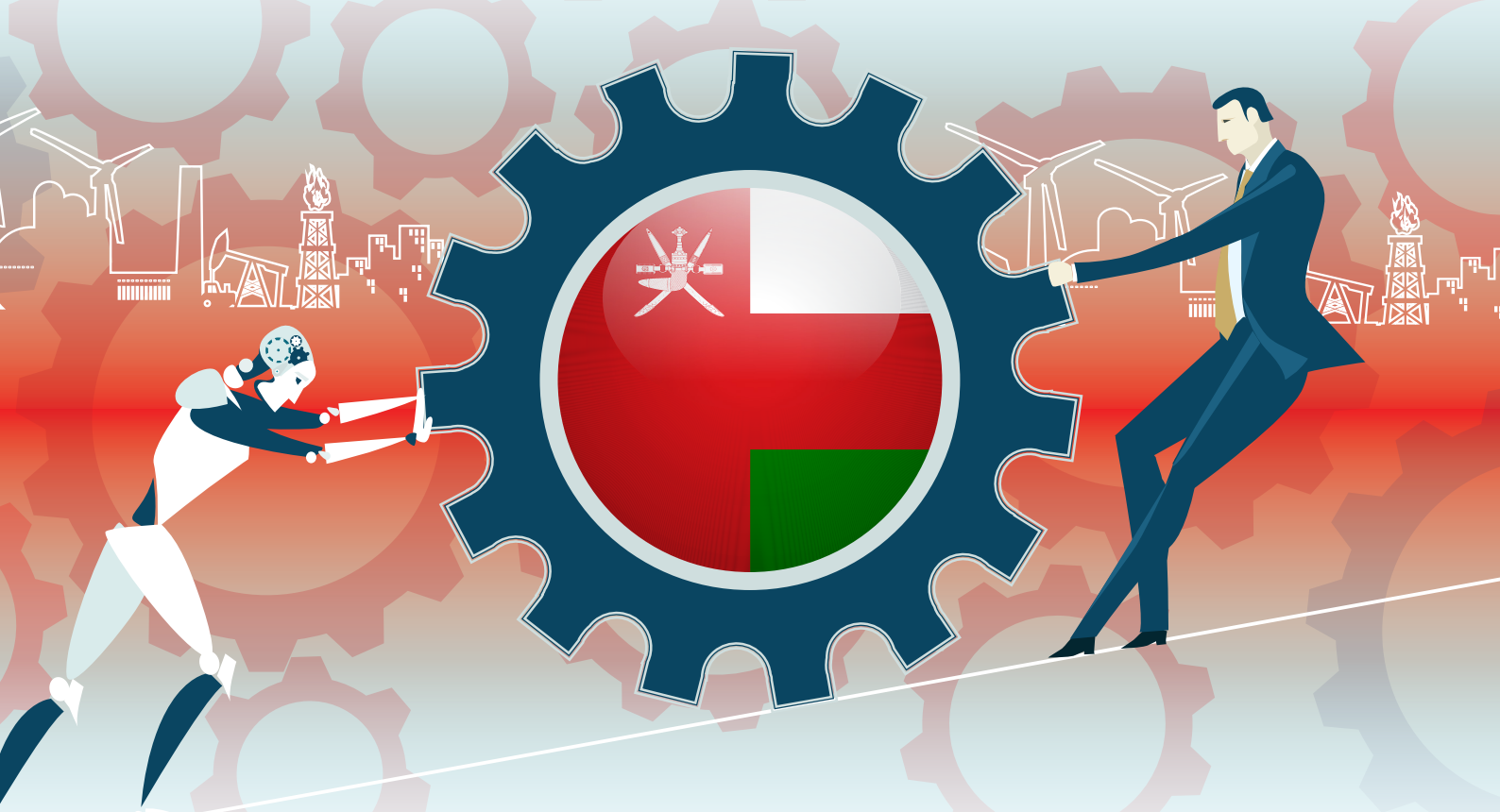


Whitepaper



Oman Energy Master Plan 2040 **How to Accelerate Oman's Energy Transition?**

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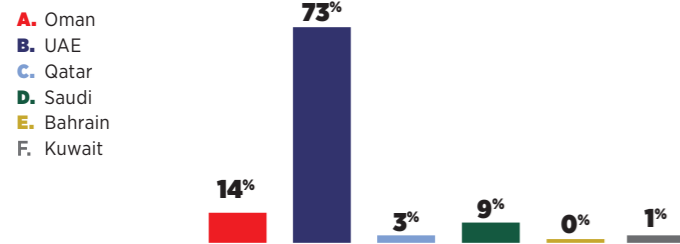
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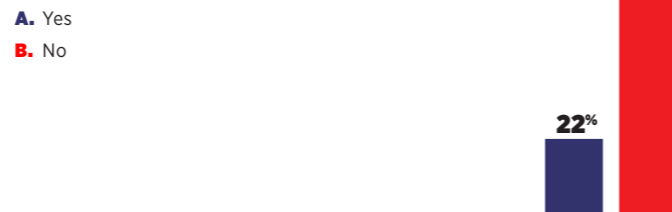
INDUSTRY SURVEY

OMAN ENERGY MASTER PLAN 2040 How to Accelerate Oman's Energy Transition?

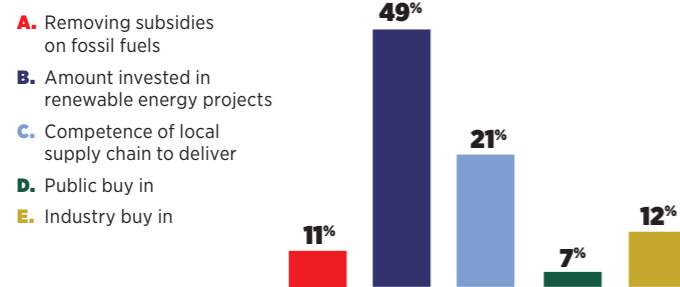
Saudi Arabia has promised to invest over \$100 billion to develop 41 gigawatts of solar electricity by 2032, while most other Gulf states have announced similar ambitious transition projects of their own. **When it comes to implementation, which GCC country do you think is currently leading the energy transition?**



Oman's total domestic use of natural gas tripled in the 10 years since 2008 to 1.5 billion standard cubic feet in 2017. **Will it be possible to meet this soaring demand growth without a centralized single authority overseeing all elements of the value chain i.e. Ministry of Energy?**



Contributions that each individual country should make to achieve the worldwide goal of the Paris Agreement on climate change are determined by all countries' nationally determined contributions (NDCs). **Which of the following is the most appropriate indicator to measure a Gulf country's progress in implementing an energy transition strategy?**



Oman and the GCC states need to go beyond their current focus on the power sector in embracing renewable energy and energy efficiency initiatives. **Consideration should also be given to the replication of these initiatives in water desalination, industrial and transportation sectors.**



The existence of a competent and integrated localized supply chain in Oman is critical for the country to be able to accelerate its energy transition!

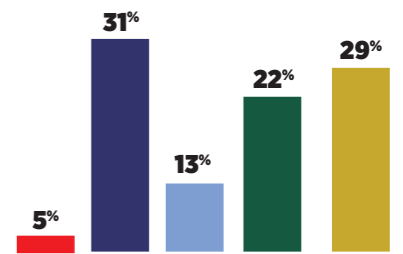


The diverse range of new energy sources within the energy transition will need complete infrastructure right through the value chain - from production and capture to processing, storage and transportation. **Is Oman's legacy energy value chain an opportunity or a barrier to the energy transition?**



The energy transition must move towards secure, efficient, and low-carbon energy systems that all encompass components related to production, conversion, delivery, and end use of energy. **Which of the following should be the most important next step for Gulf countries?**

- A. Define the need for alternative energy sources
- B. Identify alternative (sustainable) energy options
- C. Define energy consumption per sector
- D. Define sectoral and intersectoral transition strategies
- E. All of the above



Peak power demand in Oman is expected to grow at around 9% per year, from 5,122 MW in 2014 to 9,530 MW in 2021. **The sultanate will be able to meet this demand through its Vision 2040 blueprint!**



The Miraah solar thermal facility in Oman is expected to deliver 6,000 tons of steam a day for EOR operations at the Amal oil field, while six new solar and wind powered projects in the sultanate aim to deliver around 2,650 MW of renewable power by 2024. **Oman will achieve its goal to generate 10% of its power from renewables by 2025!**



Policies that provide secure payments to refinance renewable energy investments and help liberalize the power sector would be significantly beneficial in attracting more investments in energy transition projects. **Does Oman have the right financial vehicles in place to encourage the investments required to achieve more sustainable forms of energy?**



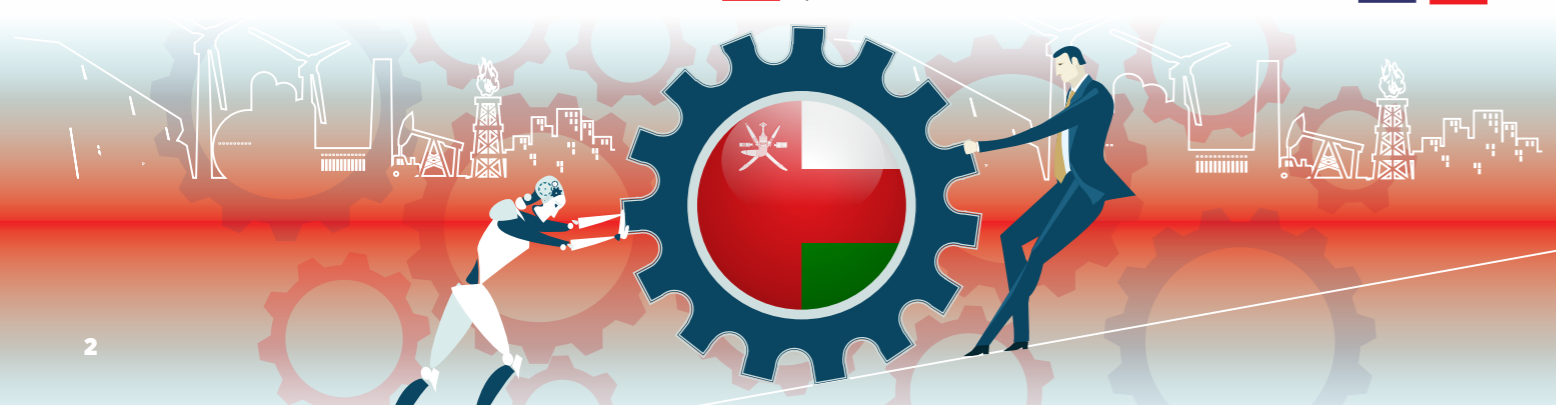
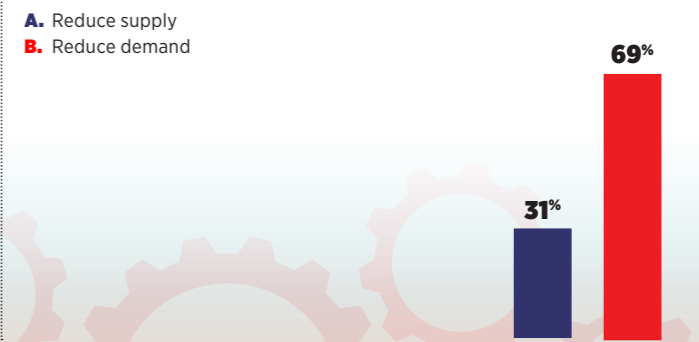
The World Economic Forum's (WEF) Global Future Council on Energy declared earlier this year that the global energy transition is still not moving fast enough. Therefore, the WEF said **the ball is back in policymakers' court to accelerate the shift towards the clean energy solutions of the future.**

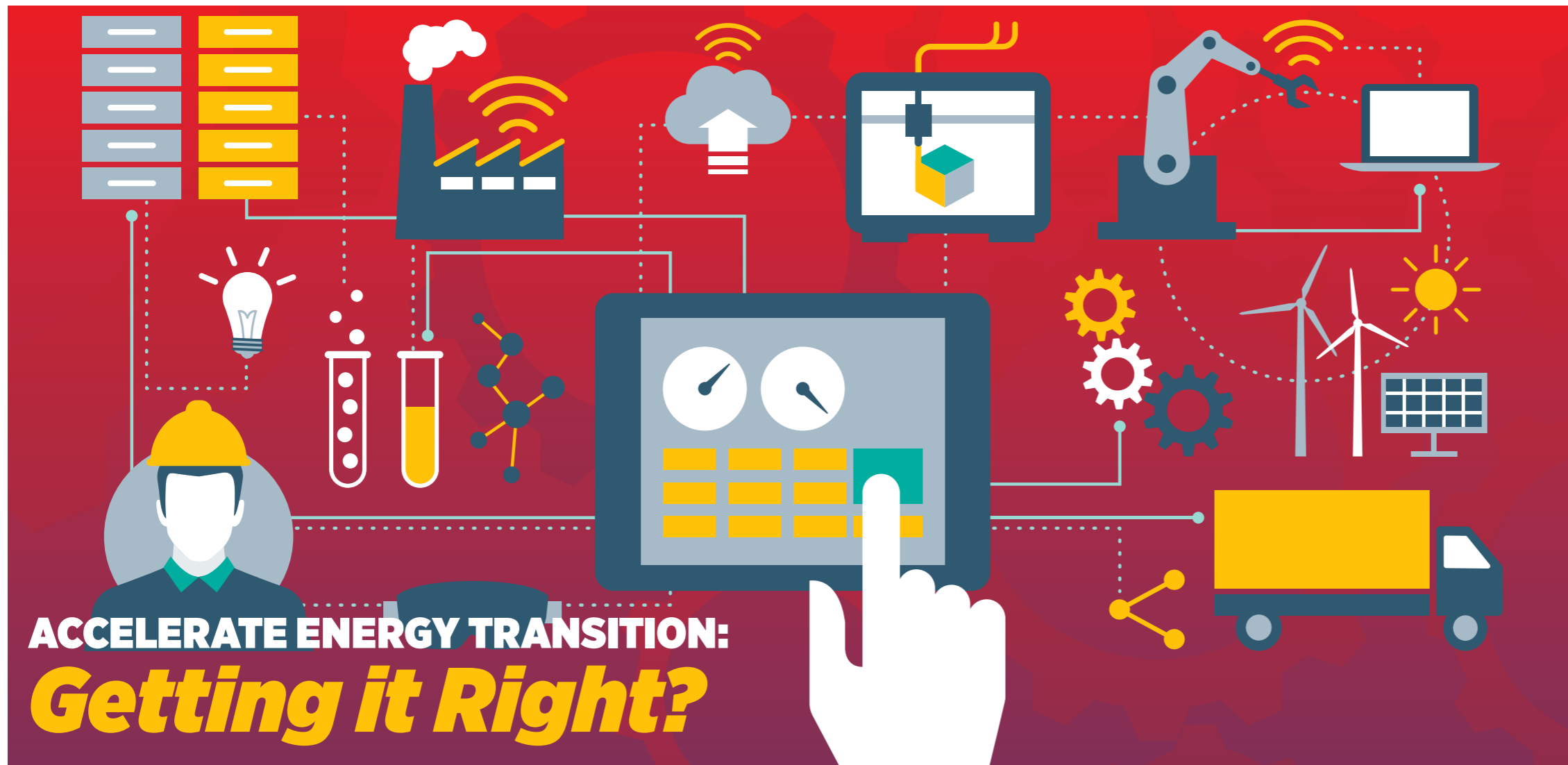


In June, the EU agreed a 32% EU renewable energy target for 2030, and Spain became the first EU state to create a Ministry for Ecological Transition from merging the former Ministries for Environment and for Energy. **Is it possible to get left behind in the great energy transition and miss out on its economic rewards, now estimated at \$1 trillion per year?**



There is a two-part solution to this energy transition challenge. First, reducing emissions stemming from energy supply by increasing the share of zero-carbon energy in the supply mix. And secondly, moderating growth in demand for energy by radically increasing energy productivity (the economic output generated from each unit of energy used). **Oman and Gulf countries should prioritize:**





ACCELERATE ENERGY TRANSITION: *Getting it Right?*

BY RAOUL RESTUCCI

Managing Director, Petroleum Development Oman (PDO)

THE FIRST RULE OF THRIVING IN THE GREAT ENERGY transition? Believe that positive disruption is only as brilliant as the minds that drive it. The thought leaders of tomorrow in Oman and beyond will be guardians of a new energy order, where fossil fuels and renewables are equally valuable sides of the same coin.

Water quality technicians working on oilfields, renewable-powered enhanced oil recovery (EOR), low-carbon engineers, green builders and wave and wind energy producers are the tip of a very long list of new careers that will be pivotal in academia, industry, government and society over the next decade. The trick is staying ahead of the curve so that these four pillars of Omani governance can actively pen a narrative of innovation and sustainability, rather than playing catch up.

Luckily, potential abounds. The International Labour Organization (ILO) estimates that Oman's unemployment rate was 17% in 2017. Every undeveloped talent equates into millions of undiscovered Omani Rial of potential; be they critical thinkers, innovative communicators, budding minds in science, technology, engineering and mathematics (STEM) and many more areas.

Momentum for significant change has finally gained speed after

nearly half a century of back-and-forth conversations worldwide between environmentalists, governments and financiers. People want – and need – change. Nearly all (82%) of respondents to the Green Energy Barometer Survey last year said it is important to create a world fully powered by renewable energy, regardless of age, education level or political ideology. And 73% of respondents to the survey, which encompassed 26,000 people across 13 countries, said building and producing more green energy will boost economic growth. In clean energy alone – just half of the new energy coin – investments reached \$333.5 billion in 2017, up 3% from a revised \$324.6 billion in 2016, according to Bloomberg New Energy Finance (BNEF).

Those doubting the environmental and economic motivators of the great energy transition can consider the third 'e' – the emotional driver. Sentiment is changing from a technical debate into an emotional one amid unnerving headlines reporting on pollution in Mumbai, raging wildfires in the US and the unexpected searing temperatures in the Middle East. There is an undoubted escalation in societies' emotional momentum, which could lead to a negative public reaction (panic, concern over resource allocation) if the cornerstones of national governance are not proactive.

WALK THE WALK

Oman has clear, innovative plans that now need to be delivered. We often all talk about new regulatory initiatives and policies, which have certainly paid dividends. But we must all do more to drive enforcement and make policies increasingly sophisticated. Building standards for schools have been enhanced, yet new schools are being built in accordance with old standards, for example. Poor alignment means innovative plans detailed on paper do not always translate into on-the-ground progress.

Subsidizing water and electricity next year for Oman could cost the government OR700 million, close to \$2 billion. Oman could funnel a relatively small part of that subsidy funding in order to have a significant benefit on its social services, such as talent

Black gold still shines

The energy transition does not mean discounting the value of fossil fuels; this side of the coin is just as necessary as renewables. We are aiming to sustainably increase crude output capacity by 13% to 680,000 b/d over the next three to four years as part of a \$20 billion spend.

enhancement and energy security. Reform comes with a temporary cost. Owing to the hike in electricity tariffs and VAT, the World Bank expects inflation to inch up to 3% in 2019 before moderating in 2020 as cost-push pressures from subsidy reform dissipate. Still, this is in the context of the Sultanate's steady growth up to 2020. GDP will likely increase by 2.3% in 2018, 2.5% in 2019 and by 2.9% by 2020; reassuring amid sub-\$60/bl oil prices.

How PDO and other energy stakeholders in Oman – industry, government and academia – position ourselves is pivotal to ensuring buy-in from the entire community. This extends to our responsibility to improve energy efficiency and renewables to supporting education and more sustainable consumption habits. Some stakeholders will be more focused on meeting Oman's obligations to the Paris Agreement, others will zoom in on the cost implications, others on the socio-economic impact and some will take more of a holistic view. Whatever your approach, united efforts are critical to make sure we make sustainable progress. After all, the red flags for the pressure points for us all in the Middle East are clear. BP Outlook expects the Middle East's energy consumption to rise by 54% by 2040, while Germany's Max Planck Institute for Chemistry and the Cyprus Institute in Nicosia warned that high temperatures could make some areas uninhabitable from mid-century onwards in the Middle East and North Africa (MENA). Plus, the United Nations expects Oman's population will rise by 26% to 5 million people, the UAE's by 39% to 13.1 million, Saudi Arabia's by 37% to 45 million by 2050.

DEEPER POCKETS PAY

The economics currently work – but they must work harder, they must sweat. Policies that encourage more funding for novel research and development (R&D), re-financing fossil fuel and renewable energy projects, more independent power producers (IPP), unbundling the current centralized framework of power generation and improving the pool of talent are pertinent to accelerating Oman's progress. Muscat must also keep pace with other countries in order to evolve into a knowledge-based economy in what is a fast-moving world of increasingly ambitious low-carbon energy policies. For example, the European Union (EU) recently agreed a 32% renewable energy target for 2030 and Spain became the first EU country to create a ministry for ecological transition (merging the former ministries of environment and energy).

Meaningful change takes time. Take our project with GlassPoint as an example. Miraah, meaning 'mirror' in Arabic, will use concentrated sunlight to generate 6,000 tonnes of solar steam each day. The steam will feed directly to PDO's existing thermal EOR operations, providing a substantial portion of the steam required at the Amal oilfield in southern Oman. Miraah will reduce carbon dioxide (CO₂) emissions by more than 300,000 tonnes each year, which is the equivalent of taking 63,000 cars off the road. This is a ground-breaking innovation, where phase one costs were more than the natural opportunity we could have had with gas, but where Phase two is in money i.e. the economics are more favourable, setting the enabling platform for phase three. Literally, patience pays. Ultimately though, the value of the project far exceeds the numbers. The project illustrates what can be achieved and how much further we can all push our expectations to guarantee an affordable, sustainable and efficient energy ecosystem. It is a marathon rather than a sprint. So pace yourselves, but don't lose your stride. □



Oil-Centric Economies: Be Agile

BY ALI AL SAFFAR

Middle East & North Africa Program Manager, International Energy Agency (IEA)

T HERE IS A MAJOR GAP IN EXPECTATIONS; A 35 million barrels a day (b/d) gap to be precise. Oil demand will hit 105 million b/d by 2040 unless significant efforts are made in key end-use sectors to limit consumption. A Paris-compliant scenario would see this being capped at around 70 million b/d. Smart, affordable and sustainable solutions can fix this huge discrepancy and ensure energy security – but the clock is ticking.

Renewables may be a nascent industry, one that is growing in importance, but it would be premature to write the obituary for the fossil fuel industry, or to assume that it is fading in significance. Fossil fuels are likely to make up the bulk of energy consumption up to the middle of this century. If they are used efficiently, the revenues from fossil fuels could be critical in stimulating other parts of the economy and financing the macroeconomic reforms that countries are starting to implement as per the energy transition.

In short: revenues from oil and gas still matter and without them, if investments in upstream assets don't continue, taking into account natural declines in producing fields, the world will be 45m b/d short on oil supply by 2040 – a gap that cannot be filled by renewables.

The current development model that relies on recycling oil and gas revenues into jobs is not sustainable in the long-run. While labor productivity across the MENA region varies, economies without large hydrocarbon resources like Tunisia, Egypt and Morocco have generally fared better than countries with major hydrocarbon resources, such as Iraq and Saudi Arabia. This is primarily because the public sector workforce has been a huge and inefficient drain on national coffers. Without a change to the employment patterns going forward, the public sector wage bill in Iraq is expected to climb to more than \$70 billion by 2030 – 40% of net oil income, for example.

Encouraging diversification and efficiencies is key. This encompasses investing more in extracting incremental value from refined products, freeing up gas resources and stimulate local economies and small and medium-sized enterprises (SMEs). The same applies to boosting investments in renewables for power generation. Today, we have 1GW of solar capacity across the Middle East and North Africa (MENA) and 90GW of power via oil generation. Clearly, there's opportunity to refine this process and use renewables to improve the efficient – and lower-carbon – use of fossil fuels.

ON THE DEMAND SIDE, the removal or retargeting of energy subsidies to encourage consumers to adopt energy efficient behaviors would limit wastage in fossil fuel generation while incentivizing more renewable projects. Strengthening the 'middle ground' between old and new i.e. fossil fuels and renewables, can be encouraged with more enhanced oil recovery (EOR) and carbon capture and storage (CCS) projects. Oman's Miraah project is an excellent example; solar power generates steam that supports EOR efforts, therefore minimizing water and gas usage. Projects that tick boxes in both 'camps' – fossil fuels and renewables – are highly valuable, especially in this transitional phase.

Every month, the outlook shifts. It's difficult to accurately measure the pace of technology advancements, but we do know that it is growing exponentially. Solar PV prices have halved in five years and are even beginning to compete in power projects against gas in certain parts of the world, such as Mexico. Let's not forget shale; nonexistent a decade ago and now a huge disruptor. The only thing anyone truly knows is that uncertainty is the only certainty. Oil producers adopt the capabilities of chameleons; agility to adapt quickly and without fuss to a rapidly changing environment. □



Think Big, Think Smart

BY DR. STEVEN GRIFFITHS

Senior Vice President, Research & Development, Khalifa University, UAE

P **IN DOWN AN AMBITIOUS VISION AND THEN WORK** backwards to figure out how to make it a reality: this is Oman's best shot at thriving in the energy transition. But there's a catch. It takes years of hard, complex and innovative work on a national and cross-border scale to transform this seemingly simple equation on paper into an affordable and sustainable reality.

Rethinking policies, financing methods, leveraging technologies and the 4th Industrial Revolution, markedly upgrading talent pools, building more alliances at home and abroad and many other points are on the sultanate's 'to do' list as it diversifies its energy basket. Can Oman achieve this tall order and keep pace with the global energy transition? Absolutely. For one, the sultanate is hardly short of vision, ranking 69th out of 126 countries in the 2018 Global Innovation Index, which is very good improvement from the country's ranking of 77th in 2017.

But Oman and its Gulf neighbors must appreciate the ticking clock. The speed of change worldwide is so fast that every month without notable progress could translate into missed opportunities worth millions of Omani rials. Hedging against this risk with smart and innovative policies is key to preserving Oman's bullish outlook. The sultanate's GDP is expected to rise by 5% this year, according to the International Monetary Fund (IMF) – the highest growth rate in the GCC.

Oman can zoom its focus in on the innovations that are expected to have the most impact over the next five years. According to 'The Future of Sustainability' report released by Masdar in partnership with The National newspaper in January this year, carbon capture, energy storage, 3D printing, artificial intelligence (AI), and data analytics are all positive enablers to fast-track the global sustainability transition. Early movers can reap financial

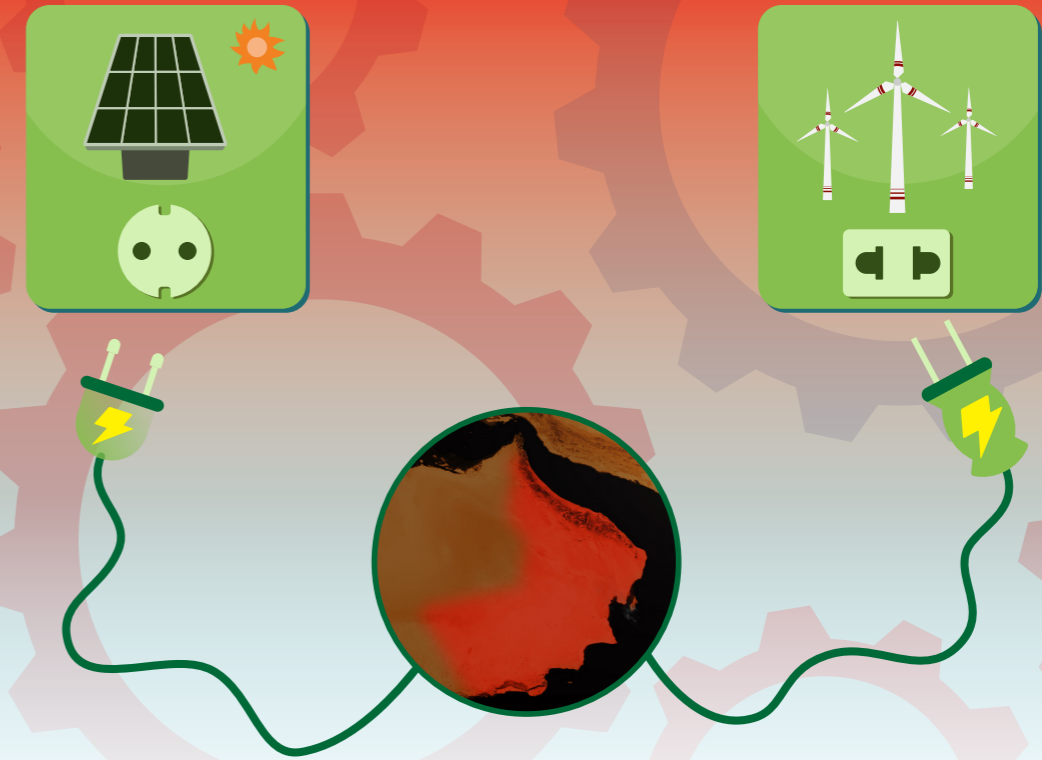
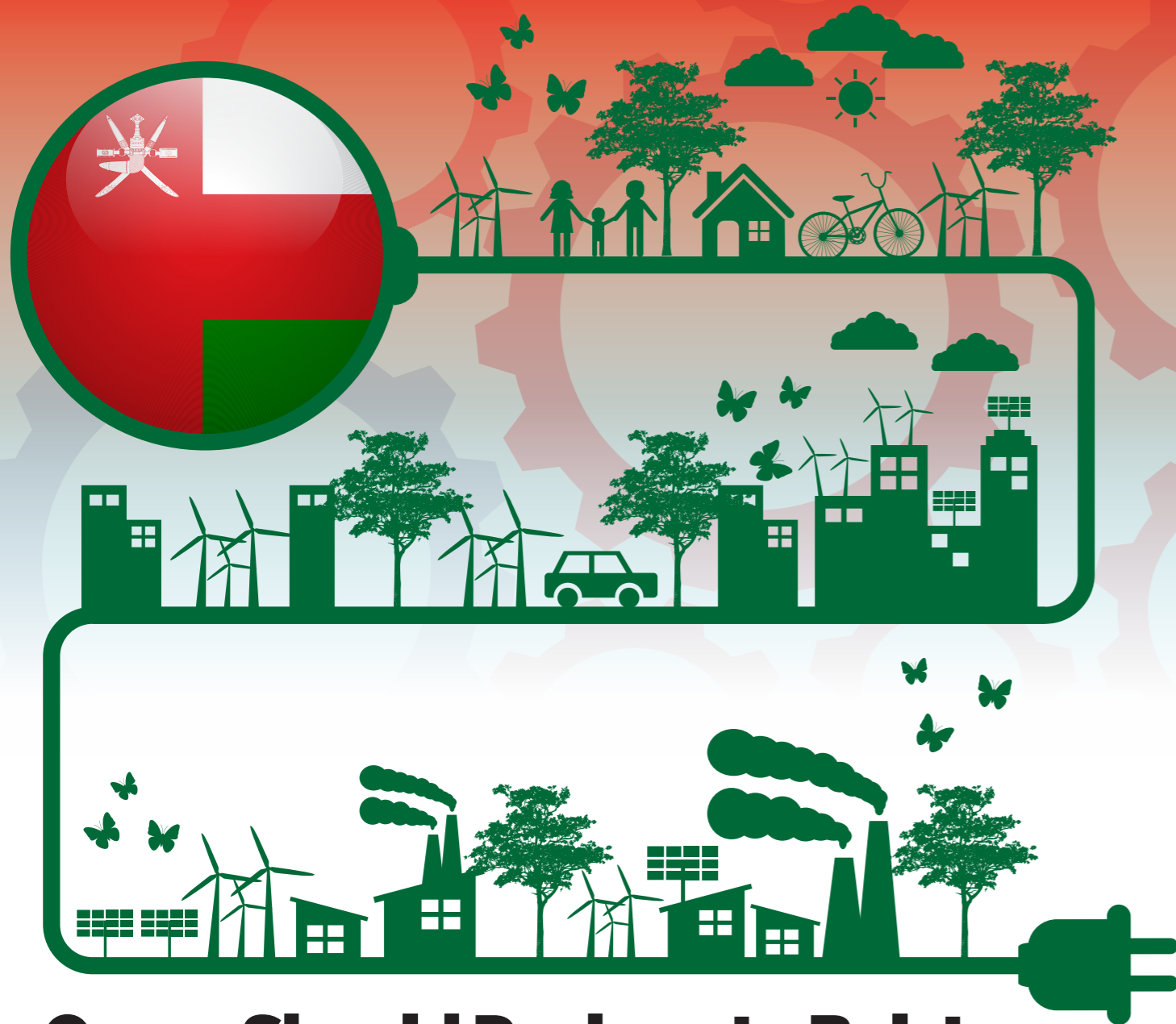
rewards. Savvy use of the digital transformation in the oil and gas industry alone could unlock a staggering \$1.6 trillion of value for the industry, its customers and wider society between 2016-2025, detailed the World Economic Forum (WEF).

EFFICIENCY COUNTS

Why spend time and resources reinventing the wheel? Learn from the success and failures of your neighbors to bolster efficiency and save resources. Industry, cross-sector and cross-border transparency and collaboration must improve. For example, Masdar is the project developer and implementation lead on the 50 MW Dhofar Wind Farm in the south of the sultanate. The first of the 13 turbines was installed in December last year, with full operations expected in the third quarter of this year. The project will supply clean energy to 16,000 homes and marks a major milestone in the construction of the GCC region's first commercial-scale wind farm project. How can Oman use this collaborative template for more similar projects?

And in the spirit of improving reliability and transparency, Masdar Institute at the Khalifa University is working on maximizing the utilization of intermittent renewable energy resources at its renewable energy resource assessment and mapping assessment center. The center's software systems leverage advanced machine learning approaches to provide analysis of energy supply and cost in a local context, factoring in the frequency and severity of dust and humidity in the Arab Gulf, to give as much actionable insight as possible.

Weaving long-term goals with the strategic tools to spur immediate progress – notably technologies, talent, alliances – is pivotal to strengthening Oman's diversified energy basket. Without planning, a vision will remain a faraway dream. □



Oman Should Push on to Bolster Financial Architecture for Renewable Power & Electricity Spot Trading

BY YOUSEF AL ZUHAIR

Director, ACWA Power (Saudi Arabia)

OMAN HAS MADE MUCH PROGRESS ON REGULATORY reform of the power sector and on putting in market structures, which leaves them readier than other GCC states for full privatization and segregation of distribution and generation.

The plan is to fully privatize generation, distribution and transition so that within 10 to 20 years it becomes a fully open spot market for trading power. There is potential that renewable

projects could benefit from power trading but that would require government involvement together with the developer to garner the potential upside.

Oman was the first Gulf country to implement the Independent Power Producer (IPP) framework, and it's one of the few which has defied the odds and been able to execute these projects without sovereign guarantees because lenders trust the system.

We expect the rest of the GCC to follow suit and continue to expand the use of project finance to fund future power generation projects. Although these countries may be wealthier than Oman and rated higher by international credit rating agencies, they have had their own challenges in implementing IPP projects that need to be overcome to replicate fully Oman's success so far, on a wider scale.

Another investment obstacle for renewables is that as the cost of PV falls and gets more competitive, profit margins drop, so equity investors could lose interest in the lower returns. This becomes even more likely when alternatives like sovereign bond issues with high investment returns of 8%, are offered by the same countries trying to attract funds into their renewables sector.

It is important to align the deal structure with government regulatory requirements however it should not be dependent on public investment.

It is standard for there to be a direct agreement between the grid entities and the developer, but there is no responsibility on the Omani government for financing. Ever since Oman changed its sector law in 2004, everything has been externally funded by the private sector and that has relieved the government from otherwise having to invest about \$10 billion.

The plan moving forward now for Oman is to fully privatize generation and distribution, and it will be necessary to get the financing structures right to achieve that. It can be difficult to accommodate different Export Credit Agencies (ECA) on the same deal --the Duqm refinery project that recently closed financing for example, was severely delayed because of trying to accommodate all its ECAs before bringing on the commercial banks.

The good thing about a competitive tender is that the market decides. There is a higher cost of finance, tax burden and cost of construction for renewables projects here and they do have to compete against hydrocarbon projects, which typically have a

higher return. The utility industry by contrast is generally lower and renewables even more so.

But countries can create other incentives to sweeten the investment deal such as granting industrial zones a 'holiday period' on pay, not charging rent on land or removing taxes on imports of solar PV equipment as Jordan has done - these are all very simple things governments can do when tendering a project and that are now common practice.

In Oman for example, it is more financially attractive to have local partners because they don't have to pay withholding tax on their dividends. But, on that point, Oman needs to better align the disparity in withholding tax rates on renewable projects for different countries-- at the moment, it imposes none on the UK, 5% on China and 10% on the GCC.

And when it comes to extracting the best value from local industry, as an example, 50% of the cost of solar PV comes from the manufacture of panels, so it doesn't make sense for Oman to compete with a country like China, which produces over 90% of all solar panels worldwide. It would be more logical to focus on other parts that can be manufactured locally but which do not face fierce pricing competitiveness.

In Oman, there is a requirement that after you finish construction, within one year you have to IPO 40% of the project. So once the construction is completed and that risk is gone, if you can refinance the project, you can improve your profit margin and viability of the project.

The other scenario which sometimes encourages refinancing is if the economics of the country have improved during the project construction period. Developers can also opt to approach the existing pool of lenders and renegotiate. In Europe, 'green' bonds have attracted quite a lot of hype but not so far in this region. Here, we see more examples of institutions doing renewable projects, like the EBRD in Jordan and Lebanon and the IFC (World Bank) taking a 5% shareholding in ACWA Power because they like our renewables focus. □



Local Supply Chain: Make it Count?

BY CHRIS BREEZE

Shell Country Chairman and General Manager, Shell Development Oman LLC

MANY HANDS MAKE LIGHT WORK. A VITAL ETHOS TO thrive in the great energy transition, as fossil fuels and renewables emerge as two sides of the same coin. Worldwide, local supply chains are often the unsung champions of affordable and sustainable growth. Muscat must keep turning up the volume.

Local expertise is an engine for growth; one that can tick over or one that can roar. The latter requires the celebration and increase of local entrepreneurs and small and medium-sized enterprises (SMEs). Team work lies at the heart of success, as best said by His Majesty Sultan Qaboos bin Said on the day of his accession on 23 July 1970: "My People, I will proceed as quickly as possible to transform your life into a prosperous one with a bright future. Every one of you must play your part towards this goal." This still rings true, nearly half a century later.

Oman also needs to keep pace with international progress. In the wider GCC region, SMEs are forecast to grow by 156% in the next five years, with the sector set to be worth \$920 billion, according to MENA Research Partners (MRP) last year. The SME sector in the Gulf will employ 22 million people by the early 2020s – gold dust for a region with high unemployment rates and endless potential for ground breaking ideas.

Accordingly, Shell Oman has been a key participant of in-country value (ICV) for nearly six decades through its joint ventures. The stronger the Sultanate's talent pool, the more ground breaking the results. Omanis account for more than 85%

of the in-country workforce in Shell companies in Oman and in 2018 Shell provided more than 66 training, further education and on-the-job development opportunities for our employees and the next generation of Omani professionals. We are far from alone; many in industry make a meaningful effort. In 2018, Petroleum Development Oman (PDO) has fully Omanised its hoist fleet for the first time after agreeing contracts with five local companies worth more than US\$800 million. Another ICV highlight from PDO is its National Objectives programme, which seeks to create more than 50,000 employment opportunities for Omanis since its launch in 2011. Shell Oman Marketing Company has provided more than 120 opportunities for local companies to be retailers and operators across its strategically located service station network in Oman.

PRIDE MATTERS

Building national pride in the local value chain is the first step. A more holistic celebratory approach can unlock novel ideas across the socio-economic profile. For example, energy companies in Singapore champion the CEO as much as the individuals at the bottom of the hierarchy so that all the 'slices in the corporate pie' are equally valued. In a chicken-and-egg scenario, this encourages government, larger corporations and financial institutions to help the local value chain overcome the oft-discussed hurdles. Supportive policies that accelerate progress, sharing of research and development, technologies and the accessibility of funds are at the top of challenges that more established parts of the energy

ecosystem can help the local value chain scale. This collaborative dynamic in Oman's oil and gas industry is constantly improving; these lessons must also migrate to the greener market. The two sides of the coin must be equally robust.

MORE CHOICE?

The Oman Power and Water Procurement Company (OPWP) has been very successful at tendering central generation and providing the bulk of supply for the sultanate. Historically, the Government's greater control has worked well for two reasons. Firstly, to ensure an affordable balance between demand and consumption, with a 6.5% surplus acting as a buffer for forecasted peak demand. In the last fifteen years, generation has only dipped below consumption once. Subsidies are the second reason; the government has had to keep a firm eye on spending to sustain this privilege.

But there's a catch. The current regulatory framework in Oman means one can only sell electricity to OPWP, and only if it is generated by a project that has been tendered by OPWP. Consequently, all immediate solar generation, especially larger projects, will likely be awarded to the lowest tariff for the tender. This risks diluting the sustainable ICV impact of a project, including the inclusion of the local supply chain. What can be done to broaden the profile of participants in this tender process?

As energy demand grows and the country's subsidy program is reshaped, an architecture with the option for distributed generation will help ease the pressure on government and sustain efficiency. Plus, surely stimulating entrepreneurialism, innovation and competition among SMEs won't hurt?

Occasionally, the make-up of an energy project will be too complex to 'unbundle' to give more opportunities to the local supply chain. In this case, an SME could 'shadow' the lead company or companies as part of a training program. This would strengthen the ICV of the local supply chain, reinforce SMEs' ability to bid on the next project, support the corporate and social responsibility (CSR) goals for the lead company and generally improve knowledge-sharing in Oman's energy ecosystem. In short, it's a win-win.

Inevitably, stumbling blocks will emerge. Some engineering, procurement and construction (EPC) contracts for SMEs act as

a cover to open a floodgate for expatriate workers, which dilutes the true measure of ICV and Omanization, for example. But this challenge is hardly insurmountable. Eagle-eyed stakeholders across the ecosystem – industry, Government, academia, financial institutions – with the common goal of supporting the local value chain can halt this activity.

GET ORGANIZED

How the local value chain is categorized matters; in terms of skill, size, capabilities, geographies and so on. Proper data management will ensure that the right local expertise can bid for the right projects. Steps in this direction are already being made, as illustrated by the Omani Authority for Partnership for Development, to manage the Partnership for Development program. The objective is economic diversification and support of strategic sectors through technology, leading to a knowledge-based economy ideally through joint ventures. Note the last two words: joint ventures. But this is just one step; many more are needed.

Aspiring for a knowledge-based economy as per the National Vision is no small feat. The more we know about the skills we have in Oman now, the more accurately we can nurture the skills needed for the 2020s and beyond. The sands are forever shifting. For example, a quarter of a century ago, chemical engineering was largely focused on raw materials and commodities. Today, it is primarily focused on specialty chemicals. Within this same time period, renewable energy has transformed from a bespoke utilization by a few into a mainstream method adopted by governments and multinationals.

More informational advertising campaigns that highlight the value of the local supply chain in this energy transition are essential to attract the brightest minds; today's best students are tomorrow's energy pioneers who will make the engines of growth roar. All hands are needed at the pumps. □

ENERGY TRANSITION

Keeping Pace with Change?

BY DR. ABDULLAH AL ABRI

ICV Technical Lead, External Affairs & Value Creation Directorate, Petroleum Development Oman (PDO)

WHAT HAPPENS IN THE YEAR 2169? THE GLOBAL oil supply will run out: 150 years to go at today's demand according to IEA. So, why should the energy transition be on our agendas now? In short, because meeting rising energy demand as well as the targets of the Paris Agreement are not possible with the world's current reliance on fossil fuels. A new and diversified energy strategy to meet the demands of a swelling population, nearing 10 billion by 2050, is the only smart solution.

PDO started its transformation from an oil and gas player into a fully-fledged energy company with a greater focus on improved efficiencies and decarbonization. The primary new 'tools' available in the energy transition in Oman and beyond include renewables, carbon capture and storage (CCS) technology and possibly nuclear power. Plus, the traditional fossil fuel market is getting a lower-carbon makeover.

UNTAPPED GOLD DUST

Worldwide, the cost of renewables has fallen by 40% in the past three years there is approximately 1,000GW of solar and wind capacity, with this rising by 5% every year. And global investments in renewables totaled \$250 billion in 2016. What does this mean for Oman? In short: boundless opportunities.

Oman's solar radiation per square meter is similar to that in India, Spain and the US, i.e. very promising, as well as optimum wind conditions at night. One area of great potential is the ability to use solar to create steam, heat and hydrogen. This is best demonstrated by Oman's Miraah project, which will generate 6,000 tons of steam per day for enhanced oil recovery (EOR) work at the Amal field. Such technology is gaining momentum worldwide; Shell has invested in a large facility in Germany to produce hydrogen, for example. Next on the agenda is innovative storage strategies for renewables, as is developing the local supply chain, streamlining governance and more investment incentives to help de-risk the local business environment. Setting clear and ambitious targets, guided by realistic scientific and financial realities, is also high on the agenda. Oman can look to success stories in Morocco and South Africa, for example, with both countries setting clear targets, leveraging local supply chains and establishing dedicated entities.

RETHINKING OLD HABITS

Managing consumption is critical in energy efficiency, including subsidies. We have seen successful reduction models implemented in Indonesia and Mexico, where subsidies have gone towards supporting the most vulnerable in society. Good timing of such measures is essential. It is cheaper to lower or remove subsidies amid lower oil prices, but this means hammering public sector finances as social discontent is potentially at its highest.

Continued subsidized fossil fuels and electricity will weaken incentives to invest in and deploy renewable technologies and projects in Oman. Yes, the sultanate has enough gas to cover the duration of current contracts with power generators. But we won't have that luxury as energy demand rises in the medium to long-term. Breaking the economic cycle associated with subsidized energy is one of the most important goals we need to achieve in Oman and the wider Gulf.

Accordingly, PDO launched a campaign on energy conservation to both establish a baseline for consumption in internal operations and to promote efficiency externally. We've collaborated with the Ministry of Education to start infusing a lower-carbon culture in Oman. On the international stage, we have collaborated with the European Commission at an event that focused on energy efficiency. Creating more strategic partnerships and sharing our expertise is crucial.

BRIGHT MINDS

The importance of enhancing talent cannot be over emphasized; our minds are the roots of positive disruption. PDO has a national objectives program to offer school leavers and graduates apprenticeships and short training courses to reinforce the sultanate's talent pool. Oman currently has

enough basic expertise for installing solar panels, but talent for emerging areas of expertise – energy storage, the breakdown of heat, steam and hydrogen into energy and so on – is wanting. We also recently launched the EJAD platform, which is a digital marketplace where academia and industry can collaborate on pressing R&D issues. These range from the impact of dust and moisture on solar panels to storage solutions for solar and wind power.

Shifting sands raise a lot of questions, fuel a lot of furrowed brows. The unknown is often unnerving, but exploring new territory lies at the core of sustaining energy security. The world is changing and we must change with it, if not spearheading it. The transition is an opportunity not a threat – one Oman cannot afford to miss. □



Broaden Your Energy Finance Horizons

BY KARIM BADR

Project Finance Leader, Gas Power Systems, GE Power MENA

TENTATIVE SIGHS OF RELIEF ARE SWEEPING ACROSS energy boardrooms in Oman as stakeholders voice what many hoped: the coffer remains robust despite oil prices around \$60/bl. But this does not translate into an easy win for those eyeing funds. First, more beads of intellectual sweat are needed to fix a conundrum: why is investment for the united goal of energy and environmental security wanting, yet cash is available?

The short answer is poor allocation of funds, while the solution can be crudely simplified into three parts. Stakeholders must explore a wider array of funding options; communicate more clearly, especially with projects that break away from the traditional fossil-fuel molds; and leverage local assets. These three 'streams' of effort must all flow into the same 'river' of progress to make a simple equation work: buoy financiers' confidence to loosen purse strings.

Oman must ensure investors' agendas reflect its relatively new and diversified energy goals amid the shifting sands of the energy transition, which sees the simultaneous and complementary growth of fossil fuels and renewables. This is pertinent amid the relentless ticking of the clock to affordably plug supply gaps amid rising energy demand. Rising electricity demand in Oman alone will require generation capacity to grow at an annual rate of 8.5% with a \$8 billion price tag in the medium-term, detailed Saudi Arabia-based Apicorp¹. For a treasury largely powered by petrodollars in this current climate, this sum has extra sting and is just a spoke in the energy demand wheel.

EXPLORE THE MENU

The good news is that positive sentiment – hard to achieve, easy to jeopardize – is strong in Oman. The local banking community's faith in the risk-reward ratio feeds into international confidence, making Muscat one of the region's most reliable lending spots.

Oman's increasingly wide array of energy generation routes – notably oil, gas, LNG, solar, wind – requires a broader range of funding. Export credit agencies (ECAs) are particularly helpful in providing reassurance to commercial lenders, meaning both they and the wider lending group can offer more competitive pricing. Plus, using development finance institutions (DFIs) and financial institutions (FI), such as The World Bank, helps to both garner investments while improving the use of best international practices in Oman. Both are key to attracting investors with deep pockets.

Oman, and the UAE, has led the charge in the Arab Gulf's adoption of independent power producers (IPPs) – a calling card that illustrates maturing financial acumen for international investors. And relatively stable liquidity in the sukuk market gives stakeholders a comfortable lending range of 5-10 years, which

is a good fit for smaller infrastructure projects, R&D and talent enhancement programs, for example.

To put extra shine on the outlook of Oman's energy finance, government regulations must be reinforced with stronger guarantees. This will make projects more bankable in a shorter time period – remember, the clock – in an ecosystem that often requires sovereign guarantees for utility funded projects, for instance.

LOCAL LENS

Financiers don't always need to be headline-grabbing names; smaller lenders with reputations of reliability are equally valuable. They also make a good match for supporting Oman's small and medium-sized enterprises (SMEs). As per the National Vision, local initiatives using local supply chains must be encouraged, as should more joint ventures and digital platforms for energy companies to safely share the non-sensitive fruits of their R&D labor, for example.

The World Bank² said the opportunities for SMEs in clean technology could reach a staggering \$1.6 trillion in developing countries alone. In the wider GCC region, SMEs are forecast to grow by 156% in the next five years, with the sector set to be worth \$920 billion, according to MENA Research Partners (MRP) last year. Oman, burdened by high unemployment rates, cannot afford to miss this opportunity. Still, the sultanate that is home to just 4.6 million people is doing something right; it jumped eight places in 2018 to be 69th out of 126 countries rated in the Global Innovation Index 2018. Such innovation increases prestige and attracts more investors, thus increasing local patent registration, digital fluency and the growth of grassroots intellectual property (IP).

Oman is not the only Arab Gulf country stood at the base of this cliff of challenges. BP's 2018 Outlook expects energy consumption in the Middle East to rise by 54% by 2040, primarily driven by swelling populations. This could contribute to Muscat's reputation as a thought leader in this industry, as lessons learned on how to master the new energy basket on Omani soil can be 'exported' to the wider Middle East, as per the National Vision to become a knowledge-based economy.

A smart and steady flow of finance will enable Oman's multifaceted energy industry to thrive, from its innovative management of maturing and challenging oil fields, impressive local talent utilization programs, deep-rooted international partnerships and many others. Stakeholders will be pleasantly surprised by the funding options as they expand their search for Rials. But don't forget: tick tock. □

References:

¹ APICORP Report - April 2018 - on the regional power sector

² World Bank Group Report, Q3 2014

RECOMMENDATIONS

IMPLEMENTING TANFEEDH ENERGY LAB OUTCOMES:

Tanfeedh Energy Labs have identified three pillars to pursue efficiency and transition:

- A. Electricity** – work towards achieving the country's target to meet 11% of power generation from renewables by 2023.
- B. Gas** – diversify energy sources to reduce 97% reliance on gas and allow for its allocation to other industrial sectors.
- C. Government Policy** – streamline energy strategy across the oil, gas and electricity sectors.

WHAT'S NEXT?

1. INTRODUCE SPEEDIER INTERIM APPROVALS

Quicker regulatory decision making needed to avoid abandonment of initiatives. There are currently over 200 companies in Oman in the electricity business with products and technology ready to go, but are often stalled waiting for approval. One cited example is delays in allocating land for solar projects. Tanfeedh has identified a number of 'quick wins' - projects that can be implemented today. Waiting for frameworks to be in place to be able to feed electricity back into the grid will take time so need to set up interim standards along the lines of the 'building code' model, to achieve quick progress.

2. DRIVE PUBLIC AWARENESS ON TRANSITION

Mindset on energy transition still needs to shift. The government should focus more on building general awareness of energy efficiency so that this is instinctively translated into measures taken within households and industry. Examples can vary from basic demonstration of how automating AC temperatures can save energy, to reaching into the education sector as early as primary and introducing the United Nation's 17 Sustainable Development Goals.

3. ADDRESS ELECTRICITY SUBSIDIES

Otherwise, consumption won't drop and a fully-fledged renewable energy sector can't develop. However, care must be taken to prepare the public on tariff changes for at least a few months ahead of actual implementation. Malaysia example cited – executed a two-year public campaign ahead of introducing VAT.

4. LOOSEN RESTRICTIVE CLAUSES ON TENDERS

Install less restrictive terms and conditions in tender processes – currently for example, companies have to have completed a minimum of two previous projects within the region to qualify – this drives valuable international investors away.

5. ADJUST PPA CONTRACT COMMITMENT

Shorten length of PPA contract – current 15-year structure restrictive – can lead to risk exposure of technology becoming obsolete during the contract period, with related costs.

6. BUILD IN-COUNTRY R&D

Grab the opportunity of inherent demand in Oman and build the economic supply chain. Lessen the reliance of importing technology from countries like China or from Europe and set incentives to attract R&D companies to come to Oman and take advantage of its unique environment of wind and solar resources.

7. STRIVE TO EXPORT TECHNOLOGY KNOWHOW

Become a regional leader in renewable energy technology and export it - existing example is the proven technology of conversion of heat to produce hydrogen.

8. LEARN FROM BEST PRACTICE

Renewables is a relatively new field to Oman. Seek to learn from other countries and garner advice on how to accelerate the process of implementation.

9. MAXIMISE OPPORTUNITY IN ROOFTOP SOLAR

Install Rooftop Solar for both individual energy usage and for households to sell on any surplus to distribution companies. This in turn encourages investment into SMEs for installation and servicing and boosts employment. For this to succeed, government needs to set very clear frameworks around the country's distribution network and occupational standards for the manpower required.

GULF BEST PRACTICE LEARNING FROM THE NEIGHBORS?



- Dr. Steve Griffiths, Senior Vice President, Research and Development
Khalifa University of Science & Technology
- Yousef Al Zuhair, Director, ACWA Power (Saudi Arabia)

Moderator: Is any county in the region leading on the implementation of energy transition? Saudi Arabia plans to invest \$100 billion to develop 41 GW of solar electricity by 2032 for example and others have announced ambitious projects. What should we be using as our criteria to make this judgement - the dollar amount of investment made or the nature of investment such as smart meters improving efficiencies in the home? Steve - the UAE is often dubbed as the leader in the region. Would you agree?

Dr. Steve Griffiths: Today, transition is often viewed as the power sector and that's probably why the UAE is seen as the leader but let's not forget other industries and transportation also play a huge part. There is no doubt that the UAE has made great progress on renewables of course. As recently as 2015, nobody would have thought that solar energy costs would achieve what they have done, and Dubai's solar park, now at phase four investing in storage technology, is once again setting robust records on prices. Saudi Arabia has also made excellent progress on solar pricing.

Moderator: Yousef - ACWA Power is seen as a major player in solar power generation in the region - what's your outlook for Saudi Arabia?

Yousef Al Zuhair: I do think the UAE ranking is well deserved. The achievements of the Dubai solar park have to an extent created a domino effect, opening the floodgates for the region to make progress. Outside of renewables, Abu Dhabi is making strides in transitioning away from gas with nuclear energy capacity and separating power production from desalination by using reverse osmosis technology plants. Keeping desalination independent from thermal generation is critical.

Moderator: How does Saudi Arabia compare in its commitment?

Yousef Al Zuhair: Saudi Arabia set its renewables goals a long time back but there has been a lack of real movement. We do now see two large scale wind projects finally on the agenda but big ambitions need a lot of work. Saudi is one of those countries that has a huge disparity between peak and baseload so it could benefit tremendously from renewable energy resources. But the UAE leads in terms of real effect on the ground and also on technology. Oman by contrast has made more progress on the regulatory front and on putting in market structures; they are more ready than the UAE for full privatization and segregating distribution and generation.

Moderator: What is the most important indicator to measure a country's progress on energy transition? The removal of fuel subsidies, investment in renewable projects, job creation and skills competence to enable building a local supply chain? Or is it achieving the buy-in of the public or of industry for example?

Dr. Steve Griffiths: All of these are important but what is essential for a country is to create a framework in which it can move ahead to a certain degree of sustainability and create the economic opportunity for deployment of renewables. It is somewhat challenging but most of the countries in the Gulf are moving in that direction.

Yousef Al Zuhair: Let's also remember that investing in renewables today actually makes economic sense as it is a real substitute to reducing energy imports so it's not just a driver to reduce greenhouse gasses and impact climate change.

Moderator: What is in the magic sauce of ACWA or your peer group that you've been able to bring down the price of solar substantially and is it only regionally relevant or could it be applied beyond?

Yousef Al Zuhair: ACWA is primarily looking into developing countries such as Morocco, South Africa, Turkey and Vietnam because the opportunity there at the moment is better than in mature and developed markets. Our management really believe in achieving the lowest cost possible for every project to maximize returns but they also believe water and power should be a commodity that we attempt to make as affordable as possible for all.

Moderator: How important is it that Oman and other GCC countries go beyond their current focus on the power sector and embrace renewable energy and efficiency initiatives more fully, for example on the water desalination, industrial and transportation sectors. Why is this not happening?

Dr. Steve Griffiths: The electricity sector only accounts for 20% of the power sector so the opportunity for decarbonization and a stable transition beyond electricity is 80% so yes, it is enormously important to move towards other areas such as hydrogen fuel cells and battery power for electric vehicles. Thermal energy is another fantastic opportunity that can come naturally from solar energy. In the Gulf in particular, integration of power and water generation are very tightly coupled so you have to keep your planning focused on the larger picture.

Yousef Al Zuhair: In Saudi, a lot more could be gained by focusing on efficiencies and lowering costs for example in household A/C units and district cooling so we should not just look at renewables. Other industries also need to be encouraged to start coming in - the Glasspoint steam generation Miraah project in Oman is a prime example.

Moderator: What's the most important next step for Gulf states to make to be able to achieve efficient and low carbon energy systems? Do they need to better define the real need for alternative energy sources and better identify the options? Do we need more studies on consumption per sector?

Dr. Steve Griffiths: Starting with reliable baseline data and having a vision on what is needed is critical for Gulf states. Does a country need to replace its gas resource to avoid expensive imports? Intersectoral strategies can be tricky to determine and map out - but you really have to think about your whole energy system and how to bring the power, industry, transportation and water sectors together. Ultimately, it's also about weighing current opportunity costs think what's next and taking a long term view of preparing for the future.

Moderator: Yousef - clearly Saudi Arabia and Oman didn't identify nuclear power as an alternative energy option but Abu Dhabi has. What fits into the thinking of the kingdom in terms of the bucket of identified options? Saudi has not yet even imported LNG for example.

Yousef Al Zuhair: Saudi Arabia has plenty of baseload for oil and gas fired plants. The need or primary issue is the disparity between the size of the plants just to meet the peak load. We have entire power plants offline effectively most of the year just to cater for summer peak demand. Bringing in nuclear as a base load would be a long-cycle investment - you would only see first generation ten years on from the time it's decided on. We need to think about what the energy market needs in the interim. In Europe for example, you can have 30% of your total grid as renewables; Saudi is nowhere near that. The need is there in the kingdom to identify alternative energy sources - the question today is to define how to address it.
*Edited transcript

TOP 5 RECOMMENDATIONS

- 1. COORDINATE POLICY ACROSS SECTORS**
GCC governments need comprehensive frameworks built on intersectoral strategies, to allow economic opportunities for deployment of renewables.
- 2. INCLUDE ALL INDUSTRIES IN EFFICIENCY DRIVES**
GCC energy efficiency initiatives need to focus beyond electricity and towards water desalination, other industry and transportation sectors. Opportunity for decarbonization outside the power sector globally is 80%.
- 3. DECOUPLE POWER AND WATER GENERATION**
Integration of power and water generation too tightly coupled in the GCC - governments should work towards segregating power for desalination and thermal generation.
- 4. CONSUMPTION CONTROL**
MENA countries need to progress faster in implementing renewables solutions (e.g. Saudi Arabia's critical need to meet the 800,000 b/d peak in oil demand during summer months). Demand side dynamics require more focus on efficiencies in households and district cooling.
- 5. ACCELERATE POWER DEREGULATION ACROSS THE GCC**
The GCC has made great strides in clean energy technologies - more progress needed now towards privatization and segregating generation and distribution.

ENERGY ECOSYSTEM

Strategies for a Successful Transition?

- Raoul Restucci, Managing Director, Petroleum Development Oman
- Brian Davis, Vice President Energy Solutions, Shell New Energies & Chairman, First Utility Group
- Ali Al Saffar, Middle East & North Africa Programme Manager, International Energy Agency
- Hamed Al Maghderi, Country Director –Oman, ENGIE

Moderator: Raoul – what would you identify as the strongest local accelerator to achieving successful energy transition in Oman?

Raoul Restucci: What we know is that the very high energy intensity and higher water utilization (both 5 times higher than OECD average) combined with high energy costs (with LNG regional imports as high as US\$ 17 in 2013) is not a sustainable situation.

The energy industry needs to position itself so that it ensures buy in from the community for driving efficiency, employment, local industry growth and renewables. Better awareness, commitment and economic and environmental alignment is required by government ministries – they need to work together with a common vision and road map.

Raising the urgency of advocacy is also fundamental, less so in the Middle East perhaps and more so in Europe. Some oil companies are still being judged and perceived as ‘tobacco’ companies and the likes of sovereign wealth funds and foundations no longer want to invest in some parts of these businesses. This can lead to stranded assets so we need to engage and ensure that the additional energy requirement that the world needs is secured but in a sustainable way.

We often talk about the need for new regulation. We already have good policies in place; it's now about executing them to drive change. There is so much opportunity out there already. Energy efficiency solutions are today commercial and available.

Moderator: Hamed – you were an active participant in the Tanfeedh process. As one of the largest power generators in the Middle East, what did you identify in terms of the challenges or obstructions to accelerating energy transition?

Hamed Al Maghderi: If we continue to use so much gas for our electric power, we will certainly have a shortage issue. Electricity is also still subsidized. We need to think about how we utilize the energy we have now efficiently because the outlook for power demand growth in the GCC is extremely heavy.

Transitioning to clean energy and availing of solar and wind resources is critical and it also releases any gas we have to be exported as alternative revenue.

As Raoul mentioned, we need to unify all departments under one umbrella to be more efficient in our decision making and that's the main objective of Tanfeedh.



Moderator: Brian – from a European point of view, what is the challenge of waiting for government to lead versus industry? Prior to the Paris climate agreement for example, Shell amongst others were signatories to a letter to try and convince governments to ratify. Should industry lead on its own here in Oman and not necessarily wait for various ministries to get their act together?

Brian Davis: In this region, we need to find a way to unblock the tremendous amount of private capital and innovation that businesses are providing for energy solutions. In Europe, the US and the rest of the world, as energy bills have risen, people are now realising the real costs of energy inefficiency. Once the end user sees the real cost of energy, not blurred with a subsidy, they will probably make more rational choices. Consumers need to be engaged and alert to their own consumption at home with

electricity or gas. That then creates a procurement function and opportunity for companies to sell energy efficiency services and solutions.

Moderator: And from the point of view of Shell, how do you see that happening in the context of the European and global model?

Brian Davis: Through partnership between private industry and the government and getting the mix correct between what makes sense for the country in terms of the regulatory framework. There will always be a need in every country to protect the vulnerable with various types of subsidies, while still getting the economic signals in and competition set up correctly, so the government needs to play that role and industry needs to simultaneously innovate and fight for the customer.

I believe Oman will hit its target to be 10% renewables in power by 2025 and may even go well beyond that. A lot can be achieved in six years; just look back at the last six and how the trajectory of costs has come down tremendously. Next up is energy storage and other digitals so there's a great opportunity to tackle energy efficiency in Oman and the region and for renewables to be very pervasive.

Moderator: Ali – the IEA have been advocating for decades for more oil supply. Where does it now sit in terms of advocating for energy transition and diversification of supply?

Ali Al Saffar: The IEA was created and designed to ensure oil supply but the energy sector has changed tremendously and so has the IEA family; we have added India, China, Brazil, South Africa for example. Our mandate now goes way beyond energy security and at the top is renewables and efficiency. We need to remember also that this extends beyond electricity – all parts of the energy sector need to change to bring us to the correct pathway to reach our Paris agreement goals. The power sector is challenged so the case for solar today is extremely compelling but so is the continued growth for oil supply. In our new policy scenario, we don't see peak oil demand till 2040 because of petrochemicals, aviation, and heavy transport - areas where it's more difficult to displace oil.

In a Paris compliant world, we will still need 70 million barrels of oil in 2040, much more than the natural decline, so we need investment in hydrocarbons and need to extract more value from them, such as petrochemicals, a big driver in this region. And renewables can play a complementary role. One example would be Saudi Arabia where in the summer months, crude consumption jumps an additional 800,000 barrels a day; you could meet that amount just by moving towards competitive solar.

Moderator: Does Oman have the right financial vehicles in place to encourage the needed investment towards more sustainable forms of energy?

Raoul Restucci: To attract investment, industry needs strong returns. A lot of work has been done to liberalize the market here and IPP programs are becoming more effective. Current propositions are in the money and I think we can achieve 11% renewables in the electricity sector by 2023.



If you look at the enormous amount of money spent on subsidizing water and electricity, in 2019 it's estimated to add up to 700 million Riyals - that's close to \$2 billion. If you spent a very small amount of that subsidy into smart thermostats, you could recover the money within the same year, never mind the impact over the longer term. There is already a lot in place today that is very economic, very robust - we just need to incentivize this change.

Moderator: Brian – what is your experience in other parts of the world vis-a-vis creating pathways for investments into this space?

Brian Davis: In Europe, renewables projects have become a bit like bonds because you had a very high credit worthy off-taker in the form of governments guaranteeing most of the revenue, to stimulate and get rooftop solar installed in the early days when it wasn't economic. That has now changed and we are starting to see that guarantee is no longer required as the renewable option is often cheaper than the alternative. We have 30% or 40% penetration in rooftop solar in countries like Germany and Queensland, Australia, but we don't have that in this country.

Moderator: Does Shell look at the transition story as an economic opportunity or a burden and how does that impact decision making?

Brian Davis: Shell is an energy company so it will continue to produce oil and gas. We see the big opportunity now in electricity because it is set to grow from 20% to 50% of energy consumption. The reality is that consumers and end users will increasingly have much more

choice as technology advances with more distributed generation and a move away from centrally dispatched systems.

Ali Al Saffar: If we look at energy investments going forward, about 70% of the total will be made by governments themselves or will be dependent on government policies. Globally, if you look at what we are allowed to emit in carbon dioxide that keeps us in Paris compliance, we're about forty tons away from that – that's one year of emissions i.e. the infrastructure and investment already committed to locks us in at our 2 degrees centigrade limit. So, change needs to happen quickly and we are going to have to look beyond renewables. An example is the use of CCUS technology in this region to bring down the carbon footprint of what is already committed. The Al Riyadhah project between Emirates Steel and Adnoc captures CO2 from the steel plant and reinjects it into the ground to enhance oil recovery, while also freeing up natural gas for utilization for other sectors. At the end of the day, the solution is circular - government policy, technology and renewables need to work hand in hand, and quickly. □

**Edited transcript*

TOP 5 RECOMMENDATIONS

1. PUBLIC-PRIVATE COORDINATION

Key to energy efficiency success is that government policy and the private sector work hand in hand. GCC governments should focus on setting regulatory frameworks for energy efficiency (subsidies, competition policy) while industry gets on with innovating and providing smart solutions to the customer.

2. SUBSIDIES STYMIE EFFICIENCIES

Removing/lowering subsidies on water and electricity is essential to trigger end users to make rational choices and adopt energy efficient solutions (such as home smart meters) that private businesses are offering. Simultaneously also encourages SME and jobs growth in Oman.

3. RESOLVE OMAN GAS SHORTAGE

Oman needs to adopt renewables and other energy efficiency and carbon emission solutions, such as CCUS & EOR, more urgently, to prevent gas shortage and free up gas for export.

4. HYDROCARBON INVESTMENT REMAINS CRITICAL

Continued investment in hydrocarbons is critical in parallel with renewables growth to meet global demand for oil in 2040 (70 million b/d according to IEA) – driven by oil-fueled petrochemicals, aviation and heavy transport.

5. DEREGULATE & INTRODUCE SPOT MARKET

As Europe has done in the past 10-20 years to its monopoly-style utility sectors, Oman should move to deregulate and privatise parts of its power infrastructure and introduce a spot market to allow for competition along all elements of the value chain. This would open up end user choice which is critical for enabling energy transition, particularly when it comes to driving consumer behavior and introducing new technology.



TRANSITION ENABLERS

Identifying all enablers for capturing renewables in Oman, including de-risking of projects, governance, infrastructure and concrete next steps for implementation?

- Ibrahim Al-Waili, Head of Business Planning, Gas Directorate, Petroleum Development Oman
- Dr. Steven Griffiths, Senior Vice President – Research & Development, Khalifa University, UAE
- Ali Al Saffar, Middle East & North Africa Program Manager, International Energy Agency
- Claudia Massei, Chief Executive Officer, Siemens Oman

Moderator: The current opportunities and challenges within Oman's energy system are primarily being driven by the forces of technological innovation and the supply-demand balance. What measures are needed to harness these forces and forge an affordable and efficient path forward? No single stakeholder in Oman can drive such improvement alone. Industry, government and society as a whole will have to come together to meet this new paradigm of energy transition. To facilitate effective dialogue between the different parties, an understanding of the challenges and enablers for a successful energy transition are required. In the last decade, technological progress in Oman has allowed new forms of producing, storing, transforming and consuming energy, which has altered the nature of the energy system. Oman is growing like never before, creating opportunities for many people. This growth will undoubtedly require more energy that is produced and delivered in different ways. By embracing the energy transition and identifying enablers to make it a reality, Oman will strengthen its energy security.

Speaker 1: Today, 97% of our energy is consumed by gas and the remaining 3% is more or less from oil. We'd like to change this mix; diversity is a must for sustainability.

Speaker 2: Oman is well developed in terms of legislation, such as the Tanfeedh program. Still, some silos are being developed. If efforts were combined, more synergies could be identified faster. Plus, when it comes to energy efficiency, digital solutions are not leveraged enough. There are a lot of digitalization programs in the UAE, which use the internet of things (IoT) and predictive analytics.

But a lot of these technologies are still not a core part of operations in Oman. The interest is there, but the investment is wanting.

Moderator: Is there a risk of Oman being left behind in this energy transition i.e. a missed economic opportunity?

Speaker 2: Potentially, especially if there are not enough incentives for technology providers. Without incentives, investors and technology providers are less likely to focus on resources in Oman.

Audience Member: We're all very keen to accelerate digitalization. Recently, everybody with a suit is offering us digitalization solutions for our challenges. Our dilemma? How do we, as a company, choose who to go with?

Moderator: The oil and gas industry has been historically great at being first to come in second. Typically, the risk appetite for taking these enablers may be less in our industry than in others. Does it need to be bigger?

Speaker 2: To some extent, yes. Plus, as we develop new forms of energy production, such as solar power and wind power, we must start centralizing that energy more. This is not a bad thing, but it does mean that the grid may need to be reinforced. The associated investment cannot be underestimated.

Moderator: What would you identify as the low hanging fruit enablers in Oman?

Speaker 2: In-Country Value (ICV); developing the local capabilities. There's waiting on both sides, so time passes and things don't develop as fast as they could. A lot of these enablers will come naturally if you have fully motivated and fully enabled people to drive progress. Oman should also lessen its reliance on imported talent. If you look at the associated bureaucracy, every time you bring an expert into Oman, you must wait for a visa for example. That's a lot of wasted time on paperwork. PDO does a great job informing people and has lots of communication programs, but other companies need to step up. There is also still a big gap between industry and academia. People are leaving university without practical experience.

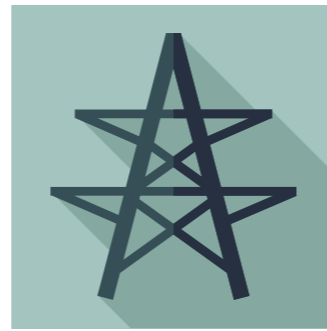
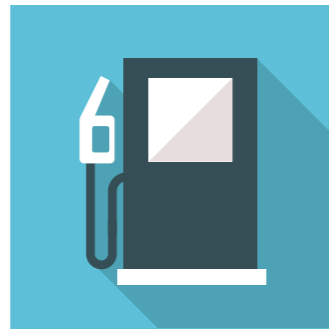
Speaker 3: The vision for where the energy system needs to go is becoming part of the dialogue as well. All the countries need to consider how they achieve their goals. It's not just about implementation and today's technology. There's quite a bit of research and development (R&D) on technology and human capital so that people are aware of how these technologies can be integrated. When you get past 15% to 20% renewables in the electricity system, it's not a simple case of operations. It's about how you make the system work and thinking about how you manage the demand side, so you can deal with intermittent supply.

Moderator: Is having very ambitious targets a useful enabler, even if they might be a little over the horizon?

Speaker 3: They can be an enabler and a hindrance. Today, you're not going to have much in the way of grid challenges with the interconnection of a couple of gigawatts, as it will be just a few percentage points of your entire electricity system. So, it's very manageable and you can get organizations that should be more sophisticated and engaged in renewable energy thinking: do we need more research in that area? I'm very impressed by Oman's on-the-ground developments in large scale solar PV, best practice, designing auctions and so on.

Speaker 4: On the demand side, the policy and implementation of efficiency standards – be it for vehicles, in homes or appliances – is hugely important. We can talk about the supply side all we want, but the same must apply to the demand side. When we look at the investments going into oil supply, for example, we're on a compliant trajectory to the Paris Agreement when it comes to investment. But from a demand perspective, what we're looking at is actually much higher than compliance to the Paris Agreement. So, we must be aware of when policies take us in one direction while other drivers take us in another. We must find the gap between reality and the actual investments.

Audience Member: We've seen so many examples, like Morocco, South Africa, Spain and Chile, that are building momentum with regards to renewables. They go beyond the 20%, sometimes 30% capacity. A clear strategy with commitments is crucial. This also helps bring in foreign direct investments (FDI). An outlook to 2030, 2040, whatever the government and stakeholders in Oman think is possible, would help incentivize investors and de-risk the environment. Clarity on the projects and clear roles and responsibilities among the different stakeholders is also vital. For



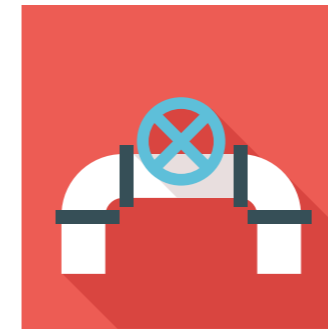
example, Duqm is booming but it's not fully connected to the main grid. In the north of Oman where most of the demand is, the vast majority of the area is mountainous, so there's no place for solar. If you go to the south, it's almost no man's land, so you could put as many solar panels as you want. Therein lies the importance of integration between various stakeholders.

Audience Member: One of the key issues is managing the public view and getting the public to buy into this transition. We should not discount this and it's something Oman can improve a lot on. The executive branch of the government that is carrying out the policy must play a key role in communication.

Audience Member: Germany is pursuing a very ambitious program of energy transition and one of the most important enablers is a clear and consistent policy with a reliable legal framework. Committing to a target does not make it a policy. The policies encompass building institutions, establishing responsibilities, who has to do what in that case and so on. This clarity is extremely important; a legal framework for people to act as freely and as creatively as possible. The question is: is there a framework in place which allows for this to happen in Oman?

Audience Member: Key stakeholders should start from the bottom-up. How can we help those people make the switch to lower-carbon growth? How can we use the current huge subsidy that we're spending of OR700 million a year to get the consumers to buy into the concept of renewables and conservation? How can we help? By installing thermostats and temperature controllers, for example. Making these sorts of steps means it will be an easier transition.

Audience Member: If you look at a private consumer, the majority do not know what choices they have. They just apply for their power supply and get a connection. People want to buy things off Amazon. Why? Because it's quick and easy. They want to press a button and be done. Changing the demand side means solutions must be on the public's doorstep rather than via complicated processes. Simplicity is an enabler.



Audience Member: One of the biggest blockers on both the supply and demand side [in terms of technology and digitalization] is digital maturity. For example, what is the cloud policy in Oman? Unless Oman is cloud ready, a lot of these ideas will not work. Often when we engage with the government, whether it's the smart grid, smart metering or production for custom analysis, the first question is: is this on cloud? The answer is yes. We [Microsoft] have transformed our building in Seattle and save about \$70 million in energy consumption per year. Our data center in Singapore is running on solar power and our data center in Ireland is running on wind power. We also have solutions and studies in Norway. But we can't replicate this in Oman because the cloud will be the problem.

Moderator: Given that Oman doesn't have a Ministry of Energy yet, it is fair to say that people have been doing their own bit of renewables here and there?

Audience Member: We've had a lot of support and there have been no constraints. But collectively we need to do so much more. Where we fail is to raise a sense of urgency, to identify the solutions and the quick wins that are available today. There are opportunities today whether we have a Ministry of Energy or not. We can't wait for it. We need to secure the alignment. There's plenty to do now with relatively simple technologies.

Audience Member: We're talking about an overall ecosystem where everybody needs to play a role. When we talk about public-private partnerships (PPP), we need to know exactly who's doing what. For example, is the government an enabler to make the policy and make things happen on the ground? Or do they want to develop the policy, legislate, implement and monitor it? Or both?

Audience Member: There are many important barometers to be considered by policy makers. Energy security, cost, ICV, grid reliability and many other markers. Building the right institution with the right policy-making process and assigning the right responsibilities with the right people: this will make the process easier. □

*Edited transcript

TOP 5 RECOMMENDATIONS

1. LEVERAGE DIGITAL TOOLS

Digitalization and technologies can be leveraged more coherently to have a greater enabling role. Such tools are key in achieving scalability in the transition, such as when renewables will inevitably account for more than 15% of the overall grid. The same applies to creating a digital cloud to incentivize more FDI, therefore enabling a greater flow of ideas and funds to drive the energy transition.

2. ESTABLISH LONGER-TERM TARGETS

Clear targets are one step; there are two other steps in this nexus. The first is to ensure there is enough ambition and longevity in the target i.e. visions and associated policies for change can stretch to 2040, not just the 2020s. Secondly, clear and practical policies must be devised to make the targets a reality. Establishing a central institution i.e. a Ministry of Energy, could help identify the right policies with assigned responsibilities.

3. IMPROVE DEMAND MANAGEMENT

Supply and demand are two sides of the same coin; one cannot succeed without progress on the other. The policy and implementation of efficiency standards – be it for vehicles, in homes or appliances – are hugely important enablers. The same applies to public buy-in. This requires comprehensive communication strategies, especially when it comes to price i.e. adjusting subsidies.

4. HARNESS LOCAL TALENT

People matter; investing in local capabilities will pay off. This broad spectrum encompasses better alignment between industry and academia, such as ensuring longer-term internships in the winter and not summer months. The same applies to increasing the volume of vocational education in academia and investing in talent on Omani soil to create a more sustainable talent pool.

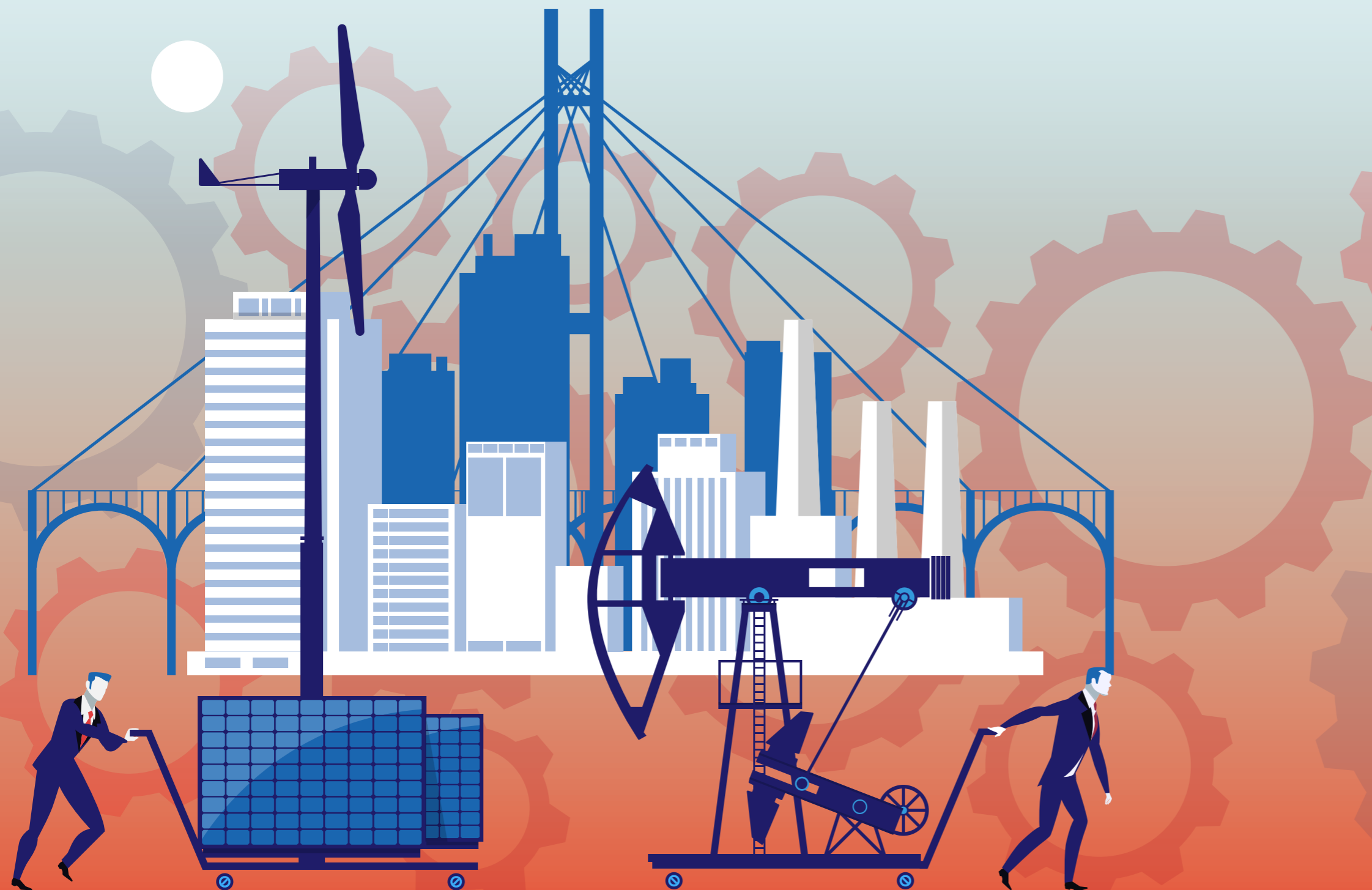
5. GREAT COLLABORATION AMONG INDUSTRY STAKEHOLDERS

Accurately monitoring and responding to supply-demand balances requires cohesion among industry stakeholders; even more so amid the shifting sands of the energy transition. Achieving greater clarity means leveraging digitalization, addressing the supply and demand side both separately and as one, harnessing more FDI and enhancing the talent pool, among other points. The thread that ties these all together? Collaboration between industry stakeholders. How can all the parties better share their views and work on solutions? What is the best framework to enable all views – national and international energy companies and SMEs – to tangible progress? Simplicity is key.

LOCAL SUPPLY CHAIN

Oman's local supply chain is an engine for economic growth and innovation – a key cog in the National Vision to become a knowledge-based economy with deep-rooted energy security. As the sultanate embraces the global energy transition – a mix of fossil and renewable fuels – how can it leverage and create its local supply chain of small and medium-sized enterprises?

- Chris Breeze, Shell Country Chairman and General Manager, Shell Development Oman LLC
- Badar Al-Abri, ICV Development Manager, External Affairs & Value Creation Directorate Petroleum Development Oman
- Dr. Syham Bentouati, Managing Director NAFAS International LLC
- Daniel Colover, Market Engagement Manager, Middle East, S&P Global Platts



Speaker 1: The energy transition is driven by three factors. One is growing energy demand; Shell estimates that total energy demand will double by 2050. The second is the need to curb emissions and mitigate global climate change and the third consists of technical advancements. This means that the energy system will move towards cleaner fossil fuels, shifting away from coal to gas where possible with an increase in renewable energy and electrification. Simultaneously, technology and digitalization are opening up a much greater degree of customer choice and customer driven changes.

I'm going to focus on the power sector. This is divided broadly into four areas – production, transmission, distribution and marketing – though distribution and marketing are more or less the same entity in Oman. Oman's regulatory approach means that you can only sell electricity to the Oman Power and Water Procurement Company (OPWP) and you can only if it's generated by a project that's being tendered by OPWP. This means that all immediate solar generation, certainly large-scale solar generation, is the result of a tender. And the winner of the tender is the company that bids the lowest tariff, but we also have to factor in how to measure the contributions to In Country Value (ICV) in the winning bids. Otherwise you'll have a 500 MW project with all the panels imported from China and little enhancement in the country's capabilities.

Speaker 2: Key points need addressing. What needs to be localized? How we can do it and who will do it? How long will it take? Some of the localized opportunities, such as services and goods, have really improved and reaped big financial rewards. Some cost reductions have ranged from 7% to 25%. Localizing the renewable supply chain would have a similar benefit, plus job creation. We have succeeded in localizing many elements in the oil and gas supply chains, which are sometimes more complicated businesses compared to renewables. There is an exponential value associated to that. Some more difficult parts of the supply chain might not be easy to change in the next three years. Some other countries have very advanced research and development (R&D), which is very difficult to compete with.

Championship was introduced to drive the ICV in the oil and gas sector in general. This encompasses resources, basic systems, processes, studies and so on. Between 2013 and in 2017, the total ICV attained value with the PDO annual spend was boosted by almost 10%. So, we must have a strategy to ensure the right resources if we want to localize the supply chain.

Something else that would be very helpful is greater transparency on upcoming demand. Once you know what is out there, people can make plans. If the demand of the other operators is mapped and united i.e. clear economies of scale, then we have a better chance to localize some elements, especially on the production side and also include R&D.

This must be collaborative work; the energy companies, the private sector, the government sector, academia, small and medium-sized enterprises (SMEs), regulators and so on. They must all come together with a plan. This is already happening to some degree. PDO has been working with SMEs which are already doing installation of solar power technologies in some of our projects.

Speaker 3: We should not wait for the government to take these initiatives. We must let businesses do it and keep in mind that that is where the money is and government needs to facilitate this. If it's not a win-win situation, it will not happen. If we look at the UN's Sustainable Development Goals (SDGs), nine out of the seventeen will be supported by local supply chains. Six of those touch on direct applications like climate change and industry innovation.

SMEs have little chance with big tenders so if we really want to increase their role, we need to champion them. Certain things can happen straight away to accelerate our progress in the energy transition. A lot of effort that was done to put ICV in the oil and gas business is applicable to the lower-carbon value chain. We don't have to reinvent the wheel. We start by understanding what we require for the supply chain of renewable energy and then look at what we already have. This type of gap analysis will help us find the balance.

When we talk about renewable energy, everybody tends to talk about solar PV panels, for example. But there is so much more. There are the controllers, the adapters and so on...all expertise that is missing. That is what we should really be focusing on and encouraging. Academia needs to start teaching people this aspect

of the lower-carbon world. Looking beyond the obvious will help Oman move into an area where there may be less competition.

The same applies to products in the supply chain. Often, we don't do things in Oman simply because we fail to ask the question. Why can't you make this here? Why can't you assemble this here? Why don't you use something else that we can procure from here?

Then there is the university curriculum, which must reflect where the country hopes to go. Theory and practice must be able to merge, so that those coming out of university can apply their knowledge to day-to-day operations. Vocational training is not considered as attractive in this region as in others, which is a shame as it is very, very valuable. It has significantly helped other countries.

Speaker 1: What needs to be learned from PDO's experience in the oil and gas sector in terms of enhancing ICV and the support and growth of SMEs? How can we replicate that in the renewables sector?

Audience Member: We must categorize SMEs based on their skill level, size, capabilities and interest. The next step is mapping them to see how they interconnect. And then we must look at monitoring and development for the gap analysis. This is where I applaud Shell which is the biggest ICV development program I know. They fully incorporated SMEs even in large tenders and gave guidance where needed. I would like to see more of this method; larger companies having a lasting impact on regulations and framework.

Audience Member: In terms of utility scale renewable energy projects, there is a 100 MW project done by PDO and another 500 MW project. If projects of this size are not split into 20 MW each



TOP 5 RECOMMENDATIONS

1. BROADEN THE TENDER PROCESS

Changing the current regulatory environment will make it easier for local SMEs and the wider local supply chain to bid – and win – roles in larger projects. Clarifying economies of scale first is crucial to accurately localize services and responsibilities.

2. NURTURE LOCAL CHAMPIONS

Bolster the respect and prestige associated with SMEs and the wider local supply chain to encourage sustainable growth, including enhanced training, reducing the brain drain and boost commercial confidence.

3. REPLICATE LESSONS LEARNED IN OIL AND GAS

Many successful techniques to engage and grow the local supply chain have trialed and tested in the fossil fuels market. Do not reinvent the wheel; apply success stories to lower-carbon growth.

4. CATEGORIZE AND SUPPORT SMES

SMEs are an integral part of affordably and efficiently achieving success in Oman's energy transition; they must be supported. Such support can be provided via on-job training (i.e. 'shadow SMEs' for a large company completing a tender) and in the categorization of SMEs' capabilities. This ensures the correct skills are allocated to the correct roles, as well as enable SMEs to broaden their horizons by working cross-sector with other SMEs.

5. INCREASE VOCATIONAL TRAINING

Pairing a strong academic knowledge base with vocational training means university leavers can apply classroom knowledge directly to a project more effectively. Such efficiency will prove vital in SMEs' ability to not only successfully compete for bigger tenders, but also support the sultanate's energy security. The intellectual gap between theoretical and practical skills must narrow.

for five SMEs, for example, then only one or two local companies can get involved. This needs more consideration and the regulatory system needs to enable it.

Audience Member: A thought from an international perspective is to stimulate a dynamic ecosystem of participants, so you basically still have ownership with the distribution grids in the hands of their relevant bodies. This basically allows for an ecosystem of developers to grow and it avoids the government being in the middle between the commercial customer and the developer, which avoids loading Oman's balance sheet.

Audience Member: In terms of being off grid, SMEs must develop their capabilities to have this reach because most of these projects are in remote areas and require more significant logistics, operations and maintenance.

Audience Member: Another idea is to ensure there is a 'shadow SME' for tenders that go to very large companies, with training and engagement running for up to five years. Some part of the scope of the project could then be awarded to that SME after they have been trained and qualified.

Speaker 4: Distributed generation is worth consideration. OPWP has been very successful at doing central generation for the transmission system and providing the bulk of supply for the country. Distributed generation could even be a 1 MW system in a shopping center or a small project in a home. They are embedded within the distribution network, which plays into strengthening the grid and providing choice. Finding a way to enable distributed generation business models within Oman would stimulate a lot of enterprise and positive competition amongst SMEs. □

*Edited transcript

SUSTAINABLE FINANCE

How can transparent and climate-smart investment support the speed of energy transition within Oman?

- Ben Oudman, Director & Regional Manager – Continental Europe, Eurasia, Middle East, India and Africa, DNV GL – Oil & Gas
- Yousef Al Zuhair, Director, ACWA Power (Saudi Arabia)
- Karim Badr, Project Finance Leader, Gas Power Systems, GE Power MENA

Moderator: What would be your insight into the current state of finance for the renewable sector in the Gulf?

Speaker 1: OECD countries have about \$54 trillion invested into energy projects at this point in time so there's a tremendous amount of capital out there. Cost curves on all renewables have come down and yet, although there is ample capital and these projects have a positive business case, we will still need to increase our investment in renewable energy annually by 150% year on year to meet Paris climate agreement objectives. Cumulatively, that is about \$16 trillion between now and 2050. The main barriers to this, both locally and globally, come down to government policies and whether they are working to enhance climate mitigation, such as directing local credit to local initiatives.

Moderator: What are your thoughts on what the bottlenecks are and how we can overcome them?

Speaker 2: As well as regulatory policies, there are blocks in the technology itself. Prices have come down yes - solar by around 60% and wind by 50% in the last four years. However, we still cannot use green technology as a base load and need conventional gas power. There is a still lack of storage capabilities in the market for renewables but solar and wind will continue to be a strong driver - Saudi Arabia, for example, plans to eliminate all liquid fuel for power generation by 2030 - but it's going to take some time to get to the desired target levels across the region.

When it comes to project finance, similar mechanisms will be used on green technology as have been used for conventional power but the government needs to play an active role from a regulatory perspective and also put in place the necessary guarantees to make these projects bankable. We have a banking community that typically requires certain sovereign guarantees, whether it's going to be a utility funded project or IPP based.

Moderator: Is the regulatory framework too embryonic to attract international investments? What needs to be done to make it the best framework that people can have confidence in?

Speaker 2: Oman is on right track and the desire to move into green energy is definitely there. I think the main driver will be to use development agencies and financial institutions such as The World Bank to demonstrate best practices and frameworks to the Omani government so that these projects follow international standards. Commercial banks and lenders need to see certain things put into place. We've seen that in Lebanon, for example, where they're partnering up with the IFC to develop an IPP framework. We've seen it in Morocco and Jordan - the most advanced countries in the region when it comes to renewables - who have used the World Bank. Collaborative efforts with one of the development agencies will definitely put into place the framework necessary for it to be funded.

Moderator: ACWA Power has had great success with running low cost solar projects. Is Oman an attractive investment destination and do you look at it in the same way as Saudi Arabia or the UAE?

Speaker 3: Actually, Oman was the first GCC country to implement the IPP framework and it's one of the few which has defied the odds and been able to do these projects without sovereign guarantees because lenders trust the system. We expect that Abu Dhabi and Saudi should follow suit, but project finance is generally becoming more difficult and costly and although countries like Saudi and Kuwait may be wealthier than Oman and rated higher by credit agencies, they have had their own challenges in implementing projects which has damaged the trust of financiers. Another obstacle for all is that as the cost of PV gets more competitive, profit margins drop, so equity investors may lose interest and this becomes even more likely when alternatives like sovereign bond issues offering high returns of 8%, are offered by the same countries trying to attract funds into their renewables sector.

Moderator: Once you have won a tender, is the onus on the developer or is it something that you do in conjunction with the government?

Speaker 3: It is standard for there to be a direct agreement between the grid entities and the developer but there is no responsibility on the government for financing. Ever since Oman changed its sector law in 2004, everything has been externally funded by the private sector and that has relieved the government from otherwise having to invest about \$10 billion. The continued plan is to fully privatize generation, distribution and transition so that within 10 or 20 years it becomes fully open on the spot market.

Moderator: Does the Omani government always look to private partnerships for these renewable projects?

Audience Member: We've seen many governments outsource the plants and take the IPP route so that bears no risk but is more expensive. In some models, the government pays 15% as a down payment and the developer seeks the remaining 85% through export credit agencies (ECAs). The beauty of ECAs is that not only do they tend to give more competitive terms than the commercial banks, but they also provide a certain insurance of finance, which then encourages additional funds more easily from other lenders.

Moderator: Where do you expect the majority of lenders to come from for Omani projects? Locally, regionally, internationally?

Speaker 2: GE primarily follows the ECA financing model, driven by our procurement capabilities. Banks are there for lending but the challenge can be on the equity side and so there is a growing demand to have specific intra-funds for the region. For example, Blackstone have established a development company with a \$1 billion investment profile to invest in the regional power sector.

As mentioned, as PV costs drop, margins and returns are not as attractive and this is putting a strain on equity investors. That's going to be the challenge going forward. Big developers like ACWA can take long term views and squeeze margins through their negotiations with suppliers and contractors but if you look at smaller developers, it is going to be a struggle to get attractive margins. We are seeing a lot of EPC contractors now coming out of China and they bring cheaper financing which is also not OECD regulated, so usually a lot more flexible and more adaptable to countries like Iraq and Sudan where commercial bank lending is more challenging.

Moderator: Is it difficult to accommodate different ECA requirements working on the same deal? The Duqm refinery project that recently closed financing for example, was severely delayed because of trying to accommodate all its ECAs before bringing on the commercial banks.

Speaker 2: ECAs are by nature quite bureaucratic but this region is also not the easiest when it comes to such things as changes in regulations and fluctuations in credit ratings so we do face a lot of difficulties.

Moderator: Is the tariff structure mature and comprehensive?

Audience Member: There seems to be a mismatch between what the developers and the Omani government expect when it comes to tariff structures. Maybe some of the governments within the region need to realize that they're not going to be able to achieve such low tariffs.

Speaker 3: The good thing about a competitive tender is that the market decides. There is a higher cost of finance, tax burden and cost of construction for renewables projects here and they do have to compete against hydrocarbon projects, which typically have a higher return of around 15-20%. The utility industry by contrast is generally at 10-15% and renewables in single digits.

But countries can create other incentives to sweeten the investment deal such as granting industrial zones a 'holiday period' on pay, not charging rent on land or removing taxes on imports of solar PV equipment as Jordan has done - these are all very simple things governments can do when tendering a project and that are now common practice.

In Oman for example, it is more financially attractive to have local partners because they don't have to pay withholding tax on their dividends. But, on that point, Oman needs to better align the disparity in withholding tax rates on renewable projects for different countries. At the moment, it imposes none on the UK, 5% on China and 10% on the GCC.

And when it comes to extracting the best value from local industry, as an example, 50% of the cost of solar PV comes from the manufacture of panels, so it doesn't make sense for Oman to compete with a country like China, which produces over 90% of all solar panels worldwide. It would be more logical to focus on other parts that can be manufactured locally for plant structures but which do not face fierce pricing competitiveness.

Moderator: To what extent does the size of projects affect financing options?

Audience Member: Small size projects require non-conventional financing institutions. In countries where there are small electricity grids, there are small development or investment firms that are more interested in such project sizes. The whole ecosystem to do small projects needs to be developed as there will be a need for it.

Moderator: Is it part of the business plan at ACWA to increase the bankability of projects? Are you looking at refinancing projects once they are constructed to decrease the cost of borrowing? Any interest in European style mechanisms such as project bonds or 'green' bonds?

Audience Member: In Oman, there is a requirement that after you finish construction, within one year you have to IPO 40% of the project. So once the construction is completed and that risk is gone, if you can refinance the project, you can improve your profit margin and viability of the project. It is more difficult now but generally developers tend to try to factor that in. The other scenario which sometimes encourages refinancing is if the economics of the country has improved during the project construction period. Developers can also opt to approach the existing pool of lenders and renegotiate.

When it comes to 'green' bonds, in Europe there is a lot of hype around using these. In this region, we see institutions like the EBRD doing more renewable projects in Jordan and Lebanon for example and the IFC is a 5% shareholder in ACWA because they like our renewables focus. There is potential that renewable projects could benefit from power trading but that would require government involvement together with the developer to garner the potential upside. □

*Edited transcript



TOP 5 RECOMMENDATIONS

1. INCREASE GLOBAL INVESTMENT IN RENEWABLE ENERGY
Global investment in renewable energy needs to increase annually by 150% year on year to meet Paris climate agreement objectives - about \$16 trillion through to 2050 so government policy should be designed to help finance meet these climate mitigation objectives, such as directing local credit to local initiatives and putting guarantees in place to make projects bankable.

2. INTERNATIONAL PARTNERSHIPS
GCC governments should partner with international development agencies such as the World Bank to ensure projects follow best practice standards and so more easily attract other commercial funding.

3. INVESTMENT INCENTIVES
IRR for renewables projects in region in single digits compared to hydrocarbons at around 15-20% and utilities at 10-15% so countries need to create other types of incentives for renewables investment such as rent-free land or removing taxes on imports of solar PV equipment.

4. ALIGN TAX RATES
Oman needs to better align the current disparity in withholding tax rates on renewable projects between different countries. e.g. currently 5% on China and 10% on the GCC.

5. ALTERNATIVE FINANCING FOR RENEWABLES
Countries with smaller sized renewables projects need to develop an ecosystem for alternative non-conventional financing.

How to Accelerate Oman's Energy Transition?

TOP 10 – STRATEGIC GOVERNMENT POLICY RECOMMENDATIONS

	CHAMPION	SUPPORT
1. GOVERNMENT REGULATION TO IMPROVE DEMAND MANAGEMENT: Gov't policy and implementation of efficiency standards - be it for vehicles or domestic appliances – are hugely important enablers. The same applies to public buy-in, which requires comprehensive communication strategies to drive awareness on transition, especially when adjusting subsidies.		
2. ACCELERATE POWER DEREGULATION & INTRODUCE SPOT MARKET: Oman should move to deregulate and privatize parts of its power infrastructure and introduce a spot market to allow for competition along all elements of the value chain.		
3. ESTABLISH CLEAR LONGTERM TARGETS FOR RENEWABLES & ALIGN TAX RATES TO DRIVE INVESTMENT INCENTIVES: Oman should set clear targets that stretch out to 2040 and beyond, while at the same time correcting the current disparity in withholding tax rates on renewable projects between different countries. e.g. presently 5% on China & 10% on GCC.		
4. OMAN SHOULD INCLUDE ALL INDUSTRIES IN ENERGY TRANSITION: Oman Energy Efficiency initiatives need to move beyond electricity and towards water desalination, transport and other industries – opportunities for decarbonization outside the power sector globally is 80%.		PDO
5. INCREASE INVESTMENT IN RENEWABLE ENERGY: Global investment in renewable energy needs to increase annually by 150% year on year for the world to meet the Paris Climate Agreement objectives – about \$16 trillion through to 2050 – so government policies should play a central role to ensure projects are bankable.		PDO
6. INTERNATIONAL DEVELOPMENT AGENCIES/ PUBLIC-PRIVATE: Oman should partner with international development agencies, such as the IFC/World Bank, to ensure projects follow best practice standards and so more easily attract other commercial funding.		PDO
7. RESOLVE OMAN GAS SHORTAGE: Oman needs to adopt renewables and other Energy Efficient --low carbon emission-- solutions, such as CCUS and EOR, with greater urgency to prevent a gas shortage and free up gas for industrial development and export.	PDO	
8. INTRODUCE FLEXIBLE REGULATORY FRAMEWORK FOR RENEWABLES: Install less restrictive terms & conditions in tender processes – currently companies have to have completed a minimum of two previous projects within the region to qualify, which drives international investors away, and quicker regulatory decision-making is needed to avoid abandonment of initiatives.		
9. FIRST MOVER ADVANTAGE: Renewable energy is a relatively new field to the GCC which presents the opportunity to become a regional leader in technology development/deployment and export it – existing example is the proven technology of conversion of heat to produce hydrogen.		
10. REMOVE ELECTRICITY SUBSIDIES: Remove/lower subsidies on water & electricity is essential to trigger end users to make rational choices and adopt energy efficient solutions (e.g. domestic smart meters) that private business are offering, which would simultaneously encourage SMEs and jobs growth in Oman.		

TOP 10 – INDUSTRY TO EXECUTE

	CHAMPION	SUPPORT
1. APPRENTICESHIP: Develop an apprenticeship program in partnership with industry in energy savings technologies for the Construction Industry.	GUTECH	ISHRAQ
2. CATEGORIZE & SUPPORT SMEs: Omani companies should broaden the tender process to facilitate SMEs which are an integral part of affordably and efficiently achieving success in Oman's energy transition -- support can be provided via on-the-job training (i.e. 'shadow SMEs' for a large company completing a tender) and in the categorization of SMEs' capabilities.	PDO	OCCI
3. NURTURE LOCAL SUPPLY-CHAIN CHAMPIONS: Bolster the respect and prestige associated with the wider local supply chain to encourage sustainable growth, including enhanced training, reducing the brain drain & boost commercial confidence.	Shell	OPAL
4. COLLABORATION AMONG INDUSTRY STAKEHOLDERS: Accurately monitoring and responding to supply-demand balances requires cohesion among industry stakeholders; even more so amid the shifting sands of the energy transition.	OPAL	
5. REPLICATE LESSONS LEARNED IN OIL AND GAS: Many successful techniques to engage and grow the local supply chain have trialed and tested in the fossil fuels market. Do not reinvent the wheel; apply success stories to lower-carbon growth.	PDO	
6. ADVOCATE VOCATIONAL TRAINING: Pairing a strong academic knowledge base with vocational training means university leavers can apply classroom knowledge directly to a project more effectively. Such efficiency will prove vital in SMEs' ability to not only successfully compete for bigger tenders, but also support the sultanate's energy security. The intellectual gap between theoretical and practical skills must narrow.	Shell	PDO
7. INTERNSHIPS - HARNESS LOCAL TALENT: People matter - investing in local capabilities will pay off. This broad spectrum encompasses better alignment between industry and academia, such as ensuring longer-term internships in the winter and not summer months.	PDO	OOCEP
8. BUILD IN-COUNTRY R&D: Undertaking applied research project on solar panel efficiency to maximize the opportunity for rooftop solar in Oman. Building in-country R&D capabilities for wind and solar will allow SMEs to grab the opportunity presented by the inherent demand in Oman and build the economic supply-chain.	GUTECH	BP (TBC)
9. LEVERAGE DIGITAL TOOLS: Digitalization & technologies can be leveraged more coherently to have a greater enabling role. Such tools are key in achieving scalability in the transition, such as when renewables will inevitably account for more than 15% of the overall grid. The same applies to creating a digital cloud to incentivize more FDI, therefore enabling a greater flow of ideas and funds to drive the energy transition.		OOCEP
10. DRIVE PUBLIC AWARENESS ON TRANSITION: The mindset on energy transition still needs to shift – industry should work with the government to build general awareness of energy efficiency so that this is instinctively translated into measures taken across the economy and within households.	OPAL	PDO

NB. With the recent establishment of a defacto Ministry of "Energy" – Oil, Gas and Electricity – in Oman (which was a prime recommendation of the Oman Energy Master Plan 2040); a new blueprint should address how to stimulate the Energy Transition – Some points to include:

1. Establishment of a National Renewable Energy Sources (RES) Blueprint for Oman – beyond the Tanfeedh timeframe. This Blueprint shall focus on energy supply for power generation and power-to-x
2. Establishment of a National Energy Efficiency (EE) Blueprint – this will entail efficiency practices, lower consumption and thus free up more gas for export
3. Establishment of a SME Development Program and Supply Chains Blueprint

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