth fund of the Sultanate of Oman – signed an agreement with Shell and EnTech Holding Company to invest in the renewable energy sector. More announcements are anticipated in the coming months as the Ministry of Oil & Gas works with its partners in sustainably developing the country’s natural resources and maximizing value from its hydrocarbon wealth.

Value proposition

Underpinning this new development model is a bold new rationale that seeks to harness synergies at the upstream and downstream ends of the business – a value proposition that is not available in the approach enshrined in the conventional Exploration & Production Sharing Agreement (ESPA), according to HE Salim bin Nasser Al Aufi, Under-Secretary of the Ministry of Oil & Gas. “The main driver in this integrated approach is the sharing of a bit of the risk with investors,” HE Al Aufi explains. “As an investor, you can develop the upstream end and take the gas over to the downstream project. By integrating the two ends, there is a beneficial synergy that comes into play. So we are attracting international players to bring their downstream investments to Oman too. Otherwise, we would be waiting for someone to knock on our doors to make use of the gas for downstream industries.”

Explaining the rationale and value proposition behind this new integrated development concept, the Under-Secretary said this innovative approach effectively grants complete control of the gas business chain to the investors. “We are actually throwing the ball into the investors’ court, pointing out that if they want to upstream gas business, part of their obligation is to also bring in the downstream industry that will monetize the gas. Based on our discussion with various interested parties, this approach is working quite well so far.

“There are many opportunities for downstream industries – whether it Gas to Liquids (GTL) that we are in discussion with Shell about, LNG bunkering with Total, or the petroleum industry that we are talking about with Oxy. So this approach
is actually changing the gas landscape in Oman.”

The official however hastened to clarify that the initiatives do not imply that the Sultanate is in the midst of any natural gas glut. “We are not suggesting that we have way more gas than we require; what we are doing is connecting the gas development directly with industries, which allows the investors to take control of the complete chain from the well all the way to the export tankers, and connect everything together. We, as government, will hopefully reap a multiplier effect on the return. Otherwise, for us, the return will simply be whatever we make from the upstream in terms of profit sharing, plus the delta we make from the buy and sell of the gas from the producer to the investor.”

This ‘multiplier effect’ inevitably associated with downstream investment underpins the strong value proposition that comes with integrated gas development, according to the Under-Secretary.

“We would like to capitalise on the multiplier effect associated with downstream industries. By definition, when you go downstream you are also increasing the In-Country Value (ICV) of the gas, and we would like to be part of that business as well. Downstream industries improve ICV, create more direct jobs, and also give rise to related industries – direct and indirect. The socioeconomic spinoffs are exciting.”

Brightening prospects
The keenly anticipated integrated energy projects mark a notable highpoint in a year that has seen the domestic Oil & Gas sector studiously staying the course in maintaining high activity levels despite the constrained fiscal environment – a
legacy of the 2014 global oil price slump. Many of the key challenges unleashed by the ensuing downturn, including a wave of redundancies and some bankruptcies as well, have been overcome, the Under-Secretary said.

Looking back on the preceding three quarters of the year, he observed: “The Oil & Gas sector has performed quite well so far this. My thoughts go back to late 2014 / early 2015 when there was huge concern that the fallout of slumping oil prices would drastically impact our activities, as well as cause a lot of unemployment, and so on. In retrospect, I think we manage to contain that fear and also address the redeployment that became a key issue during that phase. Although not every redundancy was linked to the oil price situation, we managed all of them.” Activity levels in the upstream sector, HE Al Aufi said, remained at high levels in line with trends that prevailed throughout the period of the downturn. There was also a certain degree of high-grading as well – where oilfield companies focus on drilling their most productive and profitable acreage.

“In the spirit of maintaining activity levels, while holding on to employees, I think we have done quite reasonably. I’m sure there are lessons learnt from this, but overall, we have managed the situation quite well,” he said.

Also laudable is the sector’s performance in terms of production levels during the foregoing period of the year. Output would have exceeded the 1 million barrels per day level, were it not for Oman’s commitment to the joint Opec/non-Opec agreement to cap global production reached in December 2016. However, the capacity remains in place to restore production to pre-agreement levels, he said.

Thus, despite a halving of oil prices in the wake of the 2014 price collapse, activity levels in the Oil & Gas sector - spanning exploration, seismic, development, projects and so on – remained high in a testament to the industry’s resolve to weather the storm unleashed by the crisis, he noted.

New acreage
Looking ahead, the official also sees the potential for new acreage to be offered up for investment this year – evidence of what he describes as the strong interest in the Sultanate’s upstream energy sector.

“We continue to market some open blocks and there is still interest,” the Under-Secretary said. “We are finalising negotiations for some blocks that were issued last year, while we are seriously considering the potential to issue additional blocks this year as well. At the same time, we have major negotiations ongoing with Shell and Total on the integrated downstream and upstream development targeting the Greater Barik discovery. All of this sends a very positive message to the market that we are open for business, and the investment environment in Oman is quite robust and stable.”
A sustainable model for job creation in the Oil & Gas sector

Although an industry that is less manpower-intensive than other economic sectors, Oil & Gas is nevertheless a standard bearer in how it helms strategic national initiatives in driving employment generation for young Omanis. In line with this longstanding commitment to job creation, the sector is exploring innovative ways to achieving its Omanisation goals continuously and sustainably.

Not surprisingly, Oil & Gas was among the first sectors to deliver on its pledge to contribute 5,000 positions in response to His Majesty the Sultan’s call for the creation of 25,000 jobs for Omani nationals last November. The lion’s share came from oilfield contractors through concrete commitments to replace expatriate workers with suitably trained nationals in a time-bound fashion.

But such approaches to job creation are not viable solution over the long-term, according to HE Al Aufi. “We have said right from the beginning that such initiatives in employment generation are not a sustainable model. It can be achieved once or perhaps twice, but the sustainable way forward is to plan ahead.

Planning for Omanisation can be undertaken in two ways, the Under-Secretary explains. Firstly, new Omani graduates are recruited, trained and developed to take on positions within a company either when existing national employees resign or retire, or to replace expatriates. Secondly, positions may be created at the entry level for young Omani job-seekers.

To curb any loopholes that may allow for expats to be recruited without reasonable justification, the Ministry of Oil & Gas has begun studiously examining all requests for labour permits.

“An operator or contractor seeking a clearance for an expatriate needs to assure us that they looked very thoroughly within the Omani market for an Omani potential candidate to take the position – experienced or new hires hire,” said HE Al Aufi. “It’s only when they genuinely try and fail to find an Omani will be allow them to bring in an expat for whatever the agreed period is. This is on the condition that we would like to see an Omanisation succession plan, which may include taking some Omani as fresh recruits, and training and developing them fully to take on those very positions when the expats are ready to leave the company. So we are emphasizing to contractors that they simply cannot ask for work permits and forget about Omanisation.”

Additionally, the Ministry is weighing plans for the introduction of a new category of openings exclusively for young Omanis within Oil & Gas companies, said the Under-Secretary.

“As part of the ICV strategy, we are debating the creation of another category of positions solely for Omani interns. Basically it means – support to the approval of this initiative – that every contractor will be asked to create positions for developmental purposes.

Thus, when a contractor is awarded a contract, they provide an Omanisation plan relevant to that contract. But in addition, they will also have to set aside dedicated positions for Omani trainees under the new proposal. This allows the interns to gain some experience for a year or two or three. So when they emerge from that contract, they will have some experience as well.”

The concept of Development Positions, according to the Under-Secretary, will help address the common challenge faced by many young graduates: how will they get any experience if they are never employed. Indeed, the potential for employment creation based on the new concept is promising, says HE Al Aufi. “If we even one Development Position for each of the estimated 400 contracts that are awarded in a given year, we can secure jobs for 400 young Omani job-seekers.

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The hydrocarbon sector remained a major driver of economic activities in the Sultanate, and it accounted for 30.1 percent of the nominal GDP in 2017, higher as compared with 27.1 percent in 2016.

The recovery in oil prices in conjunction with diversification efforts helped the Omani economy to rebound in 2017 from the contractionary spiral. The average price for the Omani crude oil increased by 27.8 percent to US$ 51.3 per barrel in 2017 from US$ 40.1 per barrel in 2016 (Table 3.1, chart 3.4).

During the year 2017, the average price of the Omani crude oil ranged from its lowest level of US$ 44.54 in January to its peak level of US$ 55.59 in the month of December. Daily average oil production, however, declined by 3.4 percent to 970.6 thousand barrels in 2017 as compared to 1 million barrels in 2016, reflecting implementation of OPEC and Non-OPEC oil producing countries agreement to cut production.

On an aggregate basis, oil production fell to 354.3 million barrels in 2017 from 367.6 million barrels in the previous year. The production of natural gas, on the other hand, increased slightly by 0.1 percent to 40,908 million cubic metres during 2017.

Government revenues from oil and gas as a percentage of GDP stood at 22.2 percent in 2017 and accounted for 72.9 percent of total government revenues, according to the Annual Report of the Central Bank of Oman.
Government revenues from oil and gas as a percentage of GDP stood at 22.2 percent in 2017 and accounted for 72.9 percent of total government revenues. The value-added hydrocarbon-based activities remained on the top agenda of the government and other stakeholders, given a large potential for such activities in the Sultanate. Accordingly, the promotion of petrochemicals and energy-intensive industries is likely to boost demand for hydrocarbon resources domestically going forward.

**Crude Oil Production and Exploration**

The crude oil production declined by 3.6 percent during 2017 over the previous year with a daily average production of 970.6 thousand barrels (Table 3.2 & Chart 3.5). The Sultanate had decreased its oil production as a result of the OPEC and non-OPEC agreement to limit oil production. The total average daily production in 2017 consisted of 884 thousand barrels of oil and 86.6 thousand barrels of condensates produced from 239 oilfields across Oman.

The Ministry of Oil and Gas signed four exploration and production sharing agreements (EPSA) during 2017 with energy companies to develop oil blocks in various parts of the country. The agreement with Tethys Oil Montasar Limited was signed for developing onshore block 49, while that with ARA Petroleum Oman B31 Limited was signed to explore oil in block 31. The agreement for block 30 was signed with Occidental Hafar LLC. The pact for block 52 was entered with ENI Oman B.V.

Petroleum Development Oman (PDO) remained as the biggest petroleum company in Oman with a daily average oil production of 582.2 thousand barrels in 2017 compared to the higher production level of 600.2 thousand barrels in 2016. Nonetheless, the quantity of oil produced by PDO in 2017 was well above the Company’s long-term target of 550 thousand barrels per day. The production of condensate by PDO was at 68,467 bpd, lower than the target by 8,740 bpd, due to numerous challenges including the frequent closure of Rabab wells for flare control, recurring station trips and a variable performance at Kauther.

PDO continued to maximize recovery from conventional oil and gas fields as well as to enhance exploration from unconventional opportunities. The PDO continued to display high efficiency for the tenth consecutive year 2017 and the Company’s combined production of oil, gas, liquid petroleum gases and condensates stood at 1.29 million barrels of oil equivalent per day, one of the highest levels of production in the PDO’s history.

Oil and gas companies operating in the oil and gas concession areas in 2017 drilled,
REPORT

**PETROLEUM DEVELOPMENT OMAN (PDO) REMAINED AS THE BIGGEST PETROLEUM COMPANY IN OMAN WITH A DAILY AVERAGE OIL PRODUCTION OF 582.2 THOUSAND BARRELS IN 2017 COMPARED TO THE HIGHER PRODUCTION LEVEL OF 600.2 THOUSAND BARRELS IN 2016**

tested and evaluated 58 exploration and appraisal wells, 21 of which were drilled in the years 2015 and 2016, and the progress has been satisfactory so far. PDO alone drilled 28 exploration wells, while Occidental Oman and CC Energy Development Oman drilled 17 exploration wells and the remaining companies drilled 13 wells.

Total reserves of crude oil and condensate for Oman were estimated at 4,740.3 million barrels in 2017, a decrease of about 10 percent in comparison with 5,242.5 barrels estimated in 2016. The decrease in reserves was estimated due to the modification of the Occidental reserve calculation method, where the reserve amounts were converted to recoverable amounts. PDO reserves constituted about 68 percent of the total reserve of crude oil and condensates in 2017.

**New Projects**

Oman continued with exploration and development of new oil and gas projects in 2017 to augment oil and gas production despite crude oil prices remaining low even after considerable recovery from the lows of 2016. In this regard, Oil companies, operating in the Sultanate, initiated a number of new projects during 2017. Furthermore, Ghaba North in the Qarn Alam cluster project reached its peak production during 2017. The Rabab Harweel Integrated and Yibal Khuff mega projects are progressing well and have secured capital savings of almost USD 800 million. The Zauliyah Gas Plant and Lekhwair F in the Upper Shuaiba were brought on stream during 2017. The PDO commissioned Hawqa Early Development Facility in a record time of just 13 months and unlocked the potential to produce more than 11,000 barrels of oil per day and 650,000 m³/ day of gas.

PDO also continued work in collab-
oration with Glass Point Solar on the Miraah solar energy project in Amal’s oilfield, which is the world’s largest-ever solar thermal project at peak production. The peak capacity of this project would be 1,021 megawatt solar thermal facility harnessing the sun’s rays to produce steam for thermal enhanced oil recovery. The construction work on the first phase of the project was completed and the first steam was integrated into the system at Amal West. The work on the second phase has begun with a considerable progress attained during 2017. Occidental Oman’s team added about 100,000 BPD of liquid handling capacity and 50,000 BPD of water injection capacity in 2017 in Block 9 and 27. Additional gas compression and liquid handling facilities along with further debottlenecking of production stations will continue in 2018. In Block 53, 194 production wells were provided permanent power to reduce operating expenses.

Daleel Petroleum commissioned the gas plant train II with impact reflected on gas production and the exportation of 12 MMSCFD on average. The gas plant extracts three types of gas viz. liquefied petroleum gas (LPG), natural gas liquefied (NGL) and lean gas.

Oman Oil Company inaugurated Musandam Gas Plant and the Musandam Power Company and signed a MoU with Eni for cooperation in the Oil & Gas sector. Oman Oil Company also signed partnership agreements with Kuwait Petroleum International Ltd (KPI) for the development of Duqm Refinery and Petrochemical Complex. Rabab Harweel Project has been progressing well with 40 percent completion and 38 out of 65 milestones achieved.

Sohar Refinery Improvement Project, which is a multi-billion US dollar capital investment for Orpic, is being implemented in response to the need to upgrade refining capability of the Sultanate in order to further maximize the value addition of Omani crude oil. Orpic also inaugurated Muscat Sohar Product Pipeline & Al Jefnain Terminal, which has come up in response to the strategic objective set by the government for developing oil products logistic solutions in the Sultanate to meet the rapidly growing demand for fuels.

### Oil Production & Exports (Million Barrels)

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>% Change</th>
<th>Exports</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>336.2</td>
<td>4.1</td>
<td>279.8</td>
<td>3.9</td>
</tr>
<tr>
<td>2013</td>
<td>343.8</td>
<td>2.3</td>
<td>304.2</td>
<td>8.7</td>
</tr>
<tr>
<td>2014</td>
<td>344.4</td>
<td>0.2</td>
<td>292.2</td>
<td>-3.9</td>
</tr>
<tr>
<td>2015</td>
<td>358.1</td>
<td>4.0</td>
<td>308.1</td>
<td>5.4</td>
</tr>
<tr>
<td>2016</td>
<td>367.6</td>
<td>2.7</td>
<td>321.9</td>
<td>4.5</td>
</tr>
<tr>
<td>2017</td>
<td>354.3</td>
<td>-3.6</td>
<td>294.2</td>
<td>-8.6</td>
</tr>
</tbody>
</table>

Source: Ministry of Oil and Gas and National Center for Statistics and Information.

### Oil Exports

After witnessing growth over the last two years, Omani crude oil exports declined by 8.6 percent to 294.2 million barrels in 2017 (Table 3.3 and Chart 3.5). The lower crude oil exports during 2017 were an outcome of production cut implemented by Oman as part of the agreement between OPEC and Non-OPEC countries. The exports of crude oil had increased considerably in last two years 2015 and 2016 in line with production in order to compensate for fall in oil prices.
The destination-wise analysis of crude oil exports exhibits that China constituted the largest about 70 percent of the total exports of crude oil and condensates from Oman in 2017, followed by India with around 10 percent contribution (Table 3.3 & Chart 3.6). The rest of the countries constituted the remaining about 20 percent of the total exports of crude oil and condensates.

Further investigation revealed that the crude oil exports directed to China declined the most, in absolute terms, by 46.3 million barrels, followed by the United States of America with a decline of 8.2 million barrels in 2017. In terms of percentage, the decline was highest for oil exports to the USA with 63.6 percent, followed by Singapore (58.3 percent), and Japan (25.4 percent). The crude oil exports to China and South Korea decreased by 18.4 percent and 17.0 percent, respectively, during 2017. On the other hand, the oil exports increased to India, Taiwan, and Thailand by 23.7 million barrels, 2.7 million barrels, and 0.4 million barrels, respectively, in 2017.

### Natural Gas

The natural gas industry is becoming important in the Sultanate with growing energy demand and potential to contribute notably to export revenues. The contribution of natural gas to export revenues had, however, fallen sharply following the price crash in the international market since mid-2014.

Oman Liquefied Natural Gas, a government-controlled joint-venture, signed an agreement with BP Singapore for sale and purchase of Liquefied Natural Gas (LNG) for a period of seven years, which will open up new horizons for Omani gas on the global gas map and contribute to export revenue. As per the provisional data for 2017, the natural gas reserves stood at 24.96 trillion cubic feet in Oman with 32 gas producing fields, of which, PDO contributed highest at 51 percent, followed by BP at 44 percent, and rest of the companies at 5 percent. The oil and gas companies undertook gas exploration activities, including drilling, testing and evaluating, in 32 wells during the year 2017 with some wells showing positive results, adding to new gas reserves.

During 2017, PDO faced several challenges in a low price environment, however, it continued to maintain good progress at Rabab Harweel and Yibal Khuff mega projects, securing capital savings of almost US$ 800 million. The Zauliyah gas plant and Lekhwair F in the upper Shuaiba were brought on stream.

The Khazzan gas field, jointly developed by British Petroleum (BP) Oman and Oman Oil Company Exploration and Production with 60-40 percent interest, began production in September 2017 after completion of the first phase. In the first phase of Khazzan project, over 200 wells have been dug and production at full steam is expected at 1bcf of gas per day. The work on the development of the second phase of Khazzan gas field, named “Ghazeer project” would begin in 2018. The Ghazeer project is anticipated to come on stream in 2021 and produce an additional 0.5 bcf/d and over 15,000 bpd condensate production. The Khazzan and Ghazeer together are expected to deliver total production of 10.5 tcf of gas and around 350 million barrels of condensate.
The daily production of natural gas inched up marginally by 0.7 percent to 106.8 million cubic metres (18.8 million cubic metres of associated gas and 87.9 million cubic metres of non-associated gas) in 2017 as against 106.1 million cubic metres (19.3 million cubic metres of associated gas and 86.8 million cubic metres of non-associated gas) in 2016.

PDO is the leading exploration and production company of Oman, which currently operates 14 gas fields besides 178 producing oil fields. The total production of natural gas also increased marginally to 40,903 million cubic metres (6,873 million cubic metres of associated gas and 34,029 million cubic metres of non-associated gas) in 2017 from 40,844 million cubic metres (7,071 million cubic metres of associated gas and 33,774 metres of non-associated gas) in 2016 (Table 3.4).

The demand for natural gas, which is used for various purposes viz. power generation, industries and industrial projects, and oil projects, is increasing with expanding economic activities in the Sultanate. The natural gas in oil fields is used for fuel and re-injection in oil wells to accelerate production. As domestic production fell short of demand, natural gas was imported during the year by Dolphin Energy Company at about 5.3 million cubic metres per day in 2017, albeit somewhat lower as compared to 5.5 million cubic metres per day in 2016.

Natural gas is becoming an increasingly important source of energy in the Sultanate, as alluded to earlier, with diversification in the economy on an accelerating path. The majority of new companies, which are starting operations, are energy-intensive and hence, the demand for power consumption and in turn, natural gas will further go up in the future. It is, however, worth mentioning that the first phase of Khazzan gas project has come on stream and started production in September 2017, and the work on the second phase has begun. The natural gas production from Khazzan project would be able to meet the growing demand for natural gas, reducing country’s dependence on imports.

**Gas Exports**

The natural gas constitutes a significant part of Omani merchandise exports, albeit their share had shrunk in the recent past due to collapse in international prices. During 2017, the exports of LNG from Oman at 8.6 million metric tons witnessed a marginal uptick as compared to 8.5 million metric tons in 2016. Oman LNG Company exported a total of 5.5 million metric tons, while 3.1 million metric tons were exported by Qalhat LNG Company. The Sultanate also exported 0.238 million metric tons of gas condensates in 2017. Going forward, the exports of natural gas from the Sultanate would get a boost with the signing of Oman LNG’s agreement with BP Singapore recently for sale and purchase of LNG for a period of seven years.

### Production & Uses of Natural Gas (Million Cubic Meter)

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>% Changes 2017/16</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associated</td>
<td>40,844</td>
<td>40,903</td>
<td>0.1</td>
</tr>
<tr>
<td>Non Associated</td>
<td>33,774</td>
<td>34,029</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Uses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A- Power Generations</td>
<td>40,849</td>
<td>40,908</td>
<td>0.1</td>
</tr>
<tr>
<td>B- Industrial Areas</td>
<td>7,993</td>
<td>8,236</td>
<td>3.0</td>
</tr>
<tr>
<td>C- Industrial Projects</td>
<td>650</td>
<td>659</td>
<td>1.4</td>
</tr>
<tr>
<td>D- Oil Fields</td>
<td>23,042</td>
<td>32,227</td>
<td>39.9</td>
</tr>
<tr>
<td>Fuel</td>
<td>9,163</td>
<td>8,787</td>
<td>-4.1</td>
</tr>
<tr>
<td>Re-injection</td>
<td>2,928</td>
<td>3,064</td>
<td>4.6</td>
</tr>
<tr>
<td>Flared</td>
<td>3,781</td>
<td>2,888</td>
<td>-23.6</td>
</tr>
<tr>
<td>Other</td>
<td>1,662</td>
<td>1,727</td>
<td>3.9</td>
</tr>
</tbody>
</table>

* Provisional
Source: National Center for Statistics and Information.

The demand for natural gas, which is used for various purposes viz. power generation, industries and industrial projects, and oil projects, is increasing with expanding economic activities in the Sultanate.

Towards a Low-Carbon Future

Oman is preparing to embrace an exciting low-carbon future as is evident from its pursuit of large-scale renewables based power schemes, roof-top solar PV capacity, regulations governing the operation of Electric Vehicles, and its first waste-to-energy venture.

Oman’s transition to renewables – first bandied about a decade ago when the Authority for Electricity Regulation (AER) issued a landmark report on the Sultanate’s renewables-based potential – is now well and truly underway.

Fledgling moves towards solar and wind based power generation that were initiated in 2017 have since burgeoned into a full-blown strategic quest to shift the Sultanate away from an overarching dependence on natural gas as the primary resource for electricity generation and water desalination.

At the heart of this drive is a desire, on the one hand, to conserve and divert natural gas for value-adding industrial and economic investment, and on the other, to achieve a well-diversified fuel mix to support Oman’s long-term energy requirements. On either front, the government agencies and stakeholder institutions concerned are outlined far-reaching programmes to deliver on these objectives.

Indeed, 2018 is set to be a watershed year for Oman’s renewables-based ambitions. The Authority for Electricity Regulation (AER), the sector regulator, and the Oman Power and Water Procurement Company (OPWP), the sole procurer of new power and water capacity under the sector law, are jointly spearheading the Sultanate’s aggressive foray into renewable and alternative energy resource development. Majority-government-owned Petroleum Development Oman (PDO), the nation’s largest producer of oil and gas, has already made significant investments as well in support of its energy sustainability ambitions.

Spurring to transition to renewables is a new fuel diversification policy adopted by the Omani government earlier this year. It requires that renewable energy projects contribute 10 per cent of generation output by 2025 (and up to 3,000 MW of coal-fired generation to be developed by 2030).
Accordingly, the state-owned power procurer OPWP has chalked a comprehensive renewable energy (RE) development plant envisioning substantial investments in solar, wind, and waste-to-energy (WTE) projects. As part of this strategy, OPWP plans to procure more than 2,600 MW of RE-based Independent Power Projects (IPPs) by 2025. The large majority of these investments are expected to be located in the Main Interconnected System (MIS), which covers much of the northern half of the Sultanate, and further south around Duqm, with their main market for generation in the MIS.

**Fuel diversification policy**

OPWP’s RE programme got underway in earnest last December when it floated a tender for Oman’s first ever utility scale solar PV project - 500 MW scheme - to be located at Ibri. Around a dozen international developers, including a number of prominent global energy corporations, are competing for the prestigious license to build the Sultanate’s maiden commercial-scale solar power scheme.


In early October 2018, OPWP unveiled plans for the procurement of a second utility-scale solar power plant, this time around sized at up to a world-scale 1 gigawatts (GW). The mega scheme, dubbed Solar 2022 IPP, will be a solar photo-voltaic (PV) based Independent Power Project (IPP) due for commercial launch in 2022. It is also expected to come up in the Wilayat of Ibri in Dhahirah Governorate, alongside the maiden Ibri II Solar IPP slated for commercial launch in 2021.

Kicking off the groundwork for the procurement of the new giant solar scheme, OPWP said: “In line with Oman’s vision to diversify fuel sources for power generation and following the ongoing procurement of the first utility scale solar PV IPP in Oman, OPWP would now like to Interconnected System in Oman, with a capacity between 500 MW to 1000 MW, known as Solar 2022 IPP.”

**Successive procurements**

New solar-based capacity additions are planned at yearly intervals via a succession of procurements, each sized at a minimum of 500 MW, for commercial launch in 2023 and 2024. Also envisioned is a pair of large-scale wind power schemes, each of around 200 MW, to be brought into operation in 2023 and 2024 respectively.

OPWP says it expects that solar PV projects will contribute at least 30 per cent of their peak installed capacity to the MIS peak demand, on the basis of energy output profiles determined from Manah and Adam site data.

“Specific projects may contribute somewhat more or less, depending on their location and more importantly on their technology configuration. Generally, solar energy output peaks when the sun is directly overhead, and declines toward zero by sunset. The output profile may be modified by technology, configuration, solar tracking technology, and energy storage. OPWP plans to reassess the capacity contributions of specific projects as they are awarded and the technology is defined.”

Importantly, OPWP also has substantive plans for the development of wind energy projects of capacities ranging from 150 – 200 MW. Sites in Dhofar, Duqm and potential Sharqiya, are being weighted as possible locations for these new investment, although the choice of location will be determined by its proximity to a new 400 kV transmission line due to be built from Izki to PDO and onward to Duqm by the year 2023. Two wind-based IPPs are envisioned for development as part of OPWP’s current 7-year capacity procurement cycle. The procurement process is expected to commence towards the end of 2019 with commercial operation targeted during 2023.”

“The expected locations are in Duqm and Dhofar,
and their installed capacities are expected to be in the range of 150 MW to 200 MW each,” according to OPWP. Already, the Sultanate’s first utility-scale wind farm is under construction at Harweel in Dhofar Governorate. The 50 MW project is being financed by UAE’s MASDAR, to be operated by the Rural Areas Electricity Company (RAECO) under a Power Purchase Agreement (PPA) with OPWP. The project is expected to begin operation in 2020.

**Waste-to-Energy**

Underscoring the ambitious scope of its renewable and alternative energy programme, OPWP is also pursuing a first-of-its-kind Waste to Energy (WTE) project in the Sultanate. According to OPWP, the proposed Waste to Energy project will use around 1.4 million tons of waste per annum as a fuel resource. Earlier announcements by the power procurer envisaged a generation capacity of around 50 MW with the waste sourced from landfills operated by be’ah – the Sultanate’s solid waste management flagship – in Muscat and South Al Batinah governorates. Barka is seen as an ideal location for the establishment of the project. The venture, OPWP said, will help support Oman’s fuel diversification strategy away from the nation’s current dependence of natural gas as the fuel resource for the bulk of its electricity and desalinated water requirements. Additionally, the move will aid be’ah’s goal to reduce the disposal of prodigious amounts of potentially calorific-rich municipal waste into landfills.

“This project would be competitively procured as an IPP, under a long-term Power Purchase Agreement (PPA) with OPWP, using municipal solid waste supplied by Be’ah. OPWP expects it to be a continuously operating plant, i.e., baseload supply, with guaranteed capacity similar to supply from the gas-fired power plants currently under contract with OPWP,” said OPWP in its latest 7-Year Outlook Statement for the 2018-2024 timeframe.

“We are entering a period of transition in which a variety of technologies leading to greater fuel efficiency will be released by car manufacturers.”
In coordination with be’ah and the Authority for Electricity Regulation Oman (AER), OPWP also commissioned a study to assess the techno-economic and commercial feasibility of establishing a Waste to Energy plant in Barka. The study was due to be completed in August.

“Subject to approval, OPWP expects to issue the Request for Qualifications (RFQ) in Q4 2018, a Request for Proposals (RFP) in Q1 2019, and to award the project in Q3 2019 for Commercial Operation (COD) in Q4 2022,” the power procurer added.

Rooftop solar PV

Supplementing the government’s pursuit of utility-scale renewables is an equally ambitious mass-scale initiative to harness the sun’s energy via the installation of solar photovoltaic (PV) systems atop residential buildings in the Sultanate. The initiative, dubbed Sahim-2, is being driven by the Authority for Electricity Regulation Oman (AER) and represents the second phase of an ambitious programme that will see up to 30 per cent of residential premises in the Sultanate fitted out with rooftop-based solar PV systems. In contrast, Sahim-1, which is currently under implementation, allows larger households as well as businesses that install rooftop PV systems at their own cost, to be compensated for any electricity output exported into the grid.

In June, the Authority invited Expressions from Interest (EoI) from qualified developers eager to participate in this landmark scheme. Interested developers were required to furnish, among other things, “the indicative cost of providing and operating an integrated system of automated risk management with the following non-exhaustive list of capabilities: information storage and retrieval, remote metering and monitoring of multiple rooftop PV systems, weather corrected performance evaluations, performance reports of sufficient quality to support invoicing and contract payments, high-level storage redundancy and data security, and other requirements stipulated by the Authority relevant to the life cycle management of privately financed rooftop PV system assets.

Envisaged under Sahim-2 is the large-scale deployment of small PV systems of capacities ranging from 3 – 5 kilowattpeak (kWp) covering between 10 – 30 per cent of residential premises in the Sultanate. Unlike PV systems covered in Sahim-1, the costs of procuring, installing, operating and maintaining residential systems under Sahim-2 will not be borne by the customers, but rather the developers who will recoup their costs through contracts with the licensed power suppliers.

Importantly, the EoI calls for the appointment of a corporate entity as an ‘Agent’ of the Authority with responsibility for procuring, funding, installing, commissioning, operating and maintaining the Integrated System for Sahim-2 for period of not less than 20 years.

As part of its mandate, the Agent will put together an Integrated System for the facilitation of a series of tasks covering the installation and operation of individual PV systems. For example, upon the award of contracts to successful bidders, the Agent will compile and maintain a register of awarded contracts including: participating premises, number and types of PV systems, configurations of PV systems to be installed at each premise, details of PV System Providers and contractors responsible for PV System installations at specified premises and subsequent O&M.

Likewise, during the installation phase, the Agent will be required to monitor and register all required approvals and consents (the Municipality, for example. It must ensure that only approved and correct components are installed at stipulated premises and maintain a database including photographic records of installed components at each premise.
Furthermore, the Agent is tasked with monitoring commissioning tests of all PV systems to confirm, among other things, the complete installation of specified PV systems; compliance with approved design and components; that PV system output accords with manufacturer design specifications given actual local weather conditions at time of commissioning; confirm satisfactory completion of commissioning tests or indicate why commissioning failed and actions required to retest.

Explaining the methodology for the financing of the Sahim-2 phase, as well as the respective roles of the PV System Providers and the Agent, the Authority said: “Private entities (PV System Providers) will compete to fund, procure, install, own, operate and maintain qualifying PV systems at residential premises designated by the Authority – procurement, installation and PV system operation will be closely supervised by the Authority’s Agent. The performance of all qualifying PV systems will be independently monitored over their operational lives.”

The Authority further added: “Licensed suppliers will enter long term performance based contracts with PV System Providers to remunerate investment costs (including investment returns) and the costs of installing, commissioning, operating and maintaining qualifying PV systems. The Authority’s Agent will provide performance data to support these transactions.”

**Economic spinoffs**

‘Sahim’, which means “contribute” in Arabic, was part of a series of renewable energy based initiatives spearheaded by the Authority to promote the exploitation of Oman’s limitless solar resources for electricity generation. Part of the objective is to alleviate the nation’s dependence on natural gas-based power generation, and divert any gas resources saved in the process towards investments that support economic diversification and employment creation.

Significantly, an incentive-based tariff system approved by the regulator will enable residential customers to slash their annual electricity bills by around 40 per cent when they install grid-connected solar photovoltaic (PV) systems on their rooftops.

According to the electricity authority, any surplus power exported back into the grid will be remunerated at prevailing Bulk Supply Tariffs (BST), which are higher than the electricity tariffs for residential customers – a feature designed to incentivize the rollout of rooftop solar capacity under the Authority’s ‘Sahim’ initiative.

“The Authority has approved a tariff system that encourages customers to go in for rooftop systems initially for self-supply. However, if they have any surplus output from their systems, they will be allowed to automatically inject this surplus into the grid. They will be remunerated for any exported energy based on bulk supply tariffs, which are exactly the tariffs paid by the bulk supply companies to the procurement company (OPWP) - which in turn are higher than the residential tariffs.”

**According to OPWP, the proposed waste to energy project will use around 1.4 million TONS OF WASTE PER ANNUM AS A FUEL RESOURCE**

Customers will have a greater incentive to install solar rooftop systems as they will be financially remunerated for any surplus power exported into the grid,” the Authority explained.

Preceding the full-fledged launch of the ambitious, nationwide Sahim programme, the Authority plans to conduct a pilot phase targeting between 1,000 and 3,000 homes in Muscat Governorate. The pilot phase will be tendered out to interested developers sometime between the end of Q3 and beginning of Q4 of this year.

In preparation for this pilot, the Authority is drafting new regulations and guidelines to designed to help distribution and supply companies to agree contractual terms with potential developers, who will be responsible for investing, funding, operating and maintaining the rooftop solar PV systems on residential homes.

Importantly, the Authority is prioritizing the residential segment of the electricity market for rooftop solar implementation because of its dominant share in power consumption – pegged at a hefty 47 per cent. Residential customers accounted for RO 370 million of the total subsidy of RO 510 million disbursed by the government to the sector in 2016.

**Conrad Prabhu**
A ‘Made in Oman’ BIOFUEL

The humble date, long touted in the Arab region as the ‘fruit of paradise’ for its health-enhancing benefits, has yielded another of its treasures. The seed pit can be processed to produce high-quality biodiesel with significant potential for industrial-scale commercialization, says Omani researcher and Principal Investigator of the project, Dr Lamya Al Haj.
The next time you munch on some dates, think again before you toss the seed pits into the nearest trash bin! New research spearheaded by an Omani scientist and her team has uncovered the potential to harness high-quality biodiesel fuel from these pits. Indeed, a pilot study funded by Petroleum Development Oman (PDO) has all the hallmarks of a ‘Waste-to-Energy’ success story with the potential to unleash significant strategic, socio-economic and environmental benefits for Oman, and the wider Arab region as well.

At the centre of the exciting initiative is Dr Lamya Al-Haj, Assistant Professor of Molecular Biology at Sultan Qaboos University (SQU), who was part of the original multinational team of researchers that stumbled upon the astonishing secret behind the valuable resource hidden away in date seed pits.

Also playing a pivotal part in uncovering the biofuel potential of date seed pits was Dr Ala’a H. Al-Muhtasab, Associate Professor of Chemical Engineering at SQU, who is described by Dr Lamya as a researcher of prodigious talent and who will continue to play a role as Co-Principal Investigator. Fellow SQU researcher Dr Mohab Al-Hinai was a key member of the team as well but has since moved on to pursue other rewarding professional endeavours.

Dr Lamya’s scientific quest dates back to 2010 when she enrolled at the University College London (UCL) to pursue her PhD programme on the theme, ‘Genetic Engineering of Algae for Biofuel Production’.

The young Omani scholar recalls standing before a rather bewildered interview panel sceptical about her choice of research theme. “I remember being asked the question: ‘Coming from an oil-rich country as you do, why do you want to study biofuels?’ Apparently, I was also the first Arab research student to express a research interest focusing on biofuels at UCL. My response was simple: ‘In a region awash in oil, we tend to forget that we are dealing with a finite resource that will be exhausted some day. We want to be the first to be prepared for the future!’”

That candid response clinched the interview for Dr Lamya and set her on an exciting research journey that, she says, has potential game-changing outcomes for Oman’s, and indeed, the global community’s transition to sustainable, green energy alternatives.

“We are really passionate about biofuel as a clean, alternative energy resource and want to do something for our beloved country. We need to be suitably prepared for a future that thrives on sustainable energy resources.”

**Clean fuel quest**

Thus began the quest to synthesize clean energy from waste seed pits – an effort that started with a three-member team of researchers that included Dr Ala’a Al-Muhtaseb and Dr Mohab Al-Hinai. The Research Council (TRC) – the Sultanate’s preeminent R&D institution – stepped in with initial funding for the project. With this support, Dr Lamya and her team managed to demonstrate the viability of producing biofuel from waste date seed pits.

“We succeeded in producing 100 ml of pure biodiesel from about 10
15 kg of waste date seed pits,” said the scientist. “Just to make things even more exciting, we sent the samples to UCL London for testing emission levels. The results were extremely heartening – emission levels were a lot less harmful compared with conventional fossil fuel emissions, and the greenhouse gas footprint was considerably lower as well.”

Not surprisingly, two research papers produced by the team received Best Research Paper accolades at international conferences held in France and the United States alongside eight scientific journal papers. Dr Lamya was also invited to present the findings at various events. “It was an exciting time for us, particularly because it was the first research of its kind being done in Oman, and indeed the entire Gulf region,” she remarked.

Not long thereafter, majority Omani government-owned Petroleum Development Oman (PDO) – which is the biggest independent funder of energy-related R&D in the Sultanate – voiced interest in supporting the initiative, according to Dr Lamya.

“I happened to run into PDO’s Managing Director, Mr. Raoul Restucci, and told him about our research project. He was very excited about it because it gels with PDO’s advocacy of sustainability and green energy. PDO is also a sponsor of the EJAAD initiative – a platform that seeks to bridge the gap between academia and industry.”

**Funding support**

Last month, Dr Lamya’s clean fuel initiative was among a handful of strategic R&D projects that secured grants at an event jointly hosted by The Research Council, Sultan Qaboos University and the EJAAD Platform. Besides extending funding support for the study, the grant also effectively recognized the immense commercial and economic spinoffs expected to emerge from the project once commercial viability is demonstrably established.

“A big thank-you to PDO for its generous funding support for this clean fuel initiative and an equal thanks to SQU and Ejaad platform for the support,” said Dr Lamya. “This effectively kicks off Phase

Dr Lamya emphasizes that biodiesel from waste date seed pits will not supplant fossil fuel consumption in Oman, or indeed, anywhere else in the world.
2 of our programme during which we will attempt to produce 100 litres of pure biodiesel from waste seed pits. This fuel will be tested in machines operated by PDO in the desert environment, and a comparison made of efficiency levels involving our biofuel, on the one hand, and conventional fossil fuels, on the other. If this pilot proves successful, we will then plan for Phase 3 which focuses on industrial-scale production.”

Although commercial-scale production is still some way off, Dr Lamya and her team envision a pivotal role for Oman as a regional – if not a global - producer of clean fuels. The young scientist is determined to ensure that the first biofuel refinery – based on the team’s landmark research – materializes in the Sultanate. Already, a number of Oman-based investors – sensing a potential clean-fuel goldmine – have pledged to invest in the refinery, when plans are eventually firm up, she says.

**Multiplier-effect**

Longer-term, Dr Lamya foresees hugely beneficial implications for date farmers not only in Oman but across the wider date-producing regions of the Arab world. Date pits long regarded as waste – save for some very insignificant quantities used in the production of coffee powder – are set to become a commercially sought-after commodity.

Around 10 – 15 kg of date pits are required to synthesize one litre of biodiesel in lab conditions.
Given the prodigious quantities of waste seeds that will be required as raw material for the biodiesel refinery, Dr Lamya reckons that collection and storage activities will proliferate across the Sultanate, and potentially around the Arab region as well. Already, a Rustaq based supplier has pledged to provide several tons of seed pits for the latest phase of the study, she said.

And there are positive spinoffs for the wider region as well. “If this succeeds – and there is every reason to believe it will – every single Arab country that has date palms as the central part of its natural heritage – has the potential to develop biofuel for its own consumption or export. We will be willing to share our expertise in support of economic development, as well as to advance environmental sustainability in this region.”

Auguring well for the success of the study is the One Million Date Palms Project – currently being implemented by the Diwan of Royal Court at the behest of His Majesty the Sultan. The project is seen as an important source of seed pits as raw material for biodiesel production in the future.

**Green fuel alternatives**

Dr Lamya, however, emphasizes that biodiesel from waste date seed pits will not supplant fossil fuel consumption in Oman, or indeed, anywhere else in the world. “That’s not what we are aiming at!” says the scientist. “What we are trying to do is to reduce the dependency on fossil fuels through a contribution from biofuels, as well as from solar, wind power, and so on. The idea is that everyone should try to do as much as possible to produce cleaner and sustainable energy alternatives just to reduce this dependence on fossil fuels.”

What will eventually dictate the date seed pit-based biodiesel’s commercial success is the economics of producing it versus that of conventional fossil or even other types of biofuels, says Dr Lamya. Lab tests have so far proven that biodiesel from waste date seed pits is far cheaper to produce than alternatives synthesized from, say, palm oil, waste cooking oil, and so on.

A key factor underpinning the potential commercial success of this quintessentially Omani brand of biodiesel is the use of a special catalyst to convert the oil extracted from the date pits into biofuel – a process termed as ‘esterification’. The catalyst, the type of which is a closely-guarded secret, can be reused several times, thereby contributing to the economical production of biodiesel. Dr Lamya’s team has until 2021 to come with the initial 100 litres of ‘Made in Oman’ biodiesel that already has the local scientific community, as well as clean energy advocates, agog with anticipation. To this end, the research team is currently focused on fitting out a laboratory at SQU with high-tech equipment and instrumentation necessary to demonstrate the viability of the project. Already, a number of young Masters and research students – Omani researchers Moosa Al Lawati and Maria Al Kalbaniya, and Bahraini student Nawra Al-Sayegh – have been recruited to assist in the study. Further appointments are planned as well, given the ambitious scope of the project.

Buoyed by the groundswell of interest and support generated not only locally but internationally as well, Dr Lamya is confident that an Omani biodiesel brand is well and truly on the road to commercialisation. “We dream someday of driving into a fuel station that has a biofuel dispenser in Oman; it’s going to happen – it’s just a matter of time!” she enthused.

**In Numbers**

We succeeded in producing 100 ml of pure biodiesel from about 10 – 15 kg of waste date seed pits.

**Conrad Prabhu**

- a member of the original team that launched the research project.
Global energy transformation: A ROADMAP TO 2050

Renewable energy needs to be scaled up at least six times faster for the world to start to meet the goals set out in the Paris Agreement, the International Renewable Energy Agency (IRENA) warns in its latest report.
The historic climate accord from 2015 seeks, at minimum, to limit average global temperature rise to “well below 2°C” in the present century, compared to pre-industrial levels. Renewables, in combination with rapidly improving energy efficiency, form the cornerstone of a viable climate solution.

**Keeping the global temperature rise below 2 degrees Celsius (°C) is technically feasible.**
It would also be more economically, socially and environmentally beneficial than the path resulting from current plans and policies. However, the global energy system must undergo a profound transformation, from one largely based on fossil fuels to one that enhances efficiency and is based on renewable energy. Such a global energy transformation – seen as the culmination of the “energy transition” that is already happening in many countries – can create a world that is more prosperous and inclusive.

**Currently, emission trends are not on track to meet that goal.** Government plans still fall far short of emission reduction needs. Under current and planned policies, the world would exhaust its energy-related “carbon budget” (CO2) in under 20 years to keep the global temperature rise to well below 2°C (with 66% probability), while fossil fuels such as oil, natural gas and coal would continue to dominate the global energy mix for decades to come.

**To meet the below 2°C goal, immediate action will be crucial.** Cumulative emissions must at least be reduced by a further 470 gigatons (Gt) by 2050 compared to current and planned policies (business-as-usual) to meet that goal.

Energy efficiency and renewable energy are the main pillars of the energy transition. While different paths can mitigate climate change, renewable energy and energy efficiency provide the optimal pathway to deliver the majority of the emission cuts needed at the necessary speed. Together they can provide over 90% of the energy-related CO2 emission reductions that are required, using technologies that are safe, reliable, affordable and widely available.

**Renewable energy and energy efficiency need to expand in all sectors.** The total share of renewable energy must rise from around 15% of the total primary energy supply (in 2015) to around two-thirds by 2050. To meet climate targets, the energy intensity of the global economy will need to fall by about two-thirds by 2050, lowering the total primary energy supply in that year to slightly less than 2015 levels. This can be achieved, despite significant population and economic growth, by substantially improving energy efficiency.

**By 2050, all countries can substantially increase the proportion of renewable energy in their total energy use.** REmap, a global roadmap prepared by the International Renewable Energy Agency (IRENA), suggests that renewables can make up 60% or more of many countries’ total final energy consumption (TFEC). For instance, China could increase the share of renewable energy in its energy use from 7% in 2015 to 67% in 2050. In the European Union (EU), the share could grow from about 17% to over 70%. And India and the United States could see shares increase to two-thirds or more.
A decarbonised power sector, dominated by renewable sources, is at the core of the transition to a sustainable energy future. The share of renewable energy in the power sector would increase from 25% in 2017 to 85% by 2050, mostly through growth in solar and wind power generation. This transformation would require new approaches to power system planning, system and market operations, and regulation and public policy. As low-carbon electricity becomes the main energy carrier, the share of electricity consumed in end-use sectors would need to double from approximately 20% in 2015 to 40% in 2050. Electric vehicles (EVs) and heat pumps would become more common in most parts of the world. In terms of final energy, renewable electricity would provide just under 60% of total renewable energy use, two and a half times its contribution to overall renewable energy consumption today.

The power sector has made significant progress in recent years, but the speed of progress must be accelerated. In 2017 the power sector added 167 gigawatts (GW) of renewable energy capacity globally, a robust growth of 8.3% over the previous year and a continuation of previous growth rates since 2010 averaging 8% per year. Renewable power generation accounted for an estimated quarter of total global power generation, a new record. New records were also set for solar and wind installation, with additions of 94 GW in solar photovoltaic (PV) and 47 GW wind power, including 4 GW of offshore wind power. Renewable power generation costs continue to fall. There is ample evidence that power systems dominated by renewables can be a reality, so the scale and speed of renewable energy deployment can be accelerated with confidence.

Industry, transport and the building sectors will need to use more renewable energy. In these sectors, renewable sources including increased renewable electricity supply, but also solar thermal, geothermal energy and bioenergy, must play important roles. Renewable electricity will play an increasingly important role but a large contribution are renewable fuels and direct-uses that are needed for heat and transport. For these the use of biomass could provide a little under two-thirds of renewable energy used for heat and fuel; solar thermal could provide around one-quarter; and geothermal and other renewable sources the remainder.

Energy efficiency is critical in the building sector. However, the slow rate at which energy efficiency in the sector is improving, due in part to the low building renovation rates of just 1% per year of existing building stock, remains a major issue. A three-fold
increase in this renovation rate is necessary. In industry, the high energy demand of certain industries, the high carbon content of certain products, and high emission processes, require novel solutions and lifecycle thinking.

The global energy transformation makes economic sense. The additional costs of the comprehensive, long-term energy transition would amount to USD (United States Dollars) 1.7 trillion annually in 2050. However, cost-savings from reduced air pollution, better health and lower environmental damage would far outweigh these costs. The REmap Case suggests that savings in these three areas alone would average USD 6 trillion annually by 2050. In addition, the energy transition would significantly improve the system’s global socio-economic footprint compared with business-as-usual, improving global welfare, GDP (Gross Domestic Product) and employment. Across the world economy, GDP increases by 2050 in both the reference and transition scenarios. The energy transition stimulates economic activity additional to the growth that could be expected under a business as usual approach. The cumulative gain through increased GDP from 2018 until 2050 would amount to USD 52 trillion.

Substantial additional investment in low-carbon technologies will be required compared to current and planned policies. Cumulative investment in the energy system between 2015 and 2050 will need to increase around 30%, from USD 93 trillion according to current and planned policies, to USD 120 trillion to enable the energy transition. Investment in renewable energy and energy efficiency would absorb the bulk of total energy investments. Also included in this total is USD 18 trillion that would need to be invested in power grids and energy flexibility – a doubling over current and planned policies. In total, throughout the period, the global economy would need to invest around 2% of the average global GDP per year in decarbonisation solutions, including renewable energy, energy efficiency, and other enabling technologies.

Understanding the socioeconomic footprint of the energy transition is essential to optimize the outcome. The energy transition cannot be considered in isolation, separate from the socioeconomic system in which it is deployed. Different transition pathways can be pursued, as well as different transitions of the socio-economic system. The REmap Case significantly improves the global socio-economic footprint of the energy system (relative to the Reference Case). By 2050, it generates a 15% increase in welfare, 1% in GDP, and 0.1% in employment. The GDP improvement peaks after about a decade, while welfare continuously improves to 2050 and beyond. The socioeconomic benefits of the transition (welfare) go well beyond GDP improvements, and include marked social and environmental benefits. At the regional level, the outcome of the energy transition depends on regional ambition as well as regional socioeconomic structures. Despite fluctuations in GDP and employment, welfare will improve significantly in all regions.

With holistic policies, the transition can greatly boost overall employment in the energy sector. On balance, the shift to renewables would create more jobs in the energy sector than are lost in the fossil fuel industry. The REmap Case would result in the loss of 7.4 million jobs in fossil fuels by 2050, but 19.0 million new jobs would be created in renewable energy, energy efficiency, and grid enhancement and energy flexibility, for a net gain of 11.6 million jobs. To meet the human resource requirements of renewable energy and energy efficiency sectors in rapid expansion, education and training policies would need to meet the skill needs of these sectors and maximizing local value creation. A transition that generates fair and just socioeconomic outcomes will avoid resistances that could otherwise derail or halt it. Transforming the socioeconomic system is one of the most important potential benefits.

All regions of the world stand to benefit from the energy transformation, although the distribution of benefits varies according to socio-economic context. As expected, socioeconomic benefits are not distributed uniformly across countries and regions. This is because the effects play out differently depending on each country’s or region’s dependence on fossil fuels, ambition in its energy transition, and socio-economic characteristics. In terms of welfare, the strongest overall improvements are found in Mexico, closely followed by Brazil, India and the countries and territories of Oceania. Other regions, including rest of East Asia, Southern Africa, Southern Europe, and Western
Europe also record high welfare gains. Environmental benefits are similar in all countries, because they are dominated by reduced greenhouse gas (GHG) emissions given its global nature. Regional net gains in employment fluctuate over time, but the impact is positive in almost all regions and countries.

**Accelerated deployment must start now.** Early action to channel investments in the right energy technologies is critical to reduce the scale of stranded assets. The slow progress of emission mitigation to date means that the adoption of a mitigation path detailed in this report will result in stranded assets worth more than USD 11 trillion. If the world starts to accelerate the energy transition today based largely on renewable energy and energy efficiency, it would limit the unnecessary accumulation of energy assets, which would otherwise have to be stranded; minimize the environmental and health damage caused by fossil fuel use; and reduce the need to resort in the future to environmentally questionable technologies, such as carbon capture and storage or nuclear power.

Financial constraints and inertia can inhibit the investment required to deliver the energy transition. Increasing access to finance and lowering borrowing costs would increase both GDP and employment further, while also enabling the transition pathway detailed in this report. Policy measures and structural socioeconomic modifications increase the availability of finance without compromising regional financial stability. Sources of finance that currently contribute little to sustainable energy investment should be unlocked. Potential sources include institutional investors (pension funds, insurance companies, endowments, sovereign wealth funds) and community-based finance. Scarce public finances should be used to mitigate key risks and lower the cost of capital in countries and regions where renewable energy investments are perceived to be high risk. Rapid action is required to remove this potentially significant transition barrier and ensure that the introduction of clean and modern energy sources is not further delayed.

The financial system should be aligned with broader sustainability and energy transition requirements.
Focus areas

While the energy transition described in this report is technically feasible and economically beneficial, it will not happen by itself. Policy action is urgently needed to steer the global energy system towards a sustainable pathway.

This report identifies six focus areas where policy and decision makers need to act:

1. Tap into the strong synergies between energy efficiency and renewable energy. This should be among the top priorities of energy policy design because their combined effect can deliver the bulk of energy-related decarbonisation needs by 2050 in a cost-effective manner.

2. Plan a power sector for which renewables provide a high share of the energy. Transforming the global energy system will require a fundamental shift in the way energy systems are conceived and operated. This, in turn, requires long-term energy system planning and a shift to more holistic policy-making and more co-ordinated approaches across sectors and countries. This is critical in the power sector, where timely infrastructure deployment and the redesign of sector regulations are essential conditions for cost-effective integration of solar and wind generation on a large scale. These energy sources will become the backbone of power systems by 2050.

3. Increase use of electricity in transport, building and industry. Urban planning, building regulations, and other plans and policies must be integrated, particularly to enable deep and cost-effective decarbonisation of the transport and heat sectors through electrification. However, renewable electricity is only part of the solution for these sectors. Where energy services in transport, industry and buildings cannot be electrified, other renewable solutions will need to be deployed, including modern bioenergy, solar thermal, and geothermal. To accelerate deployment of these solutions, an enabling policy framework will be essential.

4. Foster system-wide innovation. Just as the development of new technologies has played a key role in the progress of renewable energy in the past, continued technological innovation will be needed in the future to achieve a successful global energy transition. Efforts to innovate must cover a technology’s full life-cycle, including demonstration, deployment and commercialisation. But innovation is much broader than technology research and development (R&D). It should include new approaches to operating energy systems and markets as well as new business models. Delivering the innovations needed for the energy transition will require increased, intensive, focused and coordinated action by national governments, international actors and the private sector.

5. Align socio-economic structures and investment with the transition. An integrated and holistic approach is needed by aligning the socio-economic system with the transition requirements. Implementing the energy transition requires significant investments, which adds to the investment required for adaptation to climate change already set to occur. The shorter the time to materialize the energy transition, the lower the climate change adaptation costs and the smaller the socio-economic disruption. The financial system should be aligned with broader sustainability and energy transition requirements. Investment decisions made today define the energy system of decades to come. Capital investment flows should be reallocated urgently to low-carbon solutions, to avoid locking economies into a carbon-intensive energy system and to minimise stranded assets. Regulatory and policy frameworks must be established quickly that give all relevant stakeholders a clear and firm long-term guarantee that energy systems will be transformed to meet climate goals, providing economic incentives that fully reflect the environmental and social costs of fossil fuels and removing barriers to accelerate deployment of low carbon solutions. The increased participation of institutional investors and community-based finance in the transition should be facilitated and incentivized. The specificities of distributed investment needs (energy efficiency and distributed generation) should be addressed.

6. Ensure that transition costs and benefits are fairly distributed. The scope of the transition required is such that it can only be achieved by a collaborative process that involves the whole of society. To generate effective participation, the costs and benefits of the energy transition should be shared fairly, and the transition itself should be implemented justly. Universal energy access is a key component of a fair and just transition. Beyond energy access, huge disparities exist at present in the energy services available in different regions. The transition process will only be complete when energy services converge in all regions. Transition scenarios and planning should incorporate access and convergence considerations. A social accounting framework that enables and visualizes the transition contributions and obligations from individuals, communities, countries and regions should be promoted and facilitated. Advances should be made in the definition and implementation of a fair context to share the transition costs, while promoting and facilitating structures that allow a fair distribution of the transition benefits. Just transition considerations should be explicitly addressed from the onset, both at the micro and macro levels, creating the structures that provide alternatives allowing those individuals and regions that have been trapped into the fossil fuel dynamics to participate from the transition benefits.
As we all can agree, the northern hemisphere summer has proved to be anything but quiet. Record high temperatures are causing various disruptions: low water levels in the Rhine are hampering barge traffic, refinery operations are impacted in certain locations, warm water is affecting nuclear power plants, and air-conditioning demand is soaring. Record temperatures are unlikely to influence significantly road and air transport demand one way or the other as holiday plans were typically made many weeks or months ago, but the sunny weather might provide a short-lived, modest boost. New data will show us in due course.

Meanwhile, concerns about the stability of oil supply have cooled down somewhat, at least for now. We have seen increases in production, mainly in Saudi Arabia and Russia, a surge in US exports in June that saw a record weekly average level of 3 mb/d, and a partial, but fragile, recovery in Libya. Ample supply has contributed to the Brent price falling from just over $79/bbl at the end of June to below $72/bbl earlier this week. This cooling down in prices is clearly welcome for consumers: the biggest single product market in the world is US gasoline and the national average price increase seen during the spring seems to have stalled for the time being.

With so much focus on geopolitics in recent months, underlying demand trends have perhaps received less attention but there are interesting developments. As far as growth is concerned, the global number for 2018 looks solid for now at 1.4 mb/d. However, this is heavily influenced by demand in 1Q18 when growth was more than 1.8 mb/d, mainly due to low temperatures in the northern hemisphere. As we move through 2Q18 and 3Q18, growth is estimated at only 1 mb/d, partly due to comparisons with high year-ago demand levels and because prices (based on Brent crude) have typically been about 45% higher. In OECD Europe, oil demand fell below last year’s level in 2Q18, and in the US falling gasoline demand has
International Energy Agency's (IEA) latest Oil market Report highlights (released on 10 August 2018):

- Following strong demand growth in 1Q18, in 2Q18 and 3Q18 the pace has slowed dramatically to a relatively subdued 1 mb/d. In 4Q18 we expect a rebound and demand will be 100.2 mb/d.
- For 2018, our global demand growth outlook is unchanged at 1.4 mb/d. In 2019 growth accelerates slightly to 1.5 mb/d, but there are risks to the forecast from escalating trade disputes and rising prices if supply is constrained.
- Global oil supply rose by 300 kb/d in July to 99.4 mb/d, 1.1 mb/d above a year ago. Compliance with the Vienna Agreement eased to 97% in July as output cuts were relaxed. Non-OPEC production is expected to grow by 2 mb/d in 2018 and by 1.85 mb/d next year.
- OPEC crude oil output was steady in July, at 32.18 mb/d. An unexpected decline in Saudi Arabian supply was offset by higher production from the UAE, Kuwait and Nigeria. OPEC compliance was unchanged in July at 121%.
- OECD commercial stocks fell seasonally by 7.2 mb in June to 2,823 mb and were 32 mb below the five-year average. Stocks at the end of 2Q18 were up 6.6 mb versus end-1Q18, the first quarterly increase seen since 1Q17. Outside the OECD, inventories were also mostly higher during the quarter.
- ICE Brent prices fell in July on higher global output, while NYMEX WTI prices rose on strong US refining and exports. Both benchmarks are up 50% y-o-y. The Brent/WTI differential in July narrowed sharply versus June.
- Global refinery throughputs in 2H18 are expected to be 2 mb/d higher than in 1H18. Due to high summer demand, refined products stocks will draw before building again in 4Q18. The outlook will be heavily influenced by Iranian crude flows and resulting changes to crude prices and margins.
BP outlines commitment to low carbon future

BP aims to generate sustainable reductions of 3.5 million tonnes of annual CO₂ equivalent greenhouse gas emissions throughout its businesses by 2025

Energy major BP has published a new report setting out its commitment to a low carbon future and to helping meet the dual challenge of providing the increasing energy the world demands while at the same time working to reduce greenhouse gas emissions.

The report, ‘Advancing the Energy Transition’, details BP’s framework for delivering this commitment: reducing greenhouse gas emissions in its operations, improving its products to help customers reduce their emissions, and creating low carbon businesses.
The report also sets out clear near-term targets for limiting greenhouse gas emissions from BP’s operations, against which its progress can be measured. These targets are concrete, measurable and are intended to be met over ten years,” said Bob Dudley, BP Group Chief Executive. “The world is growing like never before, creating opportunity for billions of people. And all this growth requires energy. But as the world demands more energy it also demands that it be produced and delivered in new ways, with fewer emissions. At BP, we embrace this dual challenge. “We have always looked to the future, adapted to change and met challenges like this head on. In this report, we examine how the energy world is changing, set out our low carbon ambitions and show how we are helping to advance the energy transition,” Dudley stated.

**Zero net emissions growth**
Even as it delivers plans to grow its business over coming years, BP intends to keep net greenhouse gas emissions from its operations at or below 2015 levels out to 2025. It plans to achieve this by generating sustainable reductions in emissions throughout its operations, limiting the intensity of methane emissions from its oil and gas business, and through using carbon offset projects.

**Sustainable emissions reductions**
BP aims to generate sustainable reductions of 3.5 million tonnes of annual CO2 equivalent greenhouse gas emissions throughout its businesses by 2025. Improving energy efficiency throughout the businesses supported by new technology, limiting the emissions intensity of methane and reducing flaring of oil and gas are expected to deliver permanent and quantifiable reductions in emissions.

**Limiting methane emissions intensity**
As a key part of this, BP is determined to tackle emissions of methane – the primary component of natural gas but also a powerful greenhouse gas – from its operations. BP is targeting limiting the methane intensity – methane emissions from its operations where gas goes to market as a percentage of that gas – to 0.2% across its oil and gas operations.

**Carbon offsetting**
Where these actions alone do not keep BP’s net greenhouse gas emissions from its operations at or below 2015 levels, BP intends to further invest in high-quality carbon offsetting projects to ensure the aim is met.

**Advancing Low Carbon**
BP has also introduced a group-wide accreditation programme, Advancing Low Carbon (ALC), designed to encourage every part of BP to pursue lower carbon opportunities and to encourage customers and others outside BP to make lower carbon choices. “We now know that a race to renewables
The changing energy mix

The demand for energy continues to grow – largely driven by rising incomes in emerging economies and a global population heading towards nine billion by 2040. At the same time, the energy mix is changing as technology advances, consumer preferences shift and policy measures evolve.

will not be enough. To deliver significantly lower emissions every type of energy needs to be cleaner and better. That’s why we are making bold changes across our entire business,” said Bob Dudley. “We are introducing the Advancing Low Carbon accreditation programme across BP to validate all these efforts and encourage further action.”

The programme highlights activities across BP that demonstrate and deliver better carbon outcomes, including generating greenhouse gas emission savings directly or through offsets. Each activity included in the programme is evaluated, and subjected to independent assurance against defined criteria. Those judged to meet the criteria will be able to carry the ALC logo. The programme has been launched with an initial 33 accredited activities from throughout BP’s businesses. Advancing the Energy Transition was published alongside BP’s Sustainability Report for 2017. Framed around common questions about BP’s policies and performance, this year’s edition of

Energy consumption - 2040 projections

Evolving transition
In this scenario, government policies, technology and social preferences evolve in a manner and speed seen in the recent past. The growing world economy requires more energy but consumption increases less quickly than in the past.

Faster transition
This scenario sees carbon prices rising faster than in the evolving transition scenario, with other policy interventions encouraging more rapid energy efficiency gains and fuel switching.

Even faster transition
This scenario matches carbon emissions similar to the International Energy Agency’s sustainable development scenario, which aims to limit the global temperature rise to well below 2°C.
THE PROGRAMME HIGHLIGHTS ACTIVITIES ACROSS BP THAT DEMONSTRATE AND DELIVER BETTER CARBON OUTCOMES, INCLUDING GENERATING GREENHOUSE GAS EMISSION SAVINGS DIRECTLY OR THROUGH OFFSETS. EACH ACTIVITY INCLUDED IN THE PROGRAMME IS EVALUATED, AND SUBJECTED TO INDEPENDENT ASSURANCE AGAINST DEFINED CRITERIA.

Reducing emissions in our operations
Zero
net growth in operational emissions out to 2025
3.5Mte
of sustainable GHG emissions reductions by 2025
Targeting methane intensity of
0.2%
and holding it below 0.3%

Improving our products
Provide lower emissions gas
Develop more efficient and lower carbon fuels, lubricants and petrochemicals
Grow lower carbon offers for customers

Creating low carbon businesses
Expand low carbon and renewable businesses
$500 million invested in low carbon activities each year
Collaborate and invest in the Oil and Gas Climate Initiative’s $1 billion fund for research and technology

BP’s low-carbon ambitions

the Sustainability Report is designed to describe BP’s approach to a range of non-financial issues in a clear and accessible style.

Renewables are now the fastest-growing energy source in history and we estimate that they could account for 14% of all energy consumption in 2040 – if not more. That said, oil and gas could meet at least 40% of the world’s energy needs in 2040 – even on a course that’s consistent with the Paris goal of limiting global warming to less than 2°C.

Gas offers a much cleaner alternative to coal for power generation and can lower emissions at scale. It also provides a valuable back-up for renewables intermittency, delivers heating at the high temperatures required by industry and is increasingly used in transportation.

Oil is the primary fuel for transport today. We expect its share of the total energy mix will gradually decline as we see more energy efficiency in traditional engines, greater use of biofuels and natural gas, and growth in fully electric and hybrid vehicles in the years ahead.

With oil and gas in high demand for years to come, it’s essential that action is taken to reduce emissions from their production and use.
Delivering a solar hub based on sustainable in-country value

Since breaking ground on Miraah, GlassPoint has been working to qualify Omani suppliers for elements of the project, including the large curved structures that support the mirrors.
GlassPoint Solar, the leading supplier of solar energy to the global oil and gas industry, has announced a partnership with National Aluminum Products Company (NAPCO), one of the largest extruders of aluminium profiles in the Sultanate, to support the development of a ‘Sohar Hub’ in Oman.

The partnership arrangement – part of an ongoing effort by US-based GlassPoint Solar to generate sustainable in-country value (ICV) within the Sultanate – builds on GlassPoint’s landmark collaboration with Petroleum Development Oman (PDO) in the implementation of the giant Miraah solar plant. The 1-gigawatt Miraah project, which was partly brought into operation earlier this year, is one of the world’s largest solar plants.

“We are proud to be partnering with NAPCO in developing our ‘Made in Oman’ solar supply chain. Creating opportunities for local companies and contractors is part of our growth strategy within the Sultanate. Together with our partners, we are working to establish Oman as an industrial hub for renewable energy,” said Steven Moss, GlassPoint’s Chief Executive Officer.

Since breaking ground on Miraah, GlassPoint has been working to qualify Omani suppliers for elements of the project, including the large curved structures that support the mirrors. These structures are built from aluminium extrusions made with precision machining at NAPCO’s facility and assembled at the project site by local contractors. Once installed, the mirrors automatically track the sun throughout the day focusing sunlight on steel pipes filled with water. The heat from the sun boils the water to produce high pressure steam that is injected into the reservoir to help extract heavy oil.

Moss added, “GlassPoint no longer needs to import all the aluminum materials from Europe or Asia and is actively working with NAPCO to qualify them for additional components. We are increasingly looking for opportunities to build national capacities and maximize the project’s supply and manufacturing here in Oman. As we expand in the region, these Omani made materials could be exported for use in future projects”.

Official Omani delegation led by Dr Ali bin Masoud Al Sunaidi, Oman’s Minister of Commerce and Industry, on a tour of GlassPoint’s headquarters and lab facilities in California, USA.
Ihab Mouallem, Chief Executive Officer at NAPCO said, “Collaborating with GlassPoint, we have expanded our opportunity to provide them with aluminum materials used throughout their solar thermal technology. The partnership between us has not only created jobs but has positively impacted Oman when it comes to growing the manufacturing sector and adding long-lasting value to the country.”

**Technology Innovation**

GlassPoint has met all its ICV commitments since breaking ground on Miraah in 2015. The company continues to seek opportunities to expand beyond these targets and deliver sustained value to the Sultanate.

The first 100 MW of the Miraah plant were inaugurated early this year. The project is in daily operations and has met all steam output targets required by PDO’s Amal oilfield since it was brought online. Construction is ongoing with steam production ramping up to meet PDO’s future steam demand.

In addition to using local goods and services, GlassPoint is committed to developing the Omani workforce. Today, over half of the company’s local workforce consists of Omani professionals, including engineers and senior management. GlassPoint’s team in Oman is developing expertise in project deployment, manufacturing, and solar technology innovation.

GlassPoint is committed to driving innovation for Oman that extends beyond its solar oilfield projects. The company recently launched its first corporate social
responsibility initiative, the GlassPoint Innovation Spur. The full-cycle incubation program is designed to empower Omani innovators in developing renewable energy and sustainable water management solutions. Supported by a host of local partners, the two-year programme will equip participants with valuable skill sets through mentoring and technical support, allowing them to transform their innovations into implementable businesses. The programme is another significant attempt the company has taken to contribute towards diversification of the national economy.

Growing partnerships
Underscoring GlassPoint Solar’s importance as a growing player in Oman’s renewable energy space, HE Dr Ali bin Masoud Al Sunaidi, Oman’s Minister of Commerce and Industry, recently toured GlassPoint’s headquarters and lab facilities in California, USA. HE Dr Al Sunaidi was accompanied by representatives from Oman Technology Fund including Chief Executive Officer Yousuf Al Harthy and Venture Investment Leader Mohammed Al Rasbi. They were welcomed by GlassPoint’s Chief Technology Officer Pete von Behrens and other members of the company’s leadership team. The delegation had an up-close look at GlassPoint’s solar energy innovations and how the technology can be further utilized within the Sultanate.

HE Dr Al Sunaidi said, “The Sultanate is already a global leader in using solar energy for oil extraction and we are now looking at how we can use this renewable resource to power other industries and processes, such as desalinating seawater. The utilization of GlassPoint’s technology will continue to contribute to our economic diversification strategy and gives the company the opportunity to apply its know-how in other industries beyond oil and gas in Oman.”

He added, “GlassPoint has been a great partner to the Sultanate over the years in helping establish Oman as a renewable energy hub.”

Next generation concepts
GlassPoint’s Chief Technology Officer Pete von Behrens said, “Research and development is at the core of GlassPoint, where we’re constantly developing and testing next generation concepts from the lab to the field. We’re evaluating new materials, designs and integration processes to further reduce costs and expand to new markets.”

He added, “We’ve been partnering with Oman for the past seven years to advance and scale our technology and are committed to creating long-term in-country-value through future research and projects.”

GlassPoint’s solar thermal technology delivers low-cost steam to power oilfield operations, reducing carbon emissions and fuel costs. Expanding the company’s technology in Oman will save valuable natural gas, create jobs and propel the development of a local solar energy supply chain.

Operating worldwide from the Middle East to California, GlassPoint’s enclosed trough technology delivers the lowest cost energy to power oilfield operations. By harnessing sunshine, instead of burning natural gas or other fuels, GlassPoint helps oil producers reduce operating expenses while significantly cutting greenhouse gas emissions.

GlassPoint established its regional headquarters in the Sultanate of Oman in early 2012. The company’s shareholders include Royal Dutch Shell and State General Reserve Fund (SGRF), the largest sovereign wealth fund in Oman.
SolaRISE: Desert lab for solar technologies

GlassPoint and Petroleum Development Oman join hands to launch a new test-bed for next generation solar technologies in the oilfield environment
GlassPoint Solar, the leading supplier of solar energy to the oil and gas industry, has launched SolaRISE, a new technology centre in partnership with Petroleum Development Oman (PDO). SolaRISE, standing for Solar Research, Innovation and Sustainability in Energy, is a joint initiative formed to develop and test next generation solar technologies in the oilfield environment.

The launch of SolaRISE was announced during the opening session of the World Heavy Oil Congress & Exhibition (WHOC), which was held in Muscat during 3 – 5 September 2018.

The centre will focus on continuous cost reduction, including new concepts and designs to reduce material costs, ease oilfield integration and automate operations. It will also pilot and evaluate solutions for using solar energy for other industrial processes in Oman and around the world.

"GlassPoint designed the only solar steam generator made for oilfield deployment. As a pioneer in enhanced oil recovery and the growing energy convergence, PDO will provide valuable insights as we test, refine and scale future solutions for the oilfield and beyond," he added.

GlassPoint’s partnership with PDO began over seven years ago. After a successful pilot program, the companies began building Miraah, which will be one of the world’s largest solar plants. The first 100 MWt of Miraah began operating last year and is meeting all performance targets. An additional 200 MWt will come on stream by next year. The new technology center is already under development a few kilometers away from Miraah in southern Oman.

Plans are in place to test and evaluate a number of innovative concepts over the next several years. These developments could be integrated into the later stages of Miraah construction and future GlassPoint projects with PDO and other partners worldwide.

Raoul Restucci, Managing Director of PDO, said “PDO’s successful partnership with GlassPoint has put Oman on the global solar energy map. While oil and gas will continue to be fundamental to our energy mix, we are developing innovative renewable solutions to create new growth opportunities for the company as well as for the nation. As we move towards becoming a fully diversified energy compa-
Wetlands in the Omani desert
A deal to expand the Nimr Water Treatment Project (NWTP) will lift the processing capacity of this award-winning facility by more than 50 per cent to 175,000 cubic metres per day.
Petroleum Development Oman’s (PDO) award-winning Reed Bed Project at Nimr in the south of the country – the product of a collaborative arrangement with water treatment specialist Bauer Nimr LLC – is being expanded. An agreement to fund the expansion was signed in July with Bank Muscat, the leading provider of financial services in the Sultanate.

The expansion will lift the processing capacity of the Nimr Water Treatment Project (NWTP) by more than 50 per cent to 175,000 cubic metres per day (m³/day).

Bauer Nimr LLC, a subsidiary of German-based Bauer Resources, owns and operates the Nimr Water Treatment Project (NWTP) – a biological treatment facility based on the large-scale use of reed beds to treat produced water from the Nimr oilfields in the southern Oman desert. The facility has been hailed as the largest industrial constructed wetland system in the world, consisting of a series of sloping reed fields and evaporation ponds. The treatment process results in higher oil recovery and lower energy consumption compared to traditional disposal mechanisms.

The concept developed by Bauer is based on proven technical features utilised by the company for many years like Oil-Water Separation and Reed Bed Technology. The inflowing produced water passes through an oil-water separator which recovers large quantities of crude oil which would otherwise be lost. The partially treated water then flows through a surface flow wetland with a total area of 3.51 million m² (351 ha). The wetlands biodegrade the remaining hydrocarbons and reduce the volume of water via evapotranspiration.

The water leaving the wetlands is clean, but brackish. Reuse of this water for irrigation of a range of commercially valuable salt tolerant plants is currently being trialed. The remaining water flows through 360 ha of evaporation ponds where the water is transferred to the atmosphere and approximately 100,000 tons of industrial grade salts will be produced per year.

The entire system operates via gravity with the only electricity being used for flow measurement and control and staff amenities. Thus, the system uses less than 2% of the electricity required for conventional deep well disposal of the produced water, substantially reducing the carbon footprint of the oilfield operations.

Following the completion of the first stage of the project in 2011, a new expansion followed three years later. That lifted capacity to 115,000 m³/day. Last November, PDO invited Bauer Nimr to expand the project by a further 60,000 m³/day to reach a total capacity of 175,000m³ per day. Bauer Nimr will be responsible for designing, constructing and operating the plant until 2044. Construction will be finished by the end of 2019, after which Bauer will operate the plant on a 25-year basis.

Recently, Bauer Nimr LLC signed a deal with the German governmental development bank DEG along with Bank Muscat to finance the new expansion of the wetlands project. The signing took place under the patronage of HE Salim Al Aufi, Under-Secretary of the Ministry of Oil and Gas. The ceremony was attended by Mr. Waleed Al Hashar, Deputy Chief Executive Officer of Bank Muscat, and top officials of PDO, Bauer Nimr and DEG. Bank Muscat is the local financing partner for the project.

Peter Hingott, Chairman of Bauer Group, said: “The Nimr water treat-
ment plant project is the most innovative and significant project in our company’s history as a whole and the outstanding partnership with PDO, DEG and Bank Muscat will enable us to continue on this path of joint success and build on it to the benefit of Oman and Bauer and its partners.”

DEG is a financier for the Nimr Project since its inception. Mr. Turan Caglayan, Senior Director, Corporate & Funds for Asia and Europe at DEG, commented: “The Bauer Group is a long-standing partner of DEG. It is a great pleasure for us to further deepen our cooperation with Bauer and its Omani partners on the Nimr Project, which we started almost 10 years ago. DEG now arranged the financing for expansion of the plant working closely together with the Omani financing partner Bank Muscat.”

Mr. Abdullah Al Hinai, General Manager – Wholesale Banking at Bank Muscat, added: “Bank Muscat is proud to successfully close the financing facility for BAUER Nimr, marking a unique collaboration aimed at enhancing In-Country Value (ICV) and sustainable development. Bank Muscat recognises the immense investment prospects and potential that Oman offers and is committed to supporting strategic initiatives aimed at contributing to sustainable economic development in Oman. The financing agreement comes within the scope of joining hands with partners to achieve the highest value for the national economy. The agreement is a clear indication of the availability of viable financing facilities in Oman.”

Significantly, the wetlands also provide habitat for wildlife. Over 100 bird species have been identified at the site to date. The system provides a simple, cost effective produced water management solution, combining proven technologies in an innovative way and is unique in the world in terms of size and design.

THE CONCEPT DEVELOPED BY BAUER IS BASED ON PROVEN TECHNICAL FEATURES UTILISED BY THE COMPANY FOR MANY YEARS LIKE OIL-WATER SEPARATION AND REED BED TECHNOLOGY

In Numbers
Following the completion of the first stage of the project in 2011, a new expansion followed three years later. That lifted capacity to **115,000 m3/day**.
Why Oil and Gas-rich Gulf Arab States are turning to coal

By Aisha Al Sarihi

Burning coal produces almost double the amount of carbon dioxide than other fossil fuels such as diesel or natural gas. In 2015, coal accounted for 45 percent of global carbon dioxide emissions. The release of carbon dioxide from the combustion of fossil fuels is directly linked to climate change. In fact, carbon dioxide has been identified as the largest source of anthropogenic greenhouse gas emissions, representing 77 percent of global output, making it a key driver of climate change. Home to nearly a third of proven world crude oil and around a fifth of global natural gas reserves, some of the hydrocarbon-rich Gulf Arab states are switching to coal to fuel power plants. The construction of the 2,400-megawatt Hassyan project, the Gulf states’ first coal-fired power plant, started in 2016 in Saih Shuaib, Dubai, in support of the Dubai Clean Energy Strategy 2050. The United Arab Emirates is now considering the development of a second coal-fired power plant. Similarly, as part of its new fuel-mix diversification strategy, Oman has already launched a competitive bid process for the development of the country’s first coal-based power plant with a capacity of 1,200 megawatts to be located in the newly established special economic zone, Duqm.

Why are Gulf Arab states deciding to switch to coal, and why now?

Securing enough energy to meet surging domestic demand and maintaining energy export levels over the long term while also pursuing ambitious economic diversification strategies present a triple policy challenge to the hydrocarbon-dependent economies of the Gulf states, especially with the drop in oil prices since mid-2014. The Gulf Arab states are experiencing an extraordinary surge in energy consumption, with their overall energy demand rising on average some 5 percent per annum during the 2000s. Between 2003 and 2013, regional electricity consumption increased at an average rate of 6-7 percent per annum – faster than anywhere else in the world. Nearly 50 percent of all electricity produced in the Gulf states goes to the residential sector, with air conditioning accounting for a considerable portion of demand. Given the highly subsidized power sector, per capita electricity consumption in the Gulf countries is also substantial: more than 10,000 kilowatt-hours per person in 2014. This exceeded the world average (3,127 kWh per capita) but also surpassed the level of the major industrial countries such as the United Kingdom (5,129 kWh per capita) and dwarfed the level of other developing countries such as India (805 kWh per capita) and China (3,927 kWh per capita). Consequently, gas demand across the Gulf states has grown two-and-a-half fold since 2000, with almost two-thirds of this growth coming from power generation alone.
The increasing demand for gas at the domestic level affects the ability of some hydrocarbon-dependent economies of Gulf states to maintain export levels over the long term. In fact, importing natural gas has become a phenomenon for some Gulf countries, which used to be net exporters of natural gas; imported natural gas accounts for 19.2 percent of natural gas consumption in the United Arab Emirates, 37.7 percent in Kuwait, and 10.8 percent in Oman. While the majority of gas imports are used to meet domestic demand, especially for electricity and water desalination, they are
Also allocated partially to Liquefied Natural Gas processing in order to meet long-term export commitments and maintain market share. In addition, increasing gas demand at the domestic level jeopardizes the states’ ambitions to pursue economic diversification, particularly initiatives focused on industrial expansion. Owing to the post-2014 decline in oil prices – from as high as $100 per barrel to as low as $40 per barrel – economic diversification efforts have been increasingly directed toward developing downstream energy-intensive industries such as petrochemicals, which are 100 percent reliant on oil and gas for their operation. Against this background, it makes sense for the Gulf states to free up natural gas either for export or industrial expansion. Therefore, the provision of additional energy becomes ever more important. Indeed, considering this triple energy-policy challenge, all of the Gulf Arab states are now pursuing fuel-mix diversification strategies, including the development of renewable energy, nuclear power, and most recently coal. But why coal, which is directly linked to climate change?

Coal holds appeal in some Gulf states over the alternatives because:

1. Natural gas is better to be freed up for other purposes such as export or industrial expansion.
2. Nuclear power is expensive to build, takes longer to construct, and has safety concerns.
3. Renewable wind and solar energy still face the issue of intermittency, and are

### Annual Electricity Consumption Growth by User Group (2003-13):


### Estimated LCOE of coal power technology compared to renewable energy, natural gas, and nuclear power in the Gulf States:

<table>
<thead>
<tr>
<th>Technology Type</th>
<th>Average LCOE (in dollars per kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>0.05 Hassyan project</td>
</tr>
<tr>
<td>Combined Cycle Gas Turbine</td>
<td>0.02 – 0.05</td>
</tr>
<tr>
<td>Open Cycle Gas Turbine</td>
<td>0.02 – 0.05</td>
</tr>
<tr>
<td>Utility-Scale Solar PV</td>
<td>0.11 – 0.28 (0.06 in Dubai, without any financial support)</td>
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<tr>
<td>Residential Solar PV</td>
<td>0.14 – 0.47</td>
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<tr>
<td>Parabolic trough Concentrated Solar Power</td>
<td>0.17 – 0.35</td>
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<tr>
<td>Towers Concentrated Solar Power</td>
<td>0.17 – 0.29</td>
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<tr>
<td>Onshore Wind</td>
<td>0.06 – 0.12</td>
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<tr>
<td>Nuclear</td>
<td>-0.15</td>
</tr>
<tr>
<td>Total</td>
<td>32.35</td>
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Contributor

Aisha Al Sarihi

Aisha Al-Sarihi is a visiting scholar at the Arab Gulf States Institute in Washington, where she is researching the potential for climate policy integrity with economic diversification strategies in Saudi Arabia. Before joining AGSIW, Al-Sarihi served as a research officer at the London School of Economics and Political Science’s Middle East Centre, where her research was focused on addressing the challenges and opportunities for climate policy integrity with economic diversification strategies in Oman and the United Arab Emirates. She previously contributed to Sohar University’s Environment Research Centre’s regional air pollution project aimed at assessing the levels of air pollution around a petrochemical industrial port complex.

Her research interests include energy, climate, and renewable energy policies and political economy with a focus on the Gulf Arab states. Al-Sarihi earned her PhD from the Centre for Environmental Policy at Imperial College London. She holds an MSc and BSc in environmental science (with distinction) from Sultan Qaboos University.

Coal is competitive against other power sources in terms of cost. The average Levelized Cost of Electricity (LCOE), which is an instrument used to measure the competitiveness of different generating technologies, sourced from coal ($0.05 per kWh) is significantly lower than the average LCOE for alternative options such as gas-based power plants ($0.02-0.05 per kWh); solar ($0.11-0.47 per kWh); wind ($0.06-0.12 per kWh); or nuclear (around $0.15 per kWh). It is even cheaper than the lowest recorded cost of utility-scale solar photovoltaic (PV), which was $0.06 per kWh in Dubai in 2014. Further, it takes less time to construct coal-fired plants, which means that gas or diesel can be freed up and used very quickly for other purposes such as industrial expansion or sales in the international market. In addition, the Gulf states seem to be taking advantage of China’s growing economic investment in the region (i.e. the Belt and Road Initiative) to support their interest in coal. The Hassyan project, for instance, is a joint venture between Dubai Electricity and Water Authority (51 percent) and the consortium of ACWA Power, Harbin Electric, and the Silk Road Fund (49 percent). “Once fully completed by 2023, this clean coal power station will be the first of its kind in the Middle East, a symbol of UAE-China green energy partnership, and a successful joint venture under China’s Belt and Road Initiative,” said Tie Sijia, deputy manager of the Dubai Hassyan Power Plant project.

Furthermore, the Gulf Arab states’ decision to turn to coal has coincided with the efforts by the administration of U.S. President Donald J. Trump to roll back Obama-era coal pollution regulations. Earlier this year, the Trump administration considered forming a “Clean and Advanced Fossil Fuel Alliance” to advocate for natural gas and coal technology and exports, according to a document E&E News obtained from an administration source. Although such information is not disclosed, long-term allies, like the UAE, are expected to benefit from the Trump administration’s recent decision. In fact, the UAE is already considering importing gas from the United States as a way to diversify its Liquefied Natural Gas supply, especially with the uncertain state of relations with Qatar. Coal could be the next import.

However, describing the coal industry as “clean” or “green” is not convincing to everyone. In Oman, young people have strongly reacted against the newly announced coal-based power plant. Some Twitter users have repeatedly described it as a step backward while the world moves forward toward clean energy. The term “clean” has been widely used to promote the entry of coal-based technology, but details on how clean coal can be achieved have not been made available. Even if Carbon Capture and Storage (or utilization) is meant to be the solution, its technology is still not well advanced, and the fact that fossil fuels are finite makes it hard to rely on these technologies to address emerging energy concerns in the medium to long term.

It remains to be seen if other Gulf Arab states will follow the UAE and Oman in developing coal-fired plants. A more practical and “clean” option could be to avoid importing coal by advancing energy efficiency measures and continuing to reform fossil fuel subsidies, thus reducing unnecessary waste of valuable resources such as gas.
National Oil companies (NOCs) must take a holistic approach to the oil and gas value chain to fuel economic development, according to a recent study by management consultancy Strategy& Middle East (formerly Booz & Company), part of the PwC network. Recent oil price volatility, coupled with an uncertain outlook for global oil and gas markets, is putting pressure on NOCs to maximize the overall benefit of hydrocarbon resources by pursuing an integrated policy towards the management of their portfolio of operations.

The study reveals that NOCs across the maturity spectrum have typically developed their oil and gas production, refining, and petrochemicals portfolios as a series of semiautonomous assets and companies. But with an increasingly volatile market outlook and pressure to align with wider national objectives, the challenge for NOCs is to move their focus away from single elements and towards greater integrated portfolio management. This requires companies to address a number of barriers that often reflect legacy ways of working, including:

- Fragmented, incomplete, or inconsistent data
- Diverse, non-standardized planning and portfolio management tools and systems
- Rigid organizational silos that focus on the individual organization entity, rather than the NOC as a whole
- Key performance metrics that incentivize operations within only one organizational entity
Limited capabilities to resolve cross-organizational and cross-functional issues

Culture and behaviors that discourage collaboration

Commenting on the challenges faced by NOCs, Georges Chehade, Partner with Strategy& Middle East, said: “NOCs increasingly have a mandate that goes beyond profitability to support the broader development of the non-oil economy and job creation. As a result, the model of semiautonomous operating assets managed primarily to meet ambitious production and output targets has changed for good.”

In the GCC, for example, mature NOCs in Abu Dhabi and Qatar, have embarked on the merger of previously stand-alone joint ventures, whilst the need to make better use of capital is one factor behind the partial privatization of non-core operations in Abu Dhabi and Saudi Arabia.

The Strategy& Middle East report identifies two complementary measures to help NOCs overcome barriers to integrated portfolio management:

1) **Establish an integrated planning and capital allocation capability:**

This approach starts with the strategic objectives of the NOC as the key driver along with an explicit consideration of how each element of the value chain will support them. This is in contrast to typical NOC planning policies that often consider the operational needs of the assets. With an integrated planning approach, for example, financial and operational resources are allocated on the basis of prioritized value chain optimization models have a range of uses and provide tangible benefits for NOCs

**Value chain optimization model can be used for**

- **Conceptual planning**
  - Evaluating options for the development of the oil and gas sector

- **Infrastructure planning**
  - Assessing the impact of alternative infrastructure options, and evaluating required capacities

- **Removal of bottlenecks from the value chain**
  - Identifying areas where hydrocarbon flows are not aligned with existing capacity, and where removing bottlenecks/expansion is required

- **Investment decision support**
  - Evaluating how a decision on a large capital project impacts other areas of the hydrocarbon value chain

- **Price sensitivity analysis**
  - Evaluating the range of prices under which options with respect to product allocation add value

- **“What-If” analysis**
  - Evaluating the impact of unforeseen events (e.g., project delays) on value chain components

- **Complex cross value chain optimization**
  - Evaluating optimization decisions with multiple potential outcomes that require coordination between portfolio elements

**Benefits for NOCs**

- **Increased production and reduced deferment**

- **Reduced costs and improved capital efficiency**

- **Increased collaboration and teamwork**
NOCs first need to change their approach to planning and capital allocation

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Source: Strategy&

KEY METRICS UNDER AN INTEGRATED PLANNING APPROACH ARE OFTEN BASED ON OPERATIONAL AND CAPITAL EFFICIENCY, RATHER THAN EXPRESSED PRIMARILY AS TOP-DOWN PRODUCTION OR CAPACITY TARGETS. THIS RESULTS IN TARGETS THAT ARE REALISTIC AND ACHIEVABLE, AND FORMS A FIRM BASIS FOR THE MONITORING OF CORPORATE PERFORMANCE

ority, rather than bottom-up operational need, to those assets and activities that best support fulfilment of strategic objectives.

James Thomas, Partner with Strategy& Middle East, said: “NOC strategies involve balancing multiple objectives and trade-offs, particularly between growth and profitability. Consequently, key metrics under an integrated planning approach are often based on operational and capital efficiency, rather than expressed primarily as top-down production or capacity targets. This results in targets that are realistic and achievable, and forms a firm basis for the monitoring of corporate performance.”

2) Develop new models to evaluate options for optimizing operations across the value chain

The development of a value chain optimization model starts with the mapping of the physical network of infrastructure and the actual and planned flows of oil, gas, and other products across the network. The second step is to identify the key nodes where alternative options for the allocation of hydrocarbons exist, or are feasible, for example in the allocation of crude oil to domestic refining or to export. The third step involves converting the network into a numerical model that includes all key information required to develop scenarios and test the impact of different scenarios on the portfolio.

David Branson, Executive Advisor with Strategy& Middle East, concluded: “NOCs need new models of the end-to-end oil and gas value chain to identify bottlenecks and areas of misalignment, and to assess and quantify strategic options for the allocation of oil and gas to competing end-uses.”

Many of the most pressing strategic questions for NOCs cut across organizational divides, and involve decisions and trade-offs across the value chain that cannot be evaluated using a traditional approach to planning. The benefits of taking an integrated approach to oil and gas management are not only substantial for the financial performance of NOCs, but also to the achievement of broader national objectives.
For the first time since engines replaced sails in the early 19th century, the operational status quo of global shipping is being rewritten. The International Maritime Organization’s (IMO) ruling to reduce the sulphur cap for bunker fuel from 3.5% to 0.5% by 2020, not 2025, means an overhaul of the industry facilitating 90% of the world's trade, including energy commodities - and quickly.

2020 is a very short two years away for energy stakeholders to adapt to one of the biggest disruptions in the shipping industry in living memory. High sulphur fuel oil (HSFO) was used for approximately 70% of the world's bunker fuel in 2016; volumes that will not be compliant post-2020.

The impact of the IMO ruling could result in a demand drop of as much as 2.1 million barrels per day in HSFO accounting for nearly 30% of global residual fuel oil demand. No entity along the value chain – from refineries, trading, logistics, ports to shipowners – in the Middle East and beyond will be untouched.

**Front runners**

A silver bullet to post-2020 bunkering remains elusive. But amongst the plethora of options, low sulphur fuel oil (LSFO) and liquified natural gas (LNG) bunkering are emerging as preferred options for energy stakeholders seeking an economic and environmentally sustainable route. Plans to increase the use of both bunkering options are under discussion in the Middle East; the UAE’s Port of Fujairah, the world's second largest bunkering hub, is already developing LSFO bunkering solutions and in the GCC FSRU LNG import projects can be designed to facilitate LNG bunkering.

LSFO ticks the right environmental boxes and is arguably the Middle East’s easiest shortcut to meeting the IMO’s ruling, as the region’s portfolio of dedicated and sophisticated refineries can adjust their crude pallettes to 0.1% (Ultra Low sulphur fuel oil, used in emission control areas (ECA)) - 0.5% sulphur relatively easily. LNG bunkering also contains almost no sulphur, can be priced off oil markers, is a proven technology and has lower greenhouse gas (GHG) emissions. The green credentials of both fuels also support Middle Eastern governments' commitment to the Paris Agreement; an important consideration when so much of the region’s energy assets are state-owned or associated.

As with any major change, some hurdles must be navigated first; this is not a negative, but a sign of progress. The lines of communication between refineries, ports and ship owners need to improve to accurately gauge the need and subsequent supply of LSFO supply from 2020. The same applies
AS WITH ANY MAJOR CHANGE, SOME HURDLES MUST BE NAVIGATED FIRST; THIS IS NOT A NEGATIVE, BUT A SIGN OF PROGRESS. THE LINES OF COMMUNICATION BETWEEN REFINERIES, PORTS AND SHIP OWNERS NEED TO IMPROVE TO ACCURATELY GAUGE THE NEED AND SUBSEQUENT SUPPLY OF LSFO SUPPLY FROM 2020

The impact of the IMO ruling could result in a demand drop of as much as 2.1 million barrels per day in HSFO accounting for nearly 30% of global residual fuel oil demand.

Investing in scrubbers can range between US$1-9 million per ship depending on its size. Ship owners are currently reluctant to make these investments as the industry struggles out of a low margin environment. Alternatively, ship operators can fail to act and pay the penalties. While there is no global game plan – solutions depend on individual needs – there is a consensus that conformity for post-2020 bunkering will help trim overall costs and improve energy supply and security.

It is still better to feel the financial squeeze today than risk financial sorrow in the future; compliance to IMO 2020 carries a steep price tag in a cash-strapped energy industry. Consultants Wood Mackenzie estimated last year that a full compliance scenario would incur an increase of up to $60 billion per year in global bunker fuel costs from 2020, while S&P Global Platts said the impact of these changes will reach $1 trillion over five years. The line between winners and losers in the early 2020s could be well-defined between those who can afford to evolve – and those who cannot.

Each point should serve as a reminder that the emphasis on making bunkering ‘greener’ will only intensify; therein lies the value of LSFO and LNG. Leveraging either or both will relieve these intensifying pressure points. They also serve as a good starting point for energy stakeholders to hedge against more shifting sands; more climate-related mitigations in the energy market are inevitably around the corner.

In Numbers
The impact of the IMO ruling could result in a demand drop of as much as 2.1 million barrels per day in HSFO accounting for nearly 30% of global residual fuel oil demand.
As global energy markets get busier, the value of simplification and cyber-safety of blockchain will only become more alluring

The value of nascent blockchain technology to be applied to established commodities markets remains a hot topic as we move through 2018. Forward looking commodities trading companies are looking carefully at their dusty old processes through the lens of digital disruption. Distributed ledger technology, often used interchangeably with "blockchain", promises potential to improve efficiency and security in back office functions such as clearing and settlement. However, in oil markets, the first fully-fledged live commercial deployment took place at the UAE’s Port of Fujairah in February 2018. S&P Global Platts partnered with Fujairah Oil Industry Zone (FOIZ), FEDCom and the 11 terminal operators that use the flagship Middle Eastern facility on the creation of a full audit trail to collate weekly inventory oil products storage data at the home of the Middle East’s largest commercial storage capacity for refined oil products. It also shows the potential for this revolutionary technology to drive changes in energy markets, as a direct replacement for outmoded legacy processes.

The proactive steps taken by the government of Fujairah to invest in the latest cutting edge infrastructure while encouraging greater transparency are key requirements to becoming a global trading hub. This future oriented approach makes the port a robust inaugural physical environment for blockchain to prove its value. The early signs are positive. The emirate’s port is the world’s second largest bunkering hub, lying 70 nautical miles south of the Strait of Hormuz, the world’s most critical strategic chokepoint by volume of transit at around 18.5m b/d in 2016, according to the US Energy Information Administration (EIA). Comparatively, the
Strait of Malacca takes second place with 16m b/d. As of Monday, March 21, total oil product stocks in Fujairah stood at 17.662 million barrels according to FedCom. A growth trajectory is justifiably expected. BP Outlook expects the Middle East to remain the largest oil producer and the second largest gas producer up to 2040, accounting for over 34% of global liquids production and 20% of gas production. Fujairah’s venture raises a simple but significant question: where next? Advocates of the blockchain revolution will likely rise in 2018 as Middle Eastern energy entities seek to sharpen their financial and digital reputation on the global stage, especially amid the rise of well-equipped ports along the Indian Ocean’s coastline and intensifying competition for coveted Asian energy assets. There is also strong interest from market participants in the North American gas markets, for example, where compliance and filing of regulatory commodities flows is currently manual and therefore, more prone to error. Plus, energy majors BP, Shell and Statoil plan to co-develop a blockchain-based digital platform for energy trading by the end of this year. The investor group, which includes trading houses Gunvor, Koch Supply & Trading, and Mercuria, plus banks ABN Amro, ING and Société Générale, explained in a joint statement last November that it aims to “modernize and transform post-transaction management of physical energy commodities trading.”

There is also a lot more mileage to explore in Fujairah’s evolution to becoming fully digitized. There is potential to scale the launch of blockchain in areas such as digital contracts and digital networks centered on how to digitally record title and ownership of material in storage on this blockchain. In Fujairah, facilities that allow tank-to-tank transfers of refined products use cutting edge pipework, monitoring and sensor technology, but they still rely on manual and time-consuming paperwork. Therein lies a dichotomy between old and new, which blockchain could erase by consigning the passing of PDFs between departments to the history books. Digitizing this process could allow for drag and drop transfer of title between counterparties - a holy grail in commodities trading.

Public confidence in this ‘new-age’ technology will take time. A concerted effort to galvanize Middle Eastern energy entities’ appetite for change is well underway. While up to date, Blockchain is the latest instalment in an ongoing process of digitization that has been shaping manual processes since the 1960s, but importantly offers a genuine breakthrough moment. Digital tools under the umbrella of the 4th Industrial Revolution largely focus on making manual tasks more efficient, while blockchain can mean rewriting the status quo entirely. A blockchain’s network of registered computers continually validates transactions, building blocks of transactions that are then permanently entered in the ledger. Nobody can change the ledger, it is immutable. It can be shared with all members at all times and is not stored in one central place, which reduces the risk of cybercrime.

The latter is pertinent; the world’s new and invisible hackers are fast gaining influence. Two-thirds of the 2 billion people online have had their personal information stolen or compromised, according to estimates in a report by the Center for Strategic and International Studies (CSIS) and McAfee in February this year. Cybercrime may now cost the world almost $600 billion - nearly 1% of global GDP. Inevitably, hackers will continue to target the lucrative ‘hauls’ of the energy markets. Total energy investment worldwide in 2016 alone was just over $1.7 trillion, according to the International Energy Agency (IEA).

Blockchain is here to stay; market participants are excited about the efficiency gains and regulators are keen on the security and immutability of audit trails. As global energy markets get busier, the value of simplification and cyber-safety of blockchain will only become more alluring. Keeping pace with digitally-savvy competitors and hedging against cyber-threats means priming your revolutionary digital muscles now. ◆
EOR: Old Challenge, Fresh Eyes

A handful of innovative EOR projects that support the green obligations of the Paris Agreement offer a template for the growing market.
Oman’s Amal field. This is not the height of Oman’s ambitions; PDO aims for 25% of its oil production to be supported by EOR by 2025.

In the UAE, Abu Dhabi National Oil Company (ADNOC) started the world’s first commercial steel carbon capture utilization and storage project in 2016. The captured CO2 is injected into Abu Dhabi’s maturing oil fields for EOR. And the company announced plans in January to expand its carbon capture program to cater to a six-fold increase in the use of CO2 in maturing oilfields over the next decade, further supporting EOR. ADNOC also aligned with the Centre of Integrated Petroleum Research (CIPR) in Bergen University, Norway, last October, to conduct applied research into EOR techniques that could extend the life of ADNOC’s oil reservoirs. The agreement marks another stepping stone in the company’s EOR journey since 1996, with the aim of recovering up to 70% of oil.

Between 10 -15% of ADNOC’s oil is currently recovered with EOR technologies, primarily via miscible gas injection.

Oman and Abu Dhabi’s journey illustrate the increasingly dynamic tone of the Middle East’s EOR market. But there is a catch; great effort precedes great reward. Up to a decade can pass between laboratory tests and on-site application of new methods; redesigns and pilots especially linger on the calendar. Stakeholders must shorten this timeline – EOR technologies only prove their worth when utilized on site – to gain a first-mover advantage, especially in the largely unexplored field of lower-carbon technologies.

Pooling expertise and funds can hasten progress. Gulf states’ cooperation on developing bespoke regional EOR solutions is a good starting point, according to 95% of respondents to a GIQ Industry Survey last October. A united voice could lower some of the hurdles: concerns over data confidentiality and intellectual property and differing crude and reservoir qualities, for example. Identifying solutions would also give a stamp of credibility to many Gulf countries’ goal to transform into knowledge-based economies, as per their National Visions.

The economic and diplomatic value of being able to ‘export’ expertise to help others manage the nuances of their fields will only become more valuable as energy demand climbs to meet the 27% rise in the global population to 9.7 billion by 2050.

Staying atop the tightrope requires a holistic approach; EOR is not a silver bullet. But it does play a leading role in ticking the economic and environmental checklist of sustainable oil production. The degree of commitment to the EOR market today will determine who plays and secures a leading role in the 2020s and who remains unseen in the wings. ♦
In addition to its advocacy of human capital development and industry best practices, OPAL – the voice of Oman's Oil & Gas sector – is preparing to add another key objective to its mandate: to open up new horizons for its members beyond the Sultanate's geographical borders.
Looking back on roughly two-and-a-half years of his term as Chief Executive, Mr. Musallam Al Mandhari has reason to be satisfied with the important strides that OPAL has made in the delivery of its mandate to its members and the wider Oil & Gas fraternity.

Indeed, it’s been a tumultuous 30 months that coincided with the fallout of the 2014 global oil price collapse on the domestic Oil & Gas industry. The executive leadership of OPAL responded with admirable alacrity to the many challenges thrown up by the crisis, working alongside the Ministry of Oil & Gas, Ministry of Manpower, and the operators and contractors, to help steer the sector through a turbulent period.

Not surprisingly, the crisis triggered a major overhaul of OPAL’s agenda, dictated by a need to prioritize initiatives and programmes that strengthen strategic national objectives amid a constrained fiscal and economic backdrop. Programmes in support of Employment Generation, Omanisation & Training, Skills Development, SME Mentorship, In-Country Value, and Industry Standards have since moved to the top of OPAL’s list of priorities.

Now, as the executive leadership prepares to chart a new course for the Society, it has been soliciting advice and feedback from key members and industry stakeholders. Mr. Al Mandhari, the CEO, explained: “We are looking to take OPAL to the next level over the coming year and beyond. To this end, we have been engaging with the operators, major contractors, and key stakeholders for their thoughts on a new mandate for OPAL’s leadership. Our current 3-year mandate comes to an end in a few months, and we wish to be suitably prepared with a new mandate that encapsulates the aspirations of our members to serve as the voice of the broader fraternity.”

Months of interactions with prominent players have contributed to one key conclusion: that OPAL’s executive leadership has made substantial headway in the delivery of its mandate. “Going by feedback garnered from our members, we believe there is broad endorsement of our current efforts to achieve the three principal objectives of our mandate: Omanisation and Human Capital Development, Best Practice and New Standards; and to serve as the Voice of the Industry.”

Our members have strongly recommended that we stay the course in the continued delivery of these core objectives, but in addition, we are adding a fourth pillar: To help open up...
new business horizons for our members in overseas markets.”

**New horizons**
This addition to OPAL’s enlarged mandate effectively calls upon the executive leadership to supplement the efforts of government agencies, notably the Ministry of Commerce and Industry, the Public Authority for Investment Promotion and Export Development (Ithraa) and Oman Chamber of Commerce and Industry, in representing our members working in the Oil and Gas Sector in exploring business opportunities in international markets. Already, the Board of Directors has given its accent to this new initiative, says Mr. Al Mandhari. “We see Iran and China as particularly promising. Within the GCC region, Qatar and Kuwait are also prospective. We had a visit from Kuwait Oil Corporation which is keenly looking to benefit from our training capabilities as demonstrated by the OPAL Star Centre, which was gifted by BP to OPAL. For Qatar we will be seeking potential job openings for Omani technical staff on our redeployment list. Libya is also in our sights, although given its current troubles, we are looking at opportunities there on a long-term basis.”

Going forward, OPAL is also looking to strengthen its role as a platform for engagement between the industry and other government agencies on issues that impinge on the interests and concerns of members. To this end, OPAL aims to host ‘Power Breakfast Sessions’ or such other limited-scale forums where key representatives of various organisations/companies that have a stake in a topic of concern are invited to deliberate on and work out potential solutions that OPAL can take forward for deliberation with the relevant authorities.

“These forums are in line with our advocacy on issues of interest and concern to our members,” said the CEO. “Issues like Article 48 of the Labour Law, issues on drivers and their potential reskilling, and other contentious matters can be suitably deliberated upon by bringing representatives from the relevant government departments and our members around a table for a couple of hours of brainstorming. We hope to launch this series on a quarterly basis starting from 2019.”

**Broadening remit**
Significantly, OPAL is also on the cusp of an organisational revamp – an exercise designed to ensure the delineation of resources to support the Society’s ever-expanding

OPAL has pledged to support Petroleum Development Oman’s (PDO) National Objective Agenda in securing employment for 1000 young Omanis trained in a variety of skills with funding support from the national oil company.
remit. Since the onset of the downturn in the industry in 2014, OPAL has had to shoulder a number of new responsibilities and programmes in line with its mandate as the representative body of the Oil & Gas industry. Accordingly, strategies and campaigns, notably In-Country Value (ICV), Industry Standards, Road Safety, Ta’sis, and so on, have evolved into full-fledged programmes that need to be sustained over the long term, according to Mr. Al Mandhari.

“We are essentially a small organisation in terms of our present resources, but we seem to have taken on new challenges that would require the allocation of specific resources to support these initiatives. Accordingly, we are creating a new Projects Office to handle these initiatives. New premises are being added to our head office at Al Khuwair from where these initiatives, such as the Road Safety campaign, the ICV Agenda, Ta’sis, and so on, will be managed. We will see our office workforce boosted by around 60 per cent once the Projects Office is fully operational.”

Driving Omanisation

More recently, OPAL has partnered to support Petroleum Development Oman’s (PDO) National Objective Agenda in securing employment for 1000 young Omani trained in a variety of skills with funding support from the national oil company. Also, having played a pivotal role in garnering pledges from the Oil & Gas industry towards creating 5,000 openings for young Omani in support of His Majesty the Sultan’s call for the creation of 25,000 jobs, OPAL now foresees for itself an important responsibility in sustaining the employment generation effort. Key to this effort is a strategy to ease the application of labour clearances for OPAL members with the Ministry of Manpower, in pre-discussions on the requirements and relevancy of expatriate labour force required for the industry. To this end, OPAL is keen to work with the Ministry of Oil & Gas and the Ministry of Manpower to come up with a suitable framework in support of our membership that ensures that any requests for labour clearances necessary for expat recruitment are not unduly rejected, said Mr. Al Mandhari.

“As in the case of the health or banking sector, where the Ministry of Health or Central Bank of Oman respectively must sign off on any request for a labour clearance from any private entity operating within that sector, OPAL would like to play a similar role for the Oil & Gas industry. We want to make sure that Oil & Gas companies are duly given the support in the recruitment of suitable expatriates required for their business and in ensuring that their Omanisation and training plans are fully supported and possibly funded. By inserting ourselves into the vetting process, we can ensure that companies working in the Oil and Gas Industry are given a deserving ear and their labour clearances are approved without undue hassles.”

Additionally, in line with this reorganisation effort, dedicated committees will be proposed and constituted to help formulate roadmaps and blueprints in supporting the delivery of some of the OPAL’s objectives. One such committee, for example, will be tasked with deliberating on the ‘Future of Oil’ in Oman. At least three other committees are in the works as well, and will be rolled out in the coming year, said the CEO.

In recent months, OPAL has also announced successful partnerships with a number of high-profile Oil & Gas, higher learning and commercial organisations to help advance certain key goals. Notable is a pact signed with the German University of Technology in Oman (GUtech) for the establishment of a dedicated R&D lab focused on road safety and transportation issues. Likewise, OPAL has inked a deal with scaffolding and formwork specialists Doka to help develop the capabilities of a new Omani SME dubbed ‘Ta’is – 2’.  

GOING FORWARD, OPAL IS ALSO LOOKING TO STRENGTHEN ITS ROLE AS A PLATFORM FOR ENGAGEMENT BETWEEN THE INDUSTRY AND OTHER GOVERNMENT AGENCIES ON ISSUES THAT IMPINGE ON THE INTERESTS AND CONCERNS OF MEMBERS
OPAL Oil & Gas Conference 2018 builds on the overwhelming success of the inaugural event held at the Grand Millennium Hotel in October 2017. Deliberations during that event centred on themes such as, ‘Alternative Technologies in Oil and Gas’, ‘Cybersecurity in the Oil and Gas Industry’, ‘Maximizing the Protection of Assets’, ‘Effective Learning from Major Process Safety Incidents’, and ‘In-Country Value Development’. The over-arching theme, this time around, is: ‘Shaping the Future of Oman’s Oil and Gas Industry - Minimizing Capital Requirements and Improving Efficiency’. Over the course of three days, a prestigious line-up of policy-makers, international speakers, thought-leaders and industry experts will deliberate on an array of sub-themes that are integral part of Oman’s strategy to develop its Oil & Gas industry sustainably. Setting the tone for three days of deliberations will be a keynote address by HE Salim Nasser Al Aufi, Under-Secretary of the Ministry of Oil & Gas. Also scheduled as part of the inaugural session is a panel discussion on the theme, ‘Predicting the future oil price – will it stick, rise or fall?’ The panelists will dwell on three key questions: (i) What lies ahead for Oman’s Oil and Gas sector? – Understanding how Oman’s oil and gas industry is responding to demand challenges and discussing the role of digital technology in driving the industry forward; (ii) What game-changing technology can we expect to be deployed in the industry over the next 18 months?; and (iii) How can operating companies realize the full potential of digital technology available?

Various presentations during the inaugural session will focus on, among other topics, Investing in Oman’s oil and gas industry; Developing downstream and petrochemical industries in Oman and understanding how this benefits other industries; and Offshore opportunities in Oman. Underscoring the content-rich features of OPAL Oil & Gas Conference 2018, a total of five sessions and one workshop are scheduled over the ensuing three days of the event. Deliberations during these sessions will focus on the following sub-themes: Transforming Oman’s Oil and Gas - Emerging technologies; Digital Oilfields/ Oil and Gas Digital Transformation; Small and Marginal Oilfields Development; Transforming HR in Oman’s Oil & Gas Industry - HR and Local Content; and Women in Oil & Gas. A dedicated workshop scheduled on Day 3 will dwell on a number of HSE related themes.

As the only Oil & Gas platform that brings together key players representing the full spectrum of government, public and private sector stakeholders, the OPAL Oil & Gas Conference 2018 offers a unique opportunity to garner insights on the direction in which Oman’s mainstay economic sector is headed. For delegates, the three day event is also an occasion to network with top-flight industry executives, decision-makers, technocrats, and successful entrepreneurs. Besides, it offers an exclusive opportunity to be part of the dialogue currently underway to help the industry weather the enormous challenges churned up by the global oil price collapse in 2014. A companion exhibition taking place in conjunction with the conference will feature an array of oilfield equipment, technologies and innovations designed to help E&P players, contractors and other service providers with new tools to drive their business. The 3-day forum will culminate with the presentation of OPAL Best Practice Awards that recognize innovation, excellence and best practice standards centering around areas of vital importance to the industry.

For further details, log in at: www.oogc-oman.com
Oman hosts World Heavy Oil Congress

‘The world is awash with heavy and extra heavy oil deposits, in excess of 1 trillion barrels. It currently accounts for 12-15 per cent of total global production and there is significant recoverable potential to be unlocked. Technology and collaboration will be the key’: Dr Al Gheithy, Petroleum Engineering Function Director – PDO

The Sultanate played host to the 2018 edition of the World Heavy Oil Congress & Exhibition (WHOC), which was held at the Oman Convention & Exhibition Centre during 3 – 5 September 2018. The prestigious event was jointly opened by HE Dr Mohammed bin Hamad Al Rumhy, Minister of Oil & Gas of the Sultanate of Oman, and HE Shaikh Mohammed bin Khalifa Al Khalifa, Minister of Oil of the Kingdom of Bahrain.

In his opening remarks, HE Dr Al Rumhy said, “Oman did not slow down during the 2014-2018 oil drop. The fear was always that the reduction in
investment, specifically in exploration, was going to hit us hard but we stayed the course and proceeded with our previous plans with the support of the government, shareholders, and oil and gas companies operating in the country. As a country, we took the right decision to focus on investment and that has helped us in the end.”

He added, “Both the public and private sector have a responsibility. With greater private sector participation and the optimization of ecosystems of our economy versus prioritizing profits, we can together further advance our industry forward.”

HE Shaikh Al Khalifa said, “Within the region, Oman was the first to invest in heavy oil and we have a lot to learn from them. Heavy oil could be in heavy demand, at least in the short term, as a result of implications of the light tight oil phenomenon in North America.”

The Ministers along with a high-level delegation from WHOC toured the exhibition, which will run until Wednesday, where regional and international NOCs, IOCs, service and technology providers are showcasing the best technologies, products and services for the heavy oil sector.

Notable exhibitors include Petroleum Development Oman (PDO), Eni SPA, China National Offshore Oil Corporation, Bahrain Petroleum Company, Kitsnet, Badr EOR, Albpertol, RGL Reservoir Management Ltd, SoluForce, HP Well Screen, and Salamander to name but a few.

Welcoming participants from all around the globe, Congress Chairmen Dr. Ali al Gheithy, Petroleum Engineering Function Director at Petroleum Development Oman, and Dr Saleh bin Ali al Anboori, Director General of Planning and Studies at Oman’s Ministry of Oil & Gas, highlighted the Sultanate’s growing role on the global stage in spearheading innovation to maximize heavy oil production.

“The world is awash with heavy and extra heavy oil deposits, in excess of 1 trillion barrels. It currently accounts for 12-15 per cent of total global production and there is significant recoverable potential to be unlocked. Technology and collaboration will be the key,” expressed Dr Al Gheithy.

“Heavy oil and enhanced oil recovery form an important part of Oman’s oil mix. It is anticipated that by 2025 about 25 per cent of PDO’s production will come from EOR projects. We’ve partnered with Omani universities and academic institutions to develop and further advance our research and development programs to not just keep up with the technological innovations but also to pioneer and lead this disruption.”

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The Strategic Conference continued with a session on ‘Rethinking the Energy Operation Model: Agility, Adaptability & Global Cooperation in Redefining the Future of E&P’. The panel of distinguished speakers included: Dr Bakheet al Katheeri, CEO of Mubadala Petroleum, Luca Bertelli, Chief Exploration Officer of Eni, Steve Kelly, President and General Manager of Occidental Oman, Amran Marhubi, Technical Director of Petroleum Development Oman and Steven Moss, CEO of GlassPoint Solar.

“Heavy oil is a conventional resource that
The world is awash with heavy and extra heavy oil deposits, in excess of 1 trillion barrels. It currently accounts for 12-15 per cent of total global production and there is significant recoverable potential to be unlocked.
Heavily oil key to sustaining long-term output

The Ministry of Oil & Gas strongly welcomed the hosting of the event in the Sultanate as a wonderful opportunity to galvanise the quest for new technologies and solutions necessary to develop, produce, transport and refine Oman’s heavy oil resources more affordably than it currently is.

The 3-day event provided new impetus to ongoing efforts by various stakeholders to harness this valuable resource more cost-efficiently, said Dr. Saleh Ali al Anboori, Director General of Planning & Studies at the Ministry.

According to the official, the World Heavy Oil Congress shone a spotlight on a full spectrum of topics across the heavy oil value chain – from development and production of this resource to transportation and refining as well.

Earlier, in remarks to OPAL Oil & Gas magazine in the run-up to the event, the official had urged those with an interest in heavy oil – from the upstream players themselves, to the contractors and service providers, technology vendors, R&D institutions and scholars -- to make the most of this event.

The official, who co-chaired the opening session, said the forum titled ‘Transforming the Heavy Oil Value Chain’, had immensely beneficial implications for a country like Oman which depends on heavy oil to achieve its crude production targets in the future.

“The era of easy oil is on the wane, with heavy oil – which is relatively expensive and complex to produce – now accounting for 10 – 15 per cent of our daily output. Heavy oil’s share is projected to rise in the future, and we need to be suitably equipped for the challenges in store,” Dr Al Anboori stressed.

The Director General hastened to clarify however that Oman is well ahead of most hydrocarbon producers in the region on the heavy oil resource development front. “In some technological respects, Oman is a pioneer of sorts, given its excellent experience in the deployment of thermal, chemical, miscible gas and other enhanced oil recovery (EOR) technologies in harnessing our heavy oil reserves. Mukhaizna and Amal are examples of our success on this score.”

The key challenge for Oman’s energy sector is to sustain heavy oil production cost-competitively, according to the official. “Given the current fiscal and economic constraints, the onus is on us to find cheaper ways of bringing heavy oil to the surface. We need to come up with ways to drive down capital costs through a combination of technology, innovation, R&D and knowledge sharing. This conference has provided us with an excellent platform to advance these goals.”

Producing heavy oil – which is extremely viscous – is also energy-intensive and thus a key contributory factor in the relatively high cost of heavy oil production, Dr. Al Anboori points out. Exploring sustainable alternatives is thus imperative, says the official, noting in this regard the successful use of solar technology in place of pricey natural gas as a fuel source in heavy oil production.

The use of steam to heat heavy oil reservoirs, while popular in many parts of the world including Oman, also has a downside. It contributes to the generation of large quantities of produced water along with heavy oil – a by-product that must be either recycled or disposed of in sustainable ways, says Dr Al Anboori.

Importantly, the forum also focused on the refining and downstream potential of heavy oil – segments of the value chain that are equally complex and expensive to deal with. Transporting, refining and processing heavy oil, as well as options for dealing with waste residues, were addressed during the conference.

Sharing their expertise in heavy oil development in the Sultanate were executives from Petroleum Development Oman (PDO), Occidental of Oman and GlassPoint Solar – all three of which are currently on the frontlines of the Sultanate’s heavy oil-based hydrocarbon quest. They were joined by experts from prominent upstream energy firms, technology developers, and energy think-tanks who shared their perspectives on the outlook for heavy oil development and processing in the coming decades.

According to the World Petroleum Congress, around a third of the world’s heavy oil resources are located in Venezuela and Canada, followed by the Middle East, United States and Russia. Heavy oil, along with extra-heavy oil, oil sands and bitumen, accounts for 70 per cent of the world’s oil resources. The share of heavy oil alone is about 15 per cent.
PDO institutes
In-Country Value (ICV) Awards
Petroleum Development Oman (PDO) institutes awards recognizing excellence in supporting In-Country Value (ICV) development
Petroleum Development Oman (PDO) yesterday held its inaugural In-Country Value (ICV) Awards event to celebrate businesses and organisations which have gone the extra mile to support Omani economic development.

The PDO competition covered a range of ICV areas, including small and medium enterprises (SMEs), Local Community Contractors (LCCs), vendors and training institutes, and National Objectives which is focused on the creations of job, training and redeployment opportunities for Omani jobseekers.

The event was held under the auspices of His Excellency Salim bin Nasser al Aufi, Under-Secretary of the Ministry of Oil and Gas, and came a few months before the fifth anniversary of the launch of the ICV Blueprint Strategy 2013-2020 which aims to develop a competitive and sustainable local supply market for the oil and gas industry and foster Omani skills.

PDO is currently leading 43 out of the 53 Blueprint Strategy opportunities, 20 of which have been delivered so far. It has also identified an additional 66 internal ICV opportunities and has delivered 30 of them.

The event also included an exhibition showcasing 10 facilities supported by PDO in the area of manufacturing and servicing in the oil and gas industry. These facilities were presented as examples of the achievements and impact ICV has had in localising opportunities and its continuous contribution to the Sultanate’s sustainable development and economy.
PDO Managing Director Mr. Raoul Restucci said: “This is a truly special event highlighting the very best of our partners who are supporting our vision of serving the nation and retaining more of the wealth the oil and gas industry generates in Oman.

“Our ICV achievements wouldn’t have been possible without the co-operation of, and support from, our valued partners and these awards provide a great opportunity to recognise their efforts. This year has been a banner year for ICV and we are proud of where we are today, but our ICV journey is still ongoing. Maintaining the momentum is key, and we’ll continue to ramp up our efforts to tap the full potential of ICV and to continue to proudly serve Oman.”

Tuesday’s event also celebrated PDO’s National Objectives programme, which has secured more than 50,000 employment opportunities for Omani since its launch in 2011. Trainees graduating from the programme have been able to take up full-time positions in both the oil and gas industry and other sectors of the economy. Overall, the ICV Awards consisted of six categories, and the winners are: Rukun Al Yaqeen (RAY) International Skills Development (Best Training Institute); Consolidated Contractors Co. Oman (Best National Objectives Employer); Oman Drilling Systems (High-performing SMEs); Sahwat Haima Co. (High-performing LCCs); Seeh Al Sarya Engineering (Best Contractor/Vendor in Social Investment Projects); and Petrofac E&C Oman (Best Contractor/Vendor in ICV Delivery (Against Their ICV Plan).

In Numbers
PDO is currently leading 43 out of the 53 Blueprint Strategy opportunities, 20 of which have been delivered so far. It has also identified an additional 66 internal ICV opportunities and has delivered 30 of them.
Economic diversification to shape a sustainable future for Oman

Siemens is in a strong position to understand the Sultanate’s requirements. Today, the Company is actively supporting Oman’s diversification plan and executing a number of the most important projects in different sectors, says Claudia Vergueiro Massei, CEO of Siemens in Oman.
hen you first arrive in Muscat, your eye is drawn to the stretching coastline, reaching to the strategic Strait of Hormuz, which reminds you how blessed Oman is with its natural resources. For the past few decades, economic diversification has been high on the agenda of the Omani government. Even before oil prices dropped in mid-2014, the country recognized the importance of moving towards a more diversified, knowledge-based economy. The goal was clearly defined: bring diversification, industrialization, privatization to the Sultanate as well as increase the country’s integration into the global economy. In my view, the country has a great deal of potential to diversify its economy. With its young population and its geopolitical and economic significance, Oman has important prerequisites for achieving this goal.

Economic diversification begins with energy. Energy is an initial element that enables an economy to begin growing. It is followed by infrastructure in areas such as urban and industrial development.

The foundations of the future are already in place: the country has witnessed one of the world’s fastest rates of growth in the power generation sector, at around 8% per annum. The Sultanate also ranks seventh in the Middle East for petroleum and other liquid hydrocarbons, and, thanks to enhanced oil recovery techniques, oil wells have been producing at a high level.

Yet, planned investment in mega projects across the country – in sectors such as tourism, fishing, transportation, logistics – has increased the demand for boosting power generation capacity in Oman. It has also created the need to modernize older power plants and embrace new storage and distribution solutions.

Already boasting a dynamic and open power generation market, Oman has kicked-off a number of projects to add power generation capacity to the national grid. It’s no surprise, then, that Muscat has been among the first in the region to introduce Independent Power Plants (IPP) with private involvement. With more projects on the cards, more than 70% of power generation in the country already comes from IPPs, creating a diverse investment ecosystem. The special economic zone at Duqm, comprising its own power plant, refinery and petrochemical plant, is one
example that is set to serve this economic transition. Siemens is in a strong position to understand the Sultanate’s requirements. Today, we are actively supporting Oman’s diversification plan and executing a number of the most important projects in different sectors. We are also proud that around 50% of the country’s power generation capacity comes from Siemens turbines, as does a large share of its power transmission and distribution network.

“Hydrogen offers major advantages for renewable power projects”
To diversify and secure our future energy supply, the Omani government is also counting on renewable power projects to achieve energy independence, while maintaining steady hydrocarbon exports. Recently, the government unveiled plans for six new solar and wind powered projects, aimed at delivering a total of around 2,650 megawatts (MW) of renewable-based capacity by the year 2024. In my view, this shift towards renewables makes so much sense: Oman’s year-round sunshine allows solar collectors to receive daily radiation, giving the Sultanate one of the highest solar energy densities in the world. The country also has sufficient land available for large-scale solar projects.

With a higher contribution of renewables to the energy mix, compensating for fluctuations in power supply would be increasingly important in order to maintain stability and reliability of the electricity network. Hydrogen can be part of the energy mix as a clean, multi-functional energy carrier and storage concept to enable large-scale storage.

So, how does it work? Silyzer is one of the most advanced electrolysis systems; it uses Proton Exchange Membrane technology to convert electricity from renewables into ‘green’ hydrogen and oxygen. There are no CO2 emissions or waste produced in the process. The hydrogen can then be stored for use in fuel-cell cars, as an industrial gas or even to fuel a power plant.

As one example, we have just signed a MoU with Dubai Electricity and Water Authority (DEWA) to start a pilot project for the region’s first solar-driven hydrogen facility electrolysis at DEWA’s testing facilities at the Mohammed bin Rashid Al Maktoum Solar Park in Dubai.

To complement this shift towards a more diversified economy, Muscat aims to increase the contributions of manufacturing. Its plan entails a diverse set of projects, with a particular focus on development of the industrial zones. I often say that there is great potential to use automation and digitalization to leapfrog the early stages of economic development.

We are proud that over 90% of industrial plants in the Sultanate are enabled by Siemens technology. Furthermore, over 75% of the country’s industrial emissions are continuously analyzed and monitored by our solutions.

Going forward, we are confident that our “digital twin” technology can be very valuable to continuously develop the Omani manufacturing scene. Manufacturers can design, simulate, and test sophisticated products in the virtual domain before making the first physical
prototype, before setting up production lines and before starting actual production – even training of the workforce can be conducted in this virtual world! Once everything works in the virtual world, results are transferred to the real world to reduce time-to-market and achieve a more efficient production.

“It is vital that non-renewable resources are sustainably used and preserved”

With economic development and rapid population growth, it is vital that non-renewable resources are sustainably used and preserved. For instance, flare gas can become a cost-effective new source of fuel for power plants and, when used to replace heavy fuel oil, the benefits can be multiplied through reductions in power plant maintenance and outage costs.

Water is another important topic. Today, Oman’s water resources are witnessing around 9.5% annual growth in consumption along with a substantial demand for water conservation technology. The newly released OPWP 7-year plan has a comprehensive list of expected new additions to the current desalination capacity of the country. Three new desalination plants are currently under construction, which will add around 730,000 m³/day of capacity to the main interconnected system. Moreover, some 800,000 m³/day, split in 7 other new plants, are expected to be added to the system to help cope with this increase in demand, as well as to allow for a more distributed network. There is also a huge untapped potential to enhance wastewater treatment. With our power technology and intelligent automation systems, Siemens already enables the treatment of around 100,000 m³ of water daily. Nevertheless, expanding the volume would only bring benefits to the country.

“Building a skilled and a future-proof workforce is crucially important”

Operating an efficient energy system, advanced industrial production facilities and modern urban infrastructures requires a large, highly qualified local workforce. That’s why building a skilled and future-proof workforce is very important. At Siemens, we believe that “a company that does not serve society should not exist”. That is exactly why we are involved in a number of collaboration and training programs with Omani universities to empower Omani youth with the advanced skills needed to support the Sultanate’s diversification plan.

One example is our recent academic collaboration, with the German University of Technology in Oman (GUtech), to provide advanced learning and certification opportunities for engineering students and professionals. Under the agreement, GUtech will offer the Siemens Mechatronics Systems Certification Program to all students interested in advancing their skills in automation and manufacturing, developing their capacity for innovation and their value for the job market. Another contribution of Siemens involves cooperation with Sultan Qaboos University (SQU) to have Siemens experts regularly share their knowledge and experience with undergraduate and graduate students of SQU.

With company’s experience and expertise, Siemens is ready to support Oman on its journey to achieve its economic diversification goals and beyond.

**WE ARE PROUD THAT OVER 90% OF INDUSTRIAL PLANTS IN THE SULTANATE ARE ENABLED BY SIEMENS TECHNOLOGY. FURTHERMORE, OVER 75% OF THE COUNTRY’S INDUSTRIAL EMISSIONS ARE CONTINUOUSLY ANALYZED AND MONITORED BY OUR SOLUTIONS**

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In Numbers

Three new desalination plants are currently under construction, which will add around **730,000 m³/day** of capacity to the main interconnected system.
Al Haditha Petroleum Services SAOC

Raising the bar in service delivery

Al Haditha Petroleum Services SAOC – one of the largest Super Local Community Contracting (SLCC) company in operation in the Sultanate’s Oil & Gas sector – is preparing to expand and diversify its business portfolio, alongside an ambitious effort to raise the bar on its professionalism and service delivery, says newly appointed CEO Eng. Said Rashid Al Asmi.
Collectively owned by over 3,000 local Omani shareholders, Al Haditha Petroleum Services SAOC (AHPS) continues to live up to its billing as a Super Local Community Contracting (SLCC) company. It provides a range of oil and gas services in its concession area in the north of the Sultanate and operates a total of four substantive contractors for leading players in Oman’s upstream energy sector, notably Petroleum Development Oman (PDO), Occidental Oman, Daleel and CCED.

Now with newly appointed CEO Eng. Said Rashid Al Asmi at the helm, Al Haditha Petroleum Services is poised for a new phase of strong growth propelled by a quest to diversify its operations into new areas such as logistics services, chemicals distribution, small scale manufacturing and facilities management.

Outlining the company’s aspirations for growth, the CEO said: “We are looking to leverage our considerable expertise and resources to participate in joint venture opportunities in the execution of Oil & Gas EPC projects. On the manufacturing side, we are examining options for small-scale manufacturing of oilfield spares and consumables – initiatives that will underpin our growth over the foreseeable future.”

Indeed, AHPS has come a long way since it commenced operations in 2011 with a solitary contract from PDO. The company has since added three long-term contracts to its portfolio, while growing its workforce to around 1,200 employees currently to cater to its substantial order-book. For PDO, the company provides a wide range of Oil & Gas services at the former’s operations at Yibal, Fahud, Lekhwair and Qarn Alam. Over the years, the company has since amassed a formidable array of skills spanning the full spectrum of disciplines – electrical, mechanical and instrumentation - that are an integral part of Oil & Gas engineering design and construction.

New leadership
Taking over the reins of the company in March this year, Mr. Al Asmi has since set about priming the SLCC for a comprehensive makeover aimed at steering it into the ranks of the industry’s leading oilfield service providers.

“My vision as CEO is to make AHPS a ‘Future Ready’ Oil & Gas services company of choice in our industry. This is sought to be achieved by le-
A consummate industry veteran, Mr. Said began his professional life as an oilfield engineer at PDO and OGC where he spent over 20 years in various positions. Appointed CEO of AHPS earlier this year, he joins a company that was established with a unique vision that is in sync with his own philosophy as an oilfield professional.

“As a SLCC with over 3,000 Omani nationals as shareholders, our mandate is to generate wealth and thereby raise standards of living in the communities that we represent. Going forward, our goal is build our capabilities, diversify our business portfolio and future-proof ourselves in the delivery of high quality services to our oilfield clients,” he remarked.

Underpinning this vision, the CEO explains, the five key pillars: (i) Integrity (emphasizing the importance of transparency and accountability in all of AHPS’s operations; (ii) Passion (a desire to go the extra mile in delivering on its commitments; (iii) Respect (a commitment to treating all people with dignity and enable to grow to their full potential; (iv) Professionalism (to acquire new skills and knowledge in a spirit of entrepreneurship; and (v) Unity (harness synergies by encouraging staff to build their full potential.)

Under the CEO’s leadership, AHPS is also looking to entrench a strong Health-Safety-Environment (HSE) culture across the organization. “HSE is a top priority for the company and is being espoused at the highest levels of management. Any compromise on HSE could potentially cost any organization its rep-
HSE is a top priority for the company and is being espoused at the highest levels of management. Any compromise on HSE could potentially cost any organization its reputation, as well as cause harm to its employees and the environment.

Also being strongly advocated is teamwork – a virtue that the CEO stresses is indispensable to the timely and successful delivery of contracts. “Teamwork essentially means that our employees set their hearts to their work and are willing to go the extra mile in meeting the company’s corporate and operational objectives. Teamwork, along with quality and competency, are enablers that will ensure the successful completion of projects.”

**LEAN principles**

Since his appointment as CEO, Mr. Al Asmi has also been endeavoring to embed LEAN principles in all aspects of the company’s business. LEAN involves maximizing customer value while reducing or eliminating waste or duplication in the contracting process. “In embracing the LEAN process, we have looked at ways to do more with less resources – a methodology that contributes to greater efficiency,” said the CEO, adding that PDO – a pioneer in the application of LEAN principles – has been providing training support in the implementation of the methodology in AHPS.

In-Country Value (ICV) development – a powerful new mantra for localization being pursued by the Ministry of Oil & Gas along with the oilfield industry – will also be embraced with new vigour at AHPS, according to Mr. Al Asmi. “In our procurement of products and services, as well as our employment policies, ICV will be an overarching objective. ICV is very much in line with our mandate as a Super Local Community Contractor (SLCC) focused on delivering value to local communities and the national economy. Indeed, a dedicated department is being established to drive ICV alongside LEAN,” he stressed.

**Employee engagement**

Since his appointment as chief executive, Mr. Al Asmi has also strongly espoused
a commitment towards connecting with his staff – not only at the executive level – but organization-wide. The goal, says the CEO, is to engage with the company’s workforce at all levels on the achievement of AHPS’s strategic and corporate objectives, while also understanding the needs and concerns of every member of the staff.

“Employee engagement is a priority objective for me as CEO,” the executive explained. “Every quarter, I travel to various locations where our operations are based and have an informal exchange with our personnel and meetings with our client representatives. We discuss the status of our operations in that area, explore solutions to potential challenges in the delivery of our commitments, and chart a strategy for achieving our operational and performance objectives. On my part, I also provide an overview of the direction in which the company is headed and the action plan for driving growth. It’s a two-way communication that is proving to be a huge success.”

He further stated: “We are a company that strictly adheres to the laws of the land while eschewing any dealings and practices that might be in breach of legal statutes and corporate ethical norms. Any forms or bribery, corruption, and corporate gift-taking, for example, are strongly frowned up. This message is being aggressively disseminated from top management all the way across to all divisions of the company. PDO is also providing us with training support in such areas as whistle-blowing, and so on.”

Indeed, all of these efforts have begun to pay dividends, says Eng. Al Asmi. An annual survey of oilfield contractors conducted by PDO recently has found AHPS to meet above industry benchmarks in six out of seven indicators. Work is now afoot to raise performance levels with regard to the solitary indicator that has been found lacking. “Now in the third year of this annual survey, our goal is to be above benchmarks across all seven indicators,” he noted.

Attesting to this commitment to strengthen standards, AHPS has successfully obtained ISO certification for the quality of its engineering management services. The company is now looking to add ISO 14001:2015 (Environmental Health) and ISO 45000 (Occupational Health) to its burgeoning credentials.◆
WHAT NOT TO MISS

UPCOMING EVENTS

29 - 30 October 2018
Gas & LNG Middle East Summit
Venue: Grand Ballroom, Oman Convention & Exhibition Centre, Muscat - Oman
Organised by Wisdom Events, the Gas & LNG Middle East summit is a prestigious event assembling leaders in the gas industry from Europe, Asia, USA and the Middle East, covering subjects that are the most important for further development of gas infrastructure with a special focus on LNG.

12 - 15 November 2018
Abu Dhabi International Petroleum Exhibition and Conference (ADIPEC)
Venue: Abu Dhabi International Exhibition Centre (ADNEC), UAE
Established in 1984, ADIPEC is a world-class business forum, where oil and gas professionals convene to engage in dialogue, create partnerships, do business and identify solutions and strategies that will shape the industry for the years ahead.

6 - 7 December 2018
International Conference on Oil and Gas 2018
Venue: Dubai, UAE
This year’s event brings together experts on the theme, ‘A Whimsical Espy on Oil and Gas Field’ which meticulously emphasizes the recent trends in petroleum technology, challenges faced by the industry and the future of the Oil and Gas sector.

11 - 12 December 2018
SPE Workshop: ‘Petroleum Economics - Optimisation Versus Growth in Uncertain Times’
Venue: Bahrain
The third edition of the Ethylene Middle East Technology Conference (EMET) is the event for professionals looking to develop their technical knowledge and optimize their position in the fast evolving ethylene industry by increased operational efficiency, sustainability and excellence.

5 - 6 March 2019
Saudi Downstream Forum
Venue: Saudi Arabia
The Saudi Downstream Forum showcases the Kingdom’s investment potential, particularly in the downstream sector and promotes the development of associated industries to facilitate economic diversification.

2 - 4 December 2018
OPAL Oil & Gas Conference 2017
Venue: Oman Convention & Exhibition Centre, Muscat - Oman
The Sultanate of Oman’s premier oil and gas platform organized by the industry with the support of the Ministry of Oil & Gas.

15 - 17 April 2019
Oman Downstream Exhibition & Conference 2019
Venue: Oman Convention & Exhibition Centre, Muscat - Oman
Oman Downstream Exhibition & Conference is a dedicated platform for showcasing products, services and capabilities in the downstream petroleum sector.
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