# THE QAMAR NEWSLETTER

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Why it is time for the world to take geoengineering seriously. Cover story by Robin Mills.

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QAMAR ENERGY

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Qamar Energy, headquartered in Dubai, is the leading regionally based energy consultancy on the Middle East and North Africa (MENA).

The QAMAR NEWSLETTER is a monthly publication that provides critical appraisal and focussed assessments of the month's energy developments across the MENA region.


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# WHY IT IS TIME FOR THE WORLD TO TAKE GEOENGINEERING SERIOUSLY

Robin Mills • *A version of this article appeared in The National, Jan. 29 '23* • COVER STORY


It's often a mystery where the supervillains in James Bond films got their start to build up the enormous secret bases and hordes of minions they deploy to conquer the world.

Perhaps they did what Luke Iseman did in Baja California last April: with Amazon and a credit card, he got the equipment to make himself into "Greenfinger".

Climate change is lurching forward into more perilous territory. Last year was already 0.89 degrees Celsius above the historic average. The goal of limiting global warming to 1.5ºC above pre-industrial levels will probably be breached temporarily this decade, and be out of reach entirely by its end.

A series of UN conferences, major advances in renewable energy, campaigns against fossil-fuel production, a once-in-a-century pandemic, and a big war and heavy sanctions on a leading hydrocarbon exporter have not stopped greenhouse gas emissions from rising. But they have to drop an inconceivable 45 per cent by 2030 on 2010 levels.

There is nothing magical about the 1.5ºC target: 1.4 degrees would be better, 1.6 degrees worse and 1.7 degrees worse still. Every increase brings more damage and disruption, and a greater chance of inadvertently passing a climatic tipping point, such as the collapse of the Greenland or West Antarctic ice sheets, eventually raising global sea levels by three to four metres.

Political and economic tipping points may be even closer: the disruption of a populous country by flood or drought, or a wider war, bringing unimaginable suffering and migration.

Even the 1.5ºC scenarios include huge removal of carbon dioxide from the atmosphere — by reforestation, or by trapping the gas directly from the atmosphere and injecting it underground or turning it into solid minerals.

Adnoc recently announced a pilot project to do just this in Fujairah. Several promising technologies are emerging. But they remain costly and scaling up to extract the necessary billions of tonnes each year will be a colossal effort.

Worse still, some of the warming from greenhouse gases has been masked by fine particles — aerosols — from human activity, including dust and sulphur from burning coal and oil.

These reflect sunlight. As we clean up air pollution, the local environment and human health improves, but paradoxically the climate problem gets worse.

A similar natural phenomenon occurs with some big volcanic eruptions, mostly famously the Philippines' Mount Pinatubo eruption in 1991, which sent huge amounts of sulphur dioxide into the stratosphere.

Scientists proposed as far back as 1974 that we could do the same. Quite small quantities of sulphate or other particles could be released into the upper atmosphere by plane, rocket or balloon.

Harvard University's Dr David Keith, who has been active in the field since 2007, suggests it could cost as little as $1 billion per year. That compares to the $178 trillion cost of unchecked climate change to the global economy over the next half century, or the trillions of annual investment required for the new green economy.

David Victor, a specialist in climate international relations, observed in 2008 that, "A lone Greenfinger, self-appointed protector of the planet and working with a small fraction of the Gates bank account, could force a lot of geoengineering on his own".

This is where Mr Iseman comes in. In April, he released two helium balloons containing a few grams of sulphur dioxide from Mexico, expecting that at altitude they would burst and release their payload.

In October, he incorporated Make Sunsets, a company offering to sell "cooling credits", which planned to make further launches this month.

His action has attracted criticism from those in the field. They rightly point out that his experiment was scientifically worthless — it carried no monitoring equipment and nobody knew if it reached the stratosphere or functioned as intended.

They worry that lone actors will give the field a bad name, forestalling the careful public debate and government regulation that should precede any large-scale geoengineering.

Releasing cooling particles can have other consequences, in particular, altering rainfall patterns.

It does not reduce the level of carbon dioxide, and so does not stop ocean acidification, which damages coral reefs and other marine life. If we began a large-scale effort to manage solar radiation, then had to stop, warming would resume abruptly, a scenario explored in Neal Stephenson's 2021 novel *Termination Shock*.

Inevitably, academics point cautiously to these risks and call for more research. Environmentalists furiously oppose "geoengineering", considering it a seductively easy, dangerous cop-out from the hard, trillion-dollar work of a building a green economy.

They point to "moral hazard" — the lure of a simple fix prevents action on reducing emissions today.

But compared to putting a few million tonnes of sulphates into the air, which rain out within months to three years, we are currently carelessly conducting a geophysical experiment on a far vaster scale: putting 37 billion tonnes of carbon dioxide annually into the atmosphere, which will remain there for millennia. No one seriously suggests giving up on low-carbon options such as wind and solar power in favour of massive geoengineering.

And contrary to the moral hazard concept, we are collectively not doing nearly enough today despite all the scientific consensus of impending disaster. If we pass a tipping point and see a rapid climatic deterioration, hasty geoengineering may be essential — it would be wise to be prepared.

If environmentalists believe — correctly — that even 1.5 degrees of warming is dangerous, they should support a combination of deploying low-carbon technologies and careful solar radiation management to cut overall warming to 1ºC or less.

This would buy time for carbon dioxide removal over several decades to return the atmosphere to an agreed state.

Mr Iseman's action is provocative, even irresponsible.

But maybe that is what the climate field needs. It is not an either/or: we require massive deployment of green technologies, huge efforts on carbon dioxide removal and a sensible, calibrated level of solar radiation management to make up for our wasted decades.

If we don't want our climate future determined by freelance "Greenfingers", it's time for environmentalists, governments and society to take geoengineering seriously.

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## SCALING UP CARBON CAPTURE IN THE MENA REGION

Robin Mills • *A version of this article appeared in The National, Jan. 22, '23*

The most straightforward way to avoid climate change is to stop treating the atmosphere as a free waste dump for carbon dioxide.

Carbon capture, use and storage (CCUS) solves that problem — by storing carbon dioxide permanently underground, or turning it into solid minerals or useful products.

Important announcements on this critical technology were made at the World Future Energy Summit in Abu Dhabi last week.

Adnoc has begun work on the world's first venture of capturing carbon dioxide in an underground saline reservoir composed of carbonates — rocks such as limestones — rather than the sandstones used elsewhere.

It announced a pilot project to inject carbon dioxide into rocks found in Fujairah (also widespread in neighbouring Oman), bearing the mineral olivine, which reacts with the gas to form solid minerals, guaranteeing permanent storage.

Four non-profit groups — the Global Carbon Capture and Storage Institute, Clean Air Task Force, Clean Energy Ministerial and King Abdullah Petroleum Studies and Research Centre — co-hosted an in-depth expert discussion on CCUS at the summit that featured, among others, experts from Emirates Steel, the energy ministries of the UAE and Norway, Adnoc and Saudi Aramco, alongside myself.

We know now that CCUS works, is safe, economically competitive with other low-carbon options, essential to decarbonise certain industries, and has a large role in nearly all credible climate plans. North America and Europe are now finally developing it further. The key question the workshop tackled was: how do we accelerate its deployment in the Mena region?

The three main CCUS projects in the Middle East — in Saudi Arabia, Qatar and the UAE — account for about 10 per cent of the 40 million tonnes of carbon dioxide captured globally. By 2030, Qatar targets seven million tonnes per year captured and the UAE five million tonnes; Saudi Arabia aims to reach 44 million tonnes by 2035.

Today's capture is only about a thousandth of total emissions. The International Energy Agency's net-zero scenario requires 1.6 billion tonnes of worldwide capture annually by 2030. Rystad Energy, a consultancy, says we are on track to operate about 550 million tonnes by the end of the decade. By that estimate, the Middle East would just about maintain its 10 per cent share.

But this region needs to do more. As a centre of the hydrocarbon industry, it is essential for its energy industry to be as low-carbon as possible to maintain its competitive position. The GCC alone accounts for more than a tenth of world gas production and almost a quarter of world oil (although no coal). While the region is not a large emitter in absolute terms, per capita carbon dioxide is high.

Fortunately, the Middle East has among the best conditions in the world for CCUS: concentrations of heavily-emitting industry in close proximity to giant, well-understood subsurface reservoirs, usually in shallow waters offshore or in sparsely-populated deserts.

The long history of the oil business here, and people's familiarity with it, gives public acceptance and a base of skills and assets. Only the US's Gulf of Mexico coast rivals this combination.

The GCC's blue hydrogen projects alone — made from natural gas with CCUS — imply more than 26 million tonnes of capture. Intentions to decarbonise the aluminium and steel industries and the national oil and petrochemical sector's own operations add to this.

Zero-emission gas-fired electricity will also be important to complement solar and, in the UAE, nuclear generation.

Three things are essential for CCUS to realise its full potential in the Mena region.

First is to think much bigger. Projects of around one million tonnes per year of capture each are an important starting point. But we would need to build one of these every day worldwide from now to 2050 to meet climate goals.

Scaling up to combined projects of 10 to 50 million tonnes would allow CCUS to have a true impact on climate ambitions, ending the nit-picking of doubters who seize every opportunity to write it off.
Second is to create carbon capture hubs, with multiple industries feeding into common carbon dioxide transport and storage systems. Industries such as petrochemicals, cement or steel know little of subsurface geology: they need to be able to capture their emissions and know there is a capable operator who will deal with them, for a suitable fee. That is the same role as a sewage treatment or waste management company.

Smaller emitters, such as factories, who cannot carry through a viable project on their own, can make use of the shared infrastructure.

These hubs would handle both carbon dioxide and hydrogen, potentially combining the two to form useful chemicals, and making use of common facilities. They could also import carbon dioxide from countries unable to store it themselves, such as South Korea and Japan.

The third is to introduce suitable incentives. Europe has a carbon price, currently about €83 ($90) per tonne, and the US has a generous tax credit of $85 per tonne.

An emitter in the Mena region might hope to use captured carbon dioxide productively, to achieve a "green" premium for its products, or to avoid the EU's impending tariff on high-carbon imports.
But there is otherwise no domestic penalty for high emitters or compensation for businesses that install CCUS.

International agreements to allow cross-border funding of CCUS are one way forward, and could be advanced at the Cop28 climate talks in Dubai in November.

If Mena countries are to progress on their ambitious net-zero goals, they need to make carbon capture economically viable.

## WHY THE UKRAINE IS A WATERSHED FOR THE FUTURE OF LNG

Robin Mills • *A version of this article appeared in The National, Jan. 15, '23*

"We can survive. We will survive this winter season," said Maksim Timchenko, chief executive of DTEK, the largest private energy company in Ukraine.

His company and its workers are battling to keep the country's electricity flowing under a hail of Russian drones and missiles. The war may — hopefully — end soon, or it may drag on. But what happens to European energy supplies afterwards?

The Atlantic Council's Global Energy Forum, held in Abu Dhabi at the weekend, contained a fascinating cast of characters of the gas business: Gulf, European and US government, major international and national oil companies, gas exporters and buyers.

Their perspectives had many commonalities but some sharp points of divergence. The keenest differences regarded the war in Ukraine and Europe's energy situation. These have two huge implications.

During the forum, Saad Al Kaabi, Qatar's Minister of State for Energy Affairs and president and chief executive of QatarEnergy, said that Russian gas would be coming back into Europe at some point.

Claudio Descalzi, chief executive of Italian energy company Eni, on the other hand, answered a question about forgiving Russia with: "We have to forget Russia? It is not easy to forgive."

Europe's looming eastern neighbour supplied nearly 40 per cent of its gas in 2019, before the Covid-19 pandemic and war intervened.
Apart from deliveries to Turkey, only a dribble of gas via Ukraine remains and that too may soon be cut entirely. The International Energy Agency thinks Europe will be short of about 30 billion cubic metres (bcm) this year.

Historically, liquefied natural gas delivered by tanker to Europe has been a balancing factor, meeting the deficit after domestic production and Russian imports by pipeline, and accounting for swings in demand owing to weather and the economy.

Europe took in more than 80 bcm in 2011, dropping to barely 40 bcm in 2013 and 2014 as prices rose, then a record 107 bcm in 2019, a fifth of its total needs.

A Europe devoid of Russian gas will be very different. Like the Asian trio of Japan, South Korea and Taiwan, it will need huge quantities of LNG as baseload. Most of that will come from Qatar, the US and Africa. But for how long?

EU gas consumption in the August-November period was 20 per cent lower than the average of the preceding five years — even including the Covid year of 2020. Yes, the winter was unusually warm, but the summer was hot and dry, and French nuclear reactors were down for maintenance. Despite warnings of deindustrialisation, the German economy actually grew a reasonable 1.9 per cent. The continent has hastened its pursuit of energy efficiency and renewables. Large-scale imports of hydrogen could begin around 2026.

It plans to cut greenhouse emissions steeply by 2030 on its way to net-zero carbon by 2050 (and between 2035 and 2045 for some European countries, including Germany). Almost no new LNG export capacity will hit the market between now and 2025.

High prices and scant provisions will encourage growing Asian economies to rely on a mix of coal and renewables instead, and Japan and South Korea will try to boost their nuclear output, so Asian gas demand will not grow much.
However, from 2025 until the end of the decade, there will be a vast wave of supply from Qatar, North America, the UAE, and east and north-west Africa.

QatarEnergy is one of those carrying out a huge expansion of its LNG export capacity. Mr Al Kaabi complained of the difficulty of investing in multi-decade projects for clients who are only willing to sign up to buy gas over two to three years. His wish for long-term contracts is very understandable given his belief that Russian gas will eventually return to Europe.

This would require an end to the war on acceptable terms to both Brussels and Kyiv, and probably major changes within the Russian political sphere.

Even then, although some relabelled Russian gas will arrive via Turkey, Europe would surely never go back to relying on Moscow for anything more than a sliver.

A combination of some returning Russian supplies, a lot of new LNG, and weakened demand in Asia and Europe gives our first major implication: global gas in the decade's second half may suddenly be heavily oversupplied, meaning prices could tumble. LNG output is inflexible: plants are costly to build, so they generally run as close to maximum capacity as possible.

Users of American facilities, which usually buy their gas from the grid, might cut back exports if domestic prices are relatively high and international prices low, as happened in 2020, but that is a rarity.

Russia used to provide global flexibility, scaling back exports when demand was low, as in the 2009 financial crisis.

The Netherlands' Groningen field did the same on a smaller scale; it is now being closed down. That leaves only Norway as a likely flexible supplier of scale.

So prices will be much more volatile. They might have to drop very low at times to choke off unwanted supply.

Prices can then soar when the market tightens, as they did in August when the German government spent some €7.8 billion ($8.4 billion) to refill stocks, leaving it sitting on a paper loss of some €4.4 billion when the warm weather caused prices to tumble again.

Gas traders, sellers with access to a range of different markets and pricing mechanisms, buyers able to switch fuels or store large quantities of gas, will benefit.

Investors in long-term production and export projects will face a more challenging task in attracting financing, to a sector already suffering from banks' aversion to fossil fuels.

The gas stakeholders gathering in Abu Dhabi might differ on forgiving and forgetting, but no one doubts that the war is a watershed for their business.

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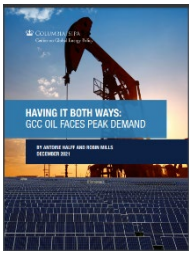
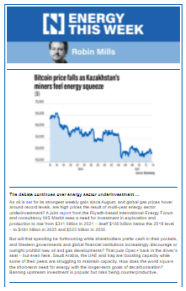
THE UAE's ROLE IN THE GLOBAL HYDROGEN ECONOMY
Authored By: Robin Mills and Julio Friedmann, along with Maryam Salman and Maryem El Farsaoui

*The UAE is well-placed to take an early-mover advantage in global hydrogen production and is pursuing a balanced strategy covering both 'blue' and 'green' hydrogen. The UAE and its corporate entities have been highly active since late 2020 in developing global partnerships to expand the local hydrogen value chain. This report presents an analysis of the hydrogen industry in the UAE covering strategic opportunity, market development, projects and partnerships, and cost-competitiveness. Read the full report here*




**HAVING IT BOTH WAYS: GCC OIL FACES PEAK DEMAND**
Authored By: Antoine Halff and Robin Mills

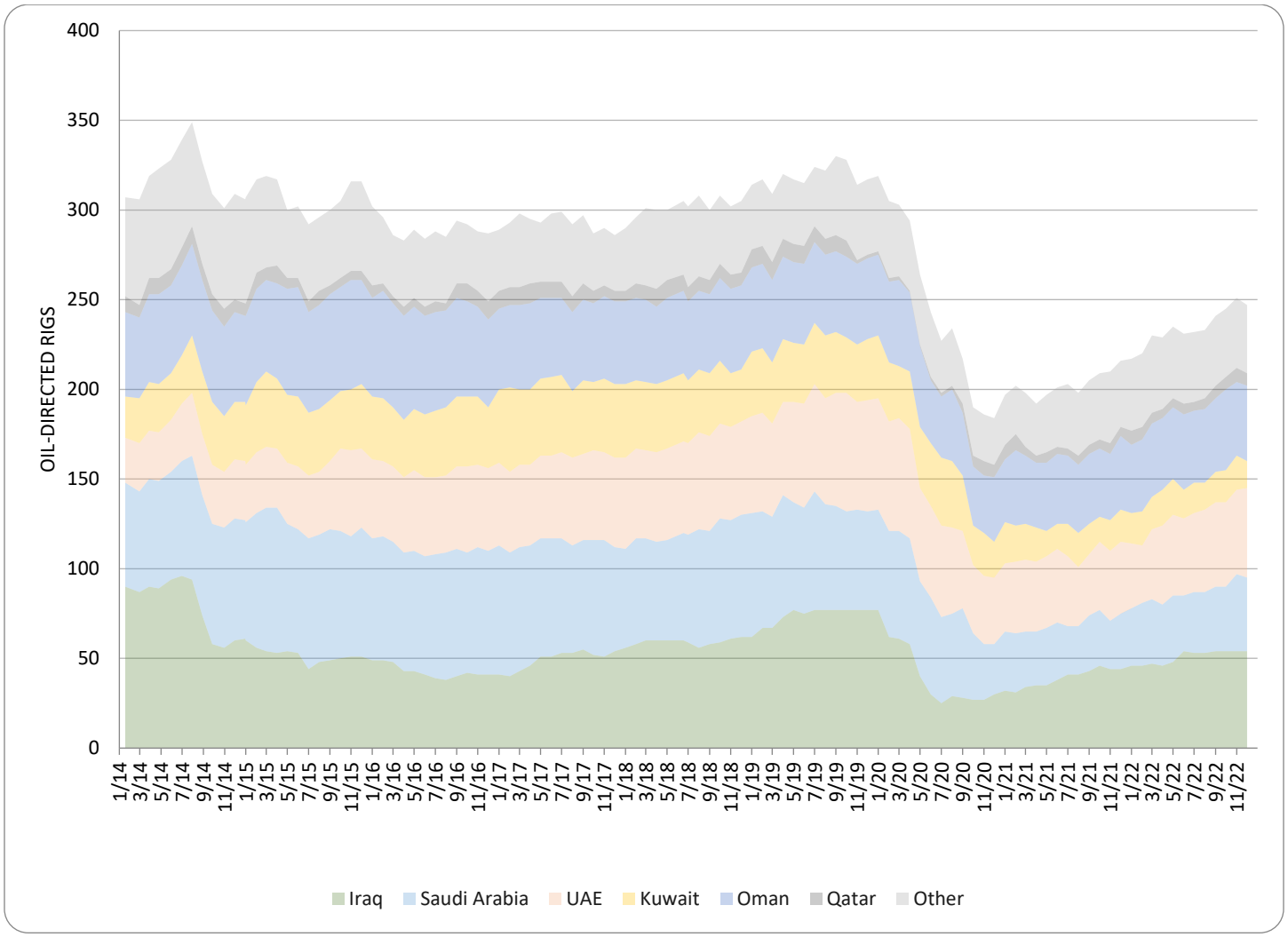
*This paper, part of the work by Columbia University's Center on Global Energy Policy on oil and Gas and the energy transition, examines two broad actions being taken by petrostates to remain relevant in a decarbonizing world: demand defense and demand creation. It also focuses on global efforts to address climate change offering difficult choices for the oil- and natural gas- reliant economies of the GCC. Read the full report here*




**ENERGY THIS WEEK, THE NATIONAL NEWSLETTER**
Authored By: Robin Mills

*Energy this Week is a weekly newsletter authored by Robin Mills, published every Wednesday. Some of the topics covered under the latest newsletter are: the debate continues over energy sector underinvestment, cryptocurrencies face energy challenges, forecasters see a short-term oil surplus – are they correct? 'A new global energy economy is emerging'. Read and subscribe to the Newsletters here*

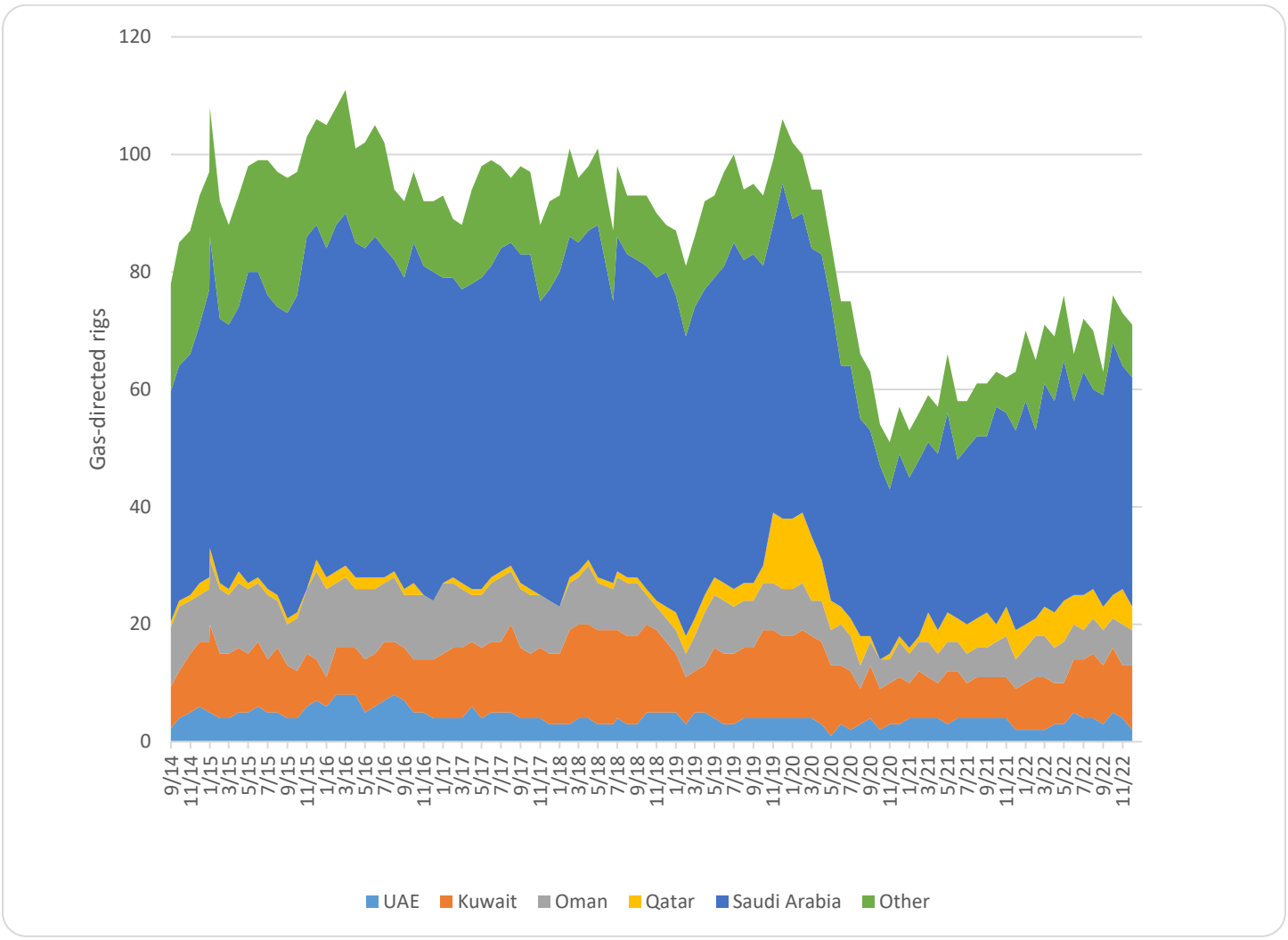
# RIG COUNT SNAPSHOT: **OIL**




- Total Middle East rig count dropped by -8 to 323 in December as OPEC countries agree to cut production.
- Iran had a two-month high in oil exports during November and December, with overall exports hitting 1.23 Mb/d in November 2022 and dropping down to 1 Mb/d in December. The recorded export increase last month to 1.4 Mb/d however remains unexplained.
- Iraq saw no change in its oil rig count since September 2022 (standing at 54); however it expects to reduce this count as it shuts down refineries and production fields to match OPEC cut.
- UAE oil rig count increased by 3 to a total of 50 in December, the highest since late 2022 but still below pre-Covid levels.
- Kuwait's rig count dropped from 19 to 15 in December; however rig count has been fluctuating all year long.
- Saudi Arabia's rig counts in November and December reached 43 and 41 respectively, the highest since September 2022.
- Oman's oil rig count increased by 1 reaching 42 in December, lower than the stable value of 45 pre-pandemic.

**Source:** Baker Hughes; OPEC

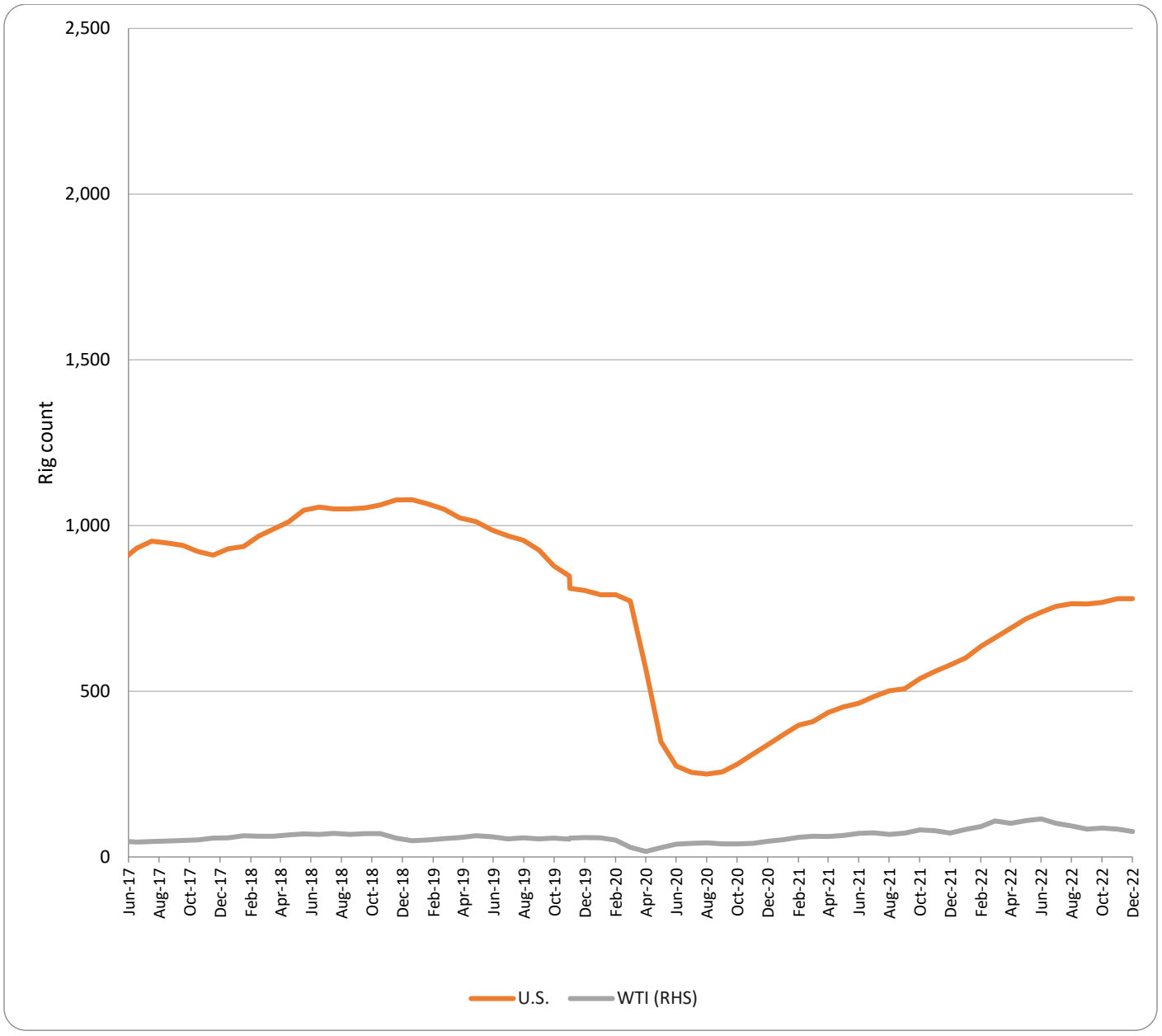
# RIG COUNT SNAPSHOT: **GAS**




- The Middle East's overall gas rig count decreased by -2 in December to 73, higher than 51 in November 2020. This is still much lower than the pre-Covid average of 99.6 in 2019.
- Oman's rig count decreased to 6 in December; however renewal of LNG deals will likely increase the count in 2023.
- Kuwait's rig count jumped back to 11 after having dropped down to 9 in November. While not reaching pre-pandemic levels, 11 rigs is the highest it has been since 2020.
- The UAE's December rig count drops down to 2 rigs. ADNOC's new LNG plant in Fujairah aims to bump its production up to 15.6 Mtpa by 2028.
- Qatar dropped down -2 to a total of 4 rigs after its +2 rise in November.
- Saudi Arabia's rig count increased by 1 in December to 39; these values are lower than pre-Covid. Saudi Arabia plans to develop its Jafurah shale gas to 2 Bcf/d of gas, 418 MMcf/d of ethane and 630 kboe/d of gas liquids as part of its 2030 plan to cut the use of oil in power generation.

**Source:** Baker Hughes; OPEC

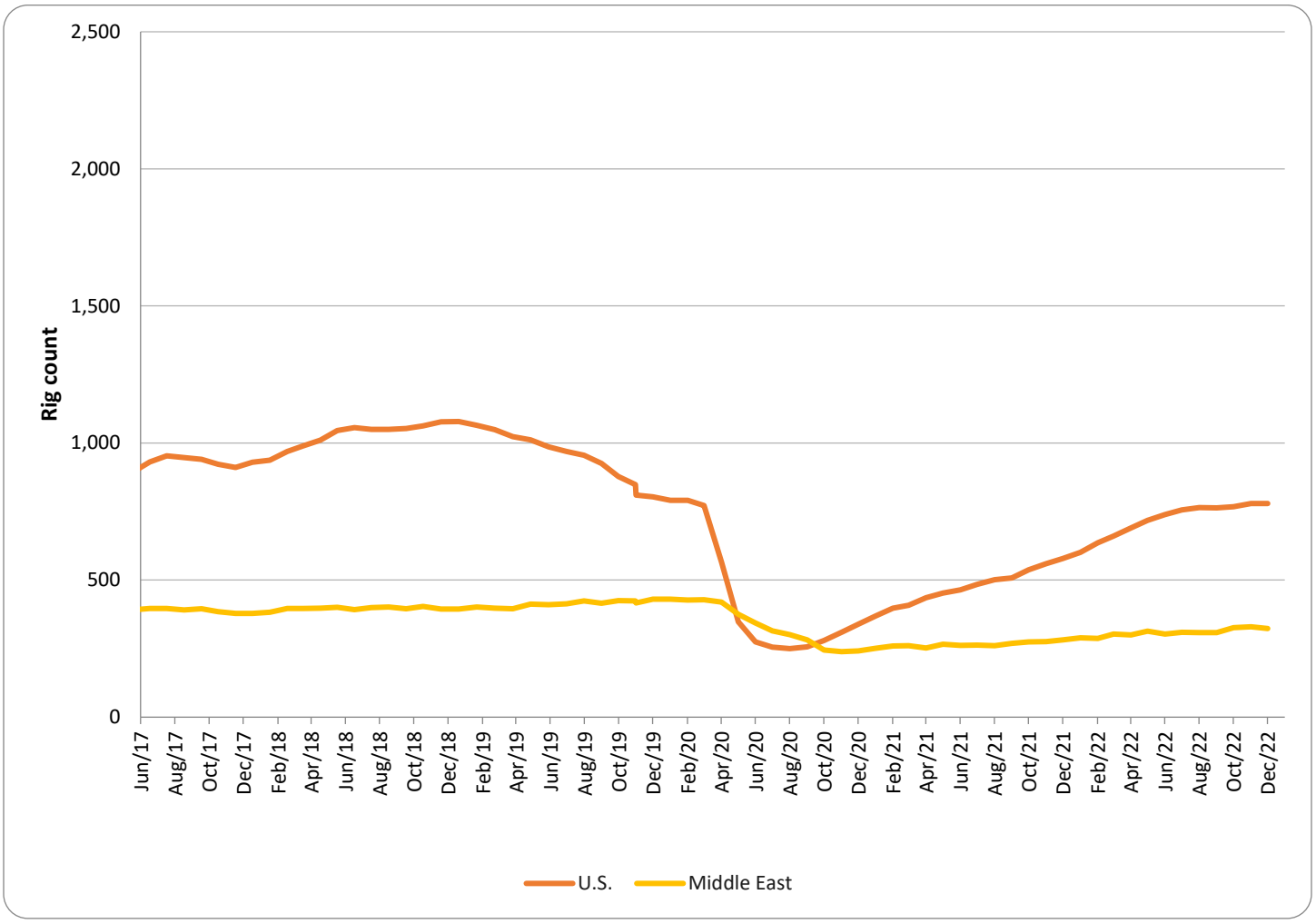
# RIGS VERSUS OIL PRICES: **US RIGS & WTI**




- Rig count in the US was maintained at 779 as 2022 ended. December 2022 saw some reduction in rig output with the eastern Marcellus and Utica by 2 and 1 respectively, and a 1.46bn cfd reduction during the 19th of December from the Bakken rigs due to freezing weather despite increasing rig counts. A 300 kb/d reduction was also a result of the storms in North Dakota.
- As weather conditions improve and production resumes, the US expects to increase its crude production from 11.88 Mb/d in 2022 to 12.44 Mb/d in 2023.

**Source:** Baker Hughes, EIA

# RIG COUNT: **US & MIDDLE EAST**



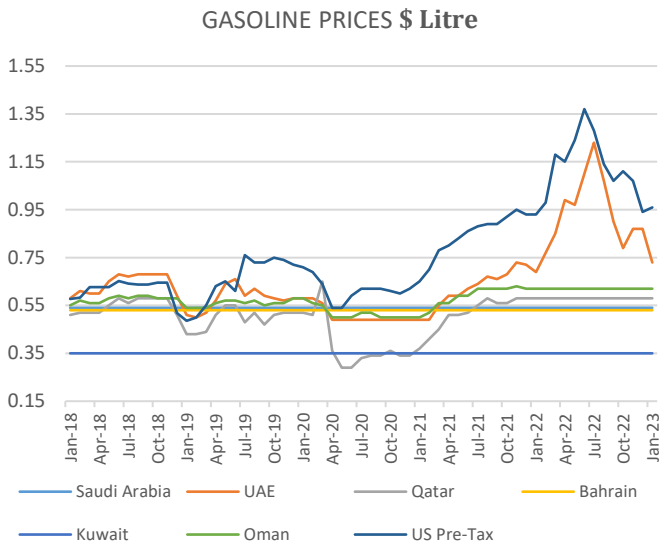

- Rig count in the US saw a -7 decrease in January after a flat from November to December in 2022. Overall count was up 171 y-o-y.
- Total Middle East Rig count increased from 282 in January 2022 to 323 by end of December 2022 with Iraq leading the oil count growth and Saudi Arabia in gas and overall count.

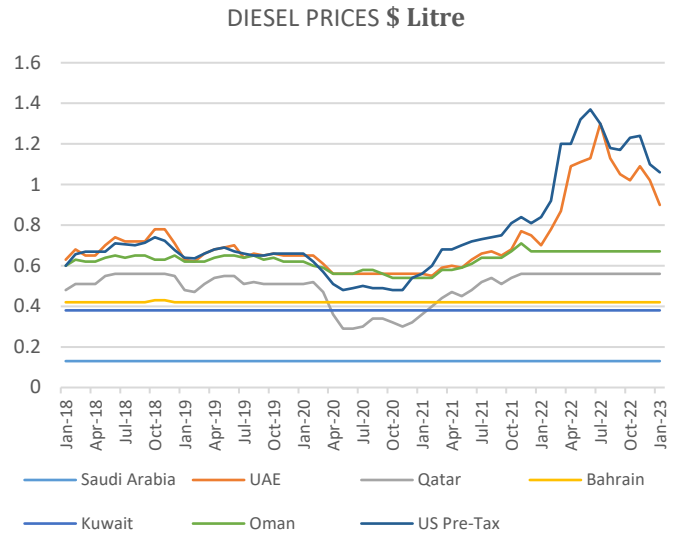
**Source:** Baker Hughes

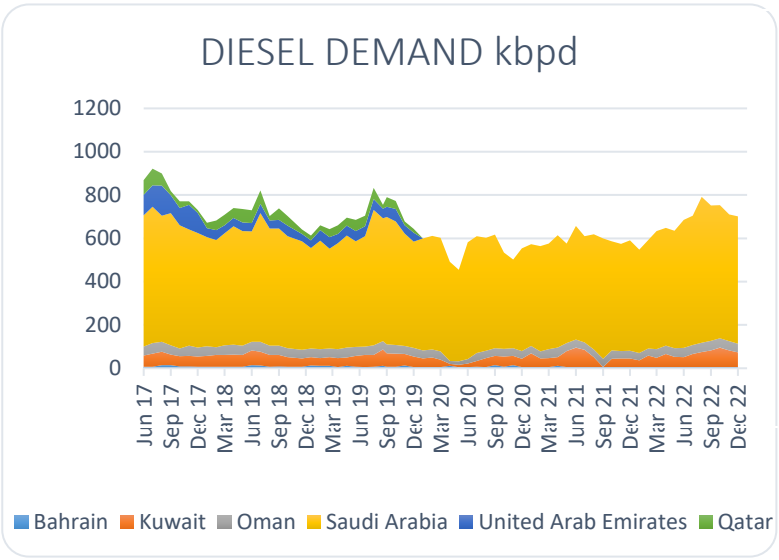
# FUEL PRICES & SUBSIDY REFORMS

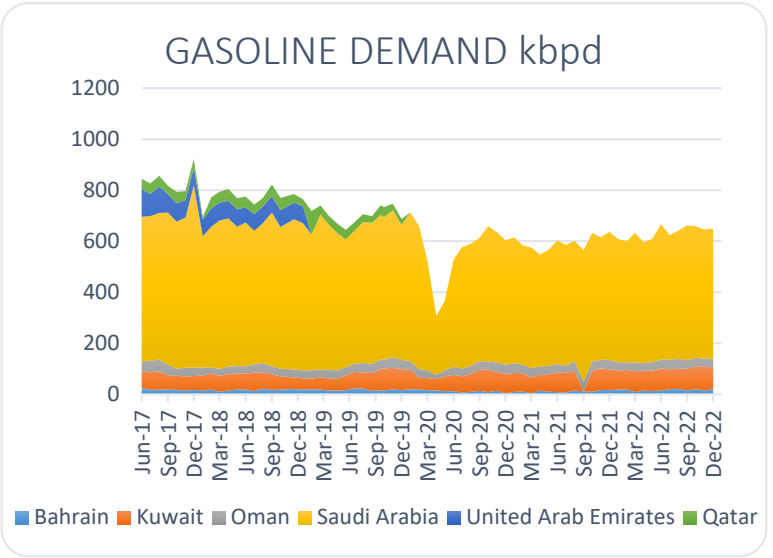
- In the UAE, gasoline and diesel January prices decreased from $0.87 and $1.02 to $0.73 and $0.9 per litre respectively, prices finally decreasing after an 8 month high due to a fall in global prices.
- In Qatar, January prices for gasoline and diesel have been set at $0.58 and $0.56 per litre respectively since November 2021 and maintained since.
- In Oman, gasoline and diesel prices have been set at $0.62 and $0.67 per litre respectively since December 2021.
- In Saudi Arabia, gasoline price is stable at $0.62 lower since June '21, when the government introduced VAT on local fuel prices to boost the economy. The price of diesel increased from $0.17 in December 2022 to $0.20 in January 2023.

The following charts represent the prices of gasoline 95 and diesel ($/litre) till January 2023 in the GCC countries.



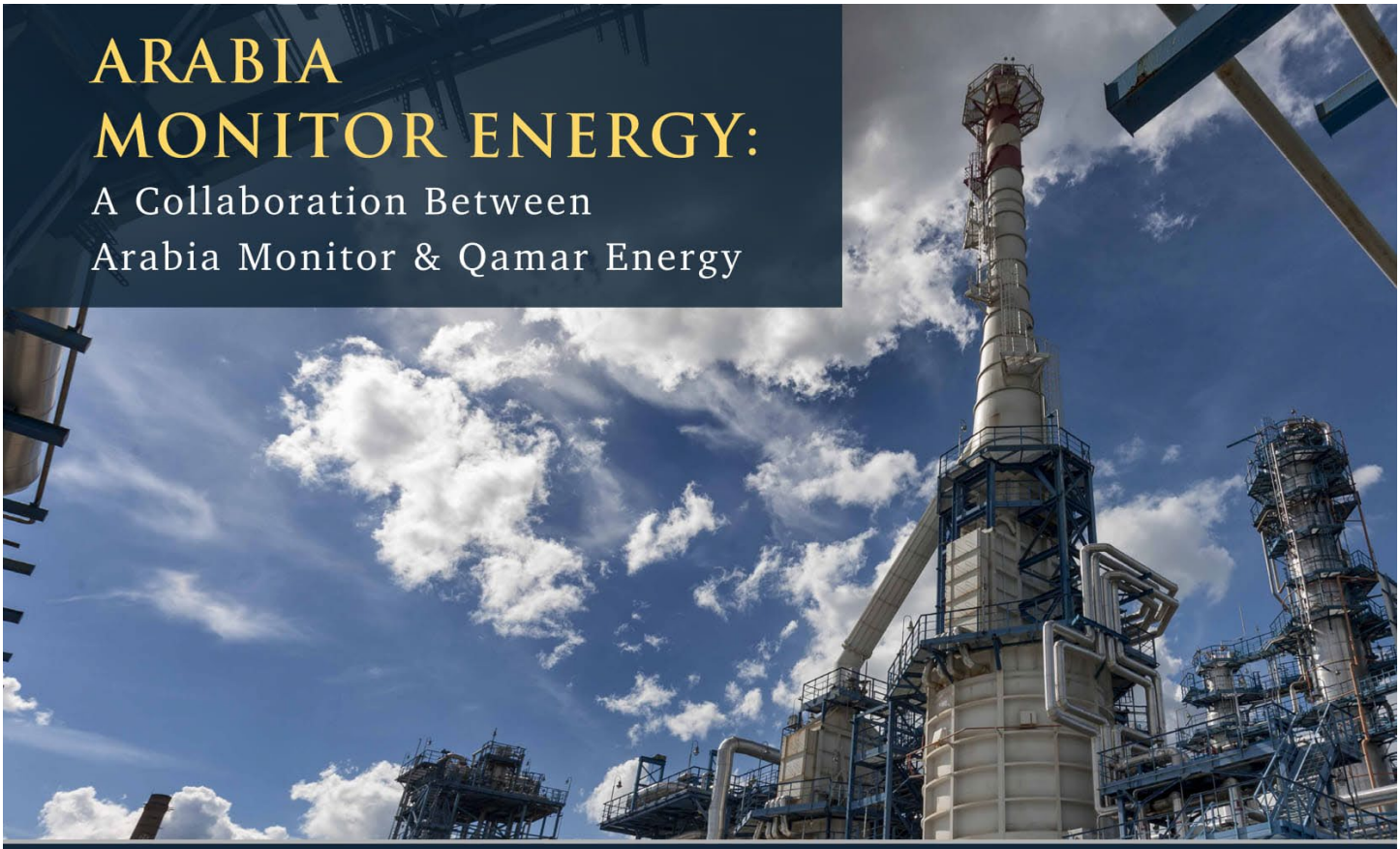



# ARABIA MONITOR ENERGY:

## A Collaboration Between Arabia Monitor & Qamar Energy



## ARABIA MONITOR ENERGY

Oil and gas tensions in the Middle East continue to influence the volatility of the world's energy markets. The Arabia Monitor Energy, a novel collaborative effort by Qamar Energy and Arabia Monitor, combines macroeconomics, geopolitics and energy intelligence to explain what the region's energy geo-economics mean for business.

## WHAT SETS IT APART?

### 1. INSIDE OPEC

Focussed assessment of the month's OPEC developments, policy advancements and strategies.

### 2. NOC & IOC ANALYSES

Examination of factors affecting NOC and IOC policies, and their impact on regional diversification schemes.

### 3. SPOTLIGHT THIS MONTH

Targeted reading of the geopolitical, macroeconomic and energy landscape of a MENA country utilising our specialised energy intel.

### 4. SCENARIOS TO WATCH

Detailed forecast of global oil developments and their impact on the risks and opportunities for MENA's oil production.

### 5. STRATEGIC IMPLICATIONS

Concise summary of major oil trends and their effect on investment strategies under bearish, bullish, and wobble scenarios.

### 6. OUTLOOK FOR THE YEAR

Cohesive outlook of the oil production, gas production, renewable energy projects, and geopolitics of key MENA countries.

## WHO BENEFITS?

### ENERGY TRADERS

- What factors will contribute to oil and gas price fluctuations?
- What is the outlook for oil and gas pricing?
- What is the outlook for OPEC's production and export strategy?
- How are NOCs adapting their oil marketing strategies?

### INVESTMENT AND RISK ANALYSIS

- What are the operational risks and investment opportunities in MENA?
- How do economics, politics, government policy changes, production and export bottlenecks contribute to risk mitigation?

### UPSTREAM FIRMS

- What are the chief economic, political and fiscal regime factors driving/limiting upstream investment decisions and progress?
- What are the oil supply outlooks for the countries by project?

### DOWNSTREAM FIRMS

- What are the demand challenges, patterns, and trends for oil and oil products?

### NATIONAL OIL COMPANIES

- What are future oil and gas pricing trends?
- What developments will intensify or weaken demand?
- What are IOCs' incentives and drawbacks in operating in the country?

### ALTERNATIVE / RENEWABLE ENERGY ORGANISATIONS

- What are the challenges to renewable energy targets?
- What is the progress of major renewable energy projects?
- Are there opportunities for more entrants?

## THE DELIVERABLES

### 8 MONTHLIES

- Oil Price Scorecard
- Headline Developments
- Spotlight this Month
- Scenarios to Watch
- Projects in the News
- Macro Dashboard for Oil Exporters/Importers
- Outlook for the year

### 4 QUARTERLIES

- MENA Map as per Political Grouping
- Map of New Licensing Rounds
- Political & Regional Security Issues
- Oil & Gas Prices Outlook
- Global Barriers to Oil & Gas Production
- Deep Dive into OPEC & NOPEC
- MENA Energy Investments
- MENA Energy Fiscal System
- MENA Energy Upstream Bidding map
- MENA Economic Outlook
- Probability Scorecard for Bearish & Bullish Oil Supply/Demand
- Investor Implication Scenarios (Under 3 Oil Price Dynamics)

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- IMPROVING OPERATIONS/PRODUCTIVITY
- MAXIMISING REVENUE
- INCREASING SUPPLY NETWORK AGILITY

DEBOTTLENECKING SHORTCOMINGS

# OPEC WATCH

| OPEC Production | OPEC+ Compliance |
|---|---|
| • A 91 kb/d m-o-m OPEC-13 oil production increase was estimated from November to December resulting in an average 28.97 mb/d.<br>• Following a 900 kb/d demand fall in 4Q22 for OECD countries (non-OECD had a 500 kb/d increase meanwhile), global demand is expected to reach 101.7 mb/d even though supply is set to decrease 1 Mb/d. OPEC+ production drops by 870 kb/d due to Russia.<br>• Nigeria lead the production increase from November to December by a 91 kb/d increase. Kuwait meanwhile cut theirs by 35 kb/d.<br>• The UAE, Iraq, and Algeria also followed Kuwait's production cuts, with a 9,000, 4,000, and 11 kb/d decrease. | • OPEC+ overall compliance reached 161% in December, with Gulf countries scoring the highest compliance rates. The increase in production (up 120 kb/d from November) can be attributed to Nigeria's recovery. Overall compliance still down from 163% in November as OPEC-10 production missed the target by 780 kb/d.<br>• Despite crude theft and unsecured oil wells, Nigeria pushed production from 1.18 Mb/d in November to 1.35 Mb/d in December.<br>• Iraq was able to reach its quota, producing 4.431 Mb/d in December, reducing overall production through closing refineries (crude sent dropped to 677 kb/d) rather than reducing exports. |

| OPEC Production, Mb/d | | | Non-OPEC Production[1], Mb/d | | |
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| November | December | Change (%) | November | December | Change (%) |
| 28.88 | 28.97 | --0.310 | 67.14 | 65.91 | --1.80 |

**Latest Organisational Changes**

- Expecting an economic recession in 2023, OPEC+ decided to maintain the production cut decision made in October by an overall 2 Mb/d from November 2022 until the end of 2023 for stabilisation. This is in line with the 0.1Mb/d OPEC+ growth to 2.3Mb/d for 2023and non-OPEC's 1.9 Mb/d increase to offset declines in Russia amid price caps and sanctions. Market is expecting volatility due to predicted demand increase in China as Covid restrictions are eased.
- The US is expected to lead the growth in supply as they near pre-pandemic levels of oil drilling; however the effects of inflation and problems in the supply chain may limit this to a 0.59 Mb/d rise. The US is followed by Brazil, Canada, and Guyana.
- The 35th OPEC and non-OPEC Ministerial Meeting will be held on June 4th, 2023 while the 47th JMCC Meeting will be on February 1st, 2023.

# KEY MENA ENERGY SCORECARD

## Abu Dhabi Developments

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| Oil & Gas | • ADNOC pushes new LNG plant construction in Fujairah to bring total capacity up to 15.6 Mtpa by 2028 and make the UAE the 2nd largest LNG exporter in the GCC.<br>• ADNOC to bump up offshore and onshore crude exports to 2.5 Mb/d each as spare capacity stands at 1.3 Mb/d ahead of expected supply crunch. |

[1] Excluding OPEC NGL and non-conventionals

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| | • ADNOC announced during ADSW that work has begun on its $CO_2$ injection well in carbonate saline aquifers. Initial capacity is set at 18,000 tpa, a small part of bringing ADNOC's total carbon capture capacity to 5 Mtpa from 800 ktpa.<br>• ADNOC announces its flagship company ADNOC Gas which will combine the ADNOC Gas Processing and ADNOC LNG operations into one company. |
| Alternative Energy | • Emerge and Coca-Cola Al Ahlia Beverages agree to develop a 1.8 MW solar PV project consisting of ground, roof, and car park panel installations, bringing Emerge's total capacity to 25 MWp.<br>• Masdar signed agreements with Angola, Uganda, and Zambia during Abu Dhabi Sustainability Week (ADSW) for the development of renewable energy projects totalling 5 GW across the three countries under the Etihad-7 initiative.<br>• Emirates Water and Electricity Company (EWEC) set forth a RFP for its Al Ajban Solar PV project in Abu Dhabi with a 1500 MW capacity. RFP replies expected until end of Q1.<br>• A feasibility study for the evaluation of Sustainable Aviation Fuel (SAF) produced using municipal waste and green hydrogen was agreed for between Masdar, Etihad Airways, bp, ADNOC, and Tadweer.<br>• Kazakhstan's Ministry of Energy signed an agreement with Masdar and the Kazakhstan Investment Development Fund (KIDF) for the development of a 1 GW wind farm, starting off at 500 MW capacity.<br>• Al Fattan Energy and South Korea's LTechUVC hydrogen consultancy agree to develop a 200 MW green hydrogen and ammonia project in KEZAD, Abu Dhabi. A MoU was signed between ADNOC and the Korea National Oil Corporation (KNOC) for renewable energy project cooperation.<br>• The State Oil Company of the Republic of Azerbaijan (SOCAR) in agreement with Masdar will develop 4 GW worth of renewable energy projects including offshore wind and solar PV plants. The agreement was signed during ADSW 2023.<br>• Masdar and The Netherlands target the aviation, steel, and shipping industries through the development of a green hydrogen supply chain. Four MoUs were signed between Masdar and the following Dutch companies: Port of Amsterdam, SkyNRG, Evos Amsterdam, and Zenith Energy.<br>• Masdar and Kyrgyzstan's Ministry of Energy for the development of 1 GW worth of renewable energy projects, starting with a 200 MW solar PV plant. |

## Kuwait Developments

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| Oil & Gas | • Kuwait expects to send 2.5 MT of diesel to the EU this year as Russian supplies decline due to sanctions. Averaging 50 kb/d, this amounts to five times the regular delivery.<br>• Technip Energies renews five-year agreement with the Kuwait Oil Company (KOC), obtaining another five-year agreement to cover all FEED operations and project management of KOC projects, with the agreement value set at a $267m minimum. |
| Alternative Energy | • The National Bank of Kuwait (NBK) aims to become carbon neutral by 2060, the first financial institution in the country. NBK has set two milestones on the way: a 25% reduction in gross operational emissions by 2025, and net zero operational emissions by 2035. |

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| | • KOC and Worley Consulting signed an agreement to explore renewable energy production in Kuwait through a feasibility study to increase the country's generating capacity and reduce carbon emissions for its net zero goal.<br>• Kuwait plans to reorganise its Ministry of Electricity, Water, and Renewable Energy under a new independent corporation to increase focus on renewables projects and reduce government spending. The Ministry looks to invite global companies to bid. |
| **Qatar Developments** | |
| Oil & Gas | • QatarEnergy acquired a 30% stake in the TotalEnergies' and Eni offshore gas exploration consortium in Lebanon. The blocks, block 4 and 9, in Lebanon's waters expect drilling of the Qana gas prospect near the Israeli maritime border to begin in 3Q23.<br>• QatarEnergy and Chevron announce Qatar's largest petrochemical project which will be the largest ethane cracker in the region; its first direct venture in the sector in 12 years. This $6bn project aims to begin production in 2026 and increase polymer output to over 4 MTpa from 2.6MT. |
| Alternative Energy | • Nikkiso Clean Energy & Industrial Gases Group to open new centre in Business Innovation Park in Ras Bufontas, Qatar. Nikkiso aims to provide support to local firms for LNG, ammonia, and industrial gases along with sustainability efforts such as energy efficiency and waste heat recovery solutions<br>• Qatar looks to join in on TotalEnergies' $27bn worth of energy projects in Iraq, hoping to acquire a 30% stake in the deal. No confirmation has been made from either TotalEnergies' or QatarEnergy's side.<br>• JA Solar and Samsung C&T to supply 1.6 million DeepBlue 3.0 high efficiency solar PV modules to Qatar's 875 MW project. Split at 417 MW in Mesaieed Industrial City and 458 MW in Ras Laffan Industrial City, this project, which is Qatar's largest PV plant, is set to operate in 2024. |
| **Federal Iraq Developments** | |
| Oil & Gas | • Iraq to improve gas terminals and increase capacities to at least 3.5 Mtpa to raise exports following record export in 2022 (3.311 Mtpa at $115bn).<br>• Iraq sets plan to build 4000 MW worth of CCGT power plants over the next two years.<br>• Four year old agreement with Siemens Energy revived as 6 GW capacity projects to be developed in the next 5 years to support the struggling power sector through conventional and renewable power plants. 2-3 MoUs were signed. |
| Alternative Energy | • Iraq and France sign a strategic agreement to improve cooperation in the energy and security sectors. |
| **Saudi Arabia Developments** | |
| Oil & Gas | • Alfanar signs deal with Daewoo Engineering & Construction Co for project exploration in Saudi Arabia for oil, gas, and petrochemicals.<br>• The Industrialization and Energy Service Company (TAQA) finalises its purchase of Al Mansoori Petroleum Services, expanding its portfolio of services and spreading its reach across the MENA, Central Asia, and East Europe.<br>• Saudi Aramco makes full use of the 6th In-Kingdom Total Vade Add (IKTVA) forum to sign $7.2bn worth of deals and MoUs, totalling up to over 100 agreements. |

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| | • Saudi Aramco fully acquires Motiva Trading and launches Aramco Trading Americas to become the sole offtaker of the oil refinery at a 630 kb/d crude capacity.<br>• JGC Arabia awards 2-year deal to Gas Arabian Services (GAS) for Saudi Aramco's Zuluf Onshore oil facilities project. GAS is to supply pre-assembly structuring services and installation for Zuluf's expansion, pushing capacity from 800 kb/d to 1.4 Mb/d, from Arabian medium to heavy crude.<br>• Saudi Arabia extends $4.44bn oil derivative purchase deal made in 2019 with an added $1bn this year to Pakistan. The deal aims to provide financial support to the economy.<br>• Arabian Drilling obtains a 5-year, $173mn contract from Saudi Aramco. Starting from 3Q23 Arabian Drilling will supply an offshore jack up unit for offshore drilling in Saudi Arabia. |
| Alternative Energy | • Saudi Arabia announces that all new gas-fired power plants are to require CCUS technology.<br>• Mitsubishi Power announces completion of local Blade and Vane service centre at the Dammam facility for gas turbines.<br>• The Saline Water Conversion Corporation (SWCC) signs deal with Carbonco for cooperation in CCUS research for the country's seawater desalination plants.<br>• Al Ghazala Energy's, a subsidiary of Jinko Power Technology Co, announces financial close of 300 MW solar project and start of construction.<br>• NEOM to work with Space Solar to develop the first ever solar power station in space, aiming to have a working 6 MW trial project within 6 years.<br>• ACWA Power signs two project deals with Uzkimyosanoat: a 3 tpa green hydrogen facility to be added to the existing Chirchiq ammonia plant, and a new 500,000 T green ammonia project.<br>• Saudi Arabia announced 1T Riyal ($266bn) investment plan to accelerate clean energy production and achieve 600 GW of renewable energy by 2030 (currently at 700MW).<br>• Elsewedy Electric signs $176.1mn deal with Al Ghazala for the construction of a 300 MW solar power plant (Saad solar) to be up and running by Q3 of 2024.<br>• ACWA Power signs MoU with Verbund for green hydrogen development to be used in Central Europe from green hydrogen projects in the Middle East.<br>• Saudi Arabia to expand its nuclear power sector after recent discovery of large uranium deposits in the Kingdom.<br>• Advanced United Systems (AUS) acquires Aluminium Bahrain's (Alba) 6MW solar farm consisting of 11,300 PV panels in a 37,000 $m^2$ space.<br>• Netline to produce solar PV panels for NEOM's The Line city starting at Q3 or Q4 of 2023 with total costs of $3.5mn.<br>• The Saudi Power Purchasing Company (SPCC) to re-tender the Taiba IPP and Qassim IPP projects into four smaller projects totalling up to 7200 MW capacity (each at 1800 MW). RFPs to be set at January 20 and new bidders are welcome present bids. |
| **Oman Developments** | |
| Oil & Gas | • Maha Energy and Mafraq Energy sign a Joint Operating Agreement for production of Block 70, an onshore block in the Ghaba Salt Basin.<br>• Oman LNG secures a 10-year deal with BOTAS Petroleum to supply 1.4bcm from 2025 onwards. |

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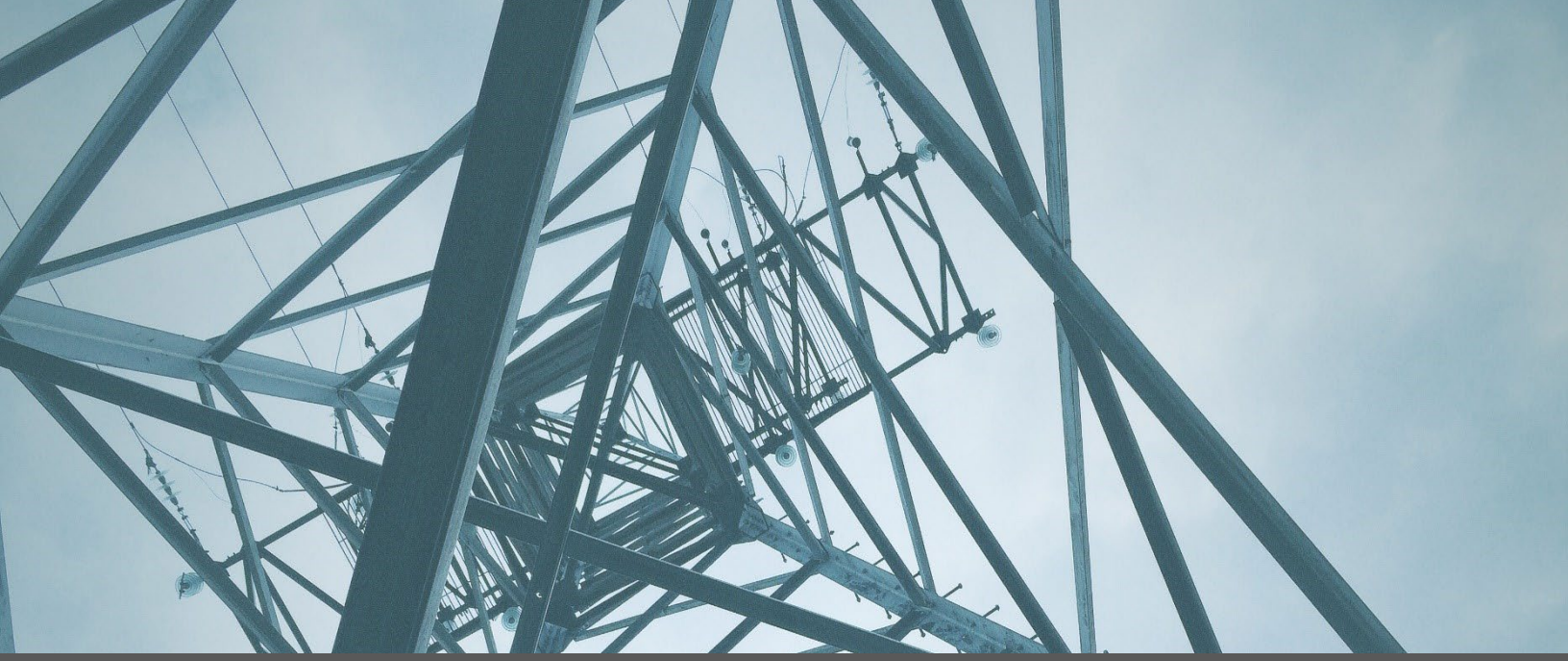
| | • OQ owned oil Block 60 in Bisat inaugurated on the 26th of January which will bring total production growth to 60 kb/d.<br>• Expected budget deficit leads OQ to sell a 49% stake of its onshore service Abraj Energy. This IPO hopes to reel in $500mn.<br>• TotalEnergies, OQ, and Shell owned onshore Block 10 in Mabrouk North-East field hit first gas on the 18th of January and is set to reach 500mn cfd by mid-2024.<br>• Oman LNG to supply PTT Global LNG Co and TotalEnergies' with 0.8 Mtpa for 9 years from 2026 onwards and 0.8 Mtpa for 10 years from 2025 onwards respectively.<br>• Shell Oman signs two agreements: a Letter of Intent with the Ministry of Energy and Minerals to explore liquefied synthetic gas (LSG) use in Oman, and a 10-year offtake agreement with Oman LNG to buy 0.8 Mtpa from 2025 onwards. |
| Alternative Energy | • Oman Energy Development Company's (EDO) Hydrom brings in 180 interested parties for investing in solar PV and wind energy projects for green hydrogen production. The project is providing a total of 50,000 $km^2$ of land across Dhofar and Al Wusta, aiming to produce 1 MTpa of hydrogen. The Special Economic Zone is set to lend a sizeable hand towards meeting sustainability goals through investing in 250 $km^2$ of land in Duqm, Al Wusta for a 300 MW solar + wind farm for hydrogen and ammonia production.<br>• Solar Wadi seeks EPC contractors for its 100 MW commercial-scale solar PV plant in Sohar Industrial City. A REOI has been announced with bids lasting until the 26th of January.<br>• Shell Oman and OQ join to take a 35% stake in the Green Energy Oman project for development of a green hydrogen chain and produce 1.8MT. |

## MENA Energy Pricing Reform

- Bahrain suspends industrial land fees for food storage facilities for three months, briefly suspends supermarket promotional campaign fees, and extends low-income family financial support to January.
- Oman to boost budget reserves through listing 49% of Abraj Energy Services on the Muscat Stock Exchange through an IPO.
- The UAE introduces a taxable income under Corporate Tax Law, set at 9% for incomes over AED 375,000 and 0% below from June 2023.
- The UAE sets $15bn budget for low carbon projects for green transition. ADNOC to push investments to $150bn over next 5 years.



## ABOUT US

Qamar Energy provides leading-edge strategy, commercial and economic consulting across the energy spectrum to governments, international oil companies (IOCs), national oil companies (NOCs), investors, and oil traders.

Robin Mills, CEO

Robin is an expert on Middle East energy strategy and economics, described by Foreign Policy as "one of the energy world's great minds". He is the author of two books, The Myth of the Oil Crisis and Capturing Carbon, columnist on energy and environmental issues for Bloomberg and The National, and comments widely on energy issues in the media, including the Financial Times, Foreign Policy, Atlantic, CNN, BBC, Sky News and others. He is a Senior Fellow with the Iraq Energy Institute, and a non-resident fellow at the Columbia Centre for Global Energy Policy. He holds a first-class degree in Geology from the University of Cambridge and speaks five languages including Farsi and Arabic.

### RECENT TALKS & APPEARANCES

*Erbil Forum 2023 organised by the Rudaw Research Center*
*1st – 2nd March 2023*

*Atlantic Council Global Energy Forum, Abu Dhabi*
*14th – 15th January 2023*

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