

# **WHITEPAPER** November 2022

# What's Next? National Oil Companies' Digital Balancing Act in 2023





Palpable appetite to address the energy trilemma is building amongst national oil companies (NOCs) across the Middle East. This historical epicenter of fossil fuel production needs to simultaneously support global energy security, strive for Net Zero, and thrive commercially – a juggling act of unprecedented importance. Streamlined and efficient digital strategies lie at the crux of making this new era of energy a reality. But a tsunami of priorities risk clouding stakeholders' digital compasses. Pinning down tailored roadmaps that educate, guide, and propel NOCs' journeys into digitalization must be a priority in 2023.

Safety, speed, scalability, savings. All are major benefits that NOCs can maximize by fully leveraging the 4<sup>th</sup> Industrial Revolution (4IR), especially as the norms of energy are dramatically rewritten. Digitalization can support the Middle East's vast hydrocarbon market, a foundation upon which modern civilization is partly built. It can also underpin the region's ambition to build a world-leading ecosystem of renewables and energy efficiency – both fundamental to safeguarding our future.

NOCs' dual remit as commercially successful energy producers and guardians of society mean they are arguably under more pressure than any other energy entity to tick all these boxes. This spotlight is magnified by the one-year countdown to COP28, the world's biggest annual climate gathering, in Dubai in November 2023. Delegates want this unique platform to highlight how much work NOCs across the Middle East are doing to address the energy trilemma; to be seen as innovators, not villains. Realizing this means NOCs need to keep upping their digital know-how and application in 2023 and beyond. Several are thriving and all are trying, but it is not a linear path.

"We are not lacking ideas on what to digitize or decarbonize. The problem is that amid so many opportunities, many NOCs do not know where to start and how to blend these two worlds. What to accelerate? What to scale? Who to work with in which sector? And so on. This leaves some in limbo with pilots and proof of concepts," one delegate explained. Another delegate described the industry's transition as a dance that has a

"Each organization is in a different phase... but those succeeding the fastest tend to have the greatest digital integration."

The exclusive insights shared in this Whitepaper reflect the opinions and outlooks discussed by senior stakeholders in the energy and technology industries at a private roundtable at ADIPEC in Abu Dhabi on 1 November. Gulf Intelligence hosted the event for Emerson under the Chatham House Rule. All quotes are paraphrased and any further use of this material must cite this Whitepaper and Emerson in full.

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set date (i.e., Net Zero by 2050), but there are still few confirmations on where, who, or what will be involved in the dance. This leaves attendees trying to prepare for all eventualities: a time-consuming and frustrating route. Governments across the Middle East can help by providing more clarity, ambition, and incentives in their policymaking, all of which would funnel more financial and intellectual capital towards the energy-digitalenvironment nexus.

"We are often pushing against policies that are not fully robust, or there is no policy at all. This can feel like pushing water uphill, which means digital adoption is slower than we would like," a delegate said. All delegates agreed there has undoubtedly been meaningful progress in recent years. Such momentum helps set a vigorous benchmark for others in the industry, both regionally and internationally (see page 4: Successful foundations). However, these tend to happen in pockets around the region in a small number of NOCs, whereas widespread, scalable, and fungible headway is needed.

A zest for innovation amongst technology and energy stakeholders means the 'menu' of digital options is always expanding and maturing, from digital twins, the Internet of Things (IoT), and big data to predictive analytics, artificial intelligence (AI), and others. All and more can accelerate sustainable progress during the energy trilemma, a challenge that calls for as many smart solutions as possible. Broadly speaking, digital technologies boost performance by enabling optimization and automation. Optimization involves increasing the number of sensors that collect data,



### "Nice words...nice commitments...limited action. Energy and tech leaders must avoid this combination as the one-year countdown to COP28 in Dubai begins."

broadening bandwidth, and structuring computing capacity so that relevant data informs better decisionmaking at regular frequencies. Automation, on the other hand, uses machines instead of people to maintain equipment in high-risk offshore operating environments. All these features apply to today's energy basket and any other avenues that emerge in the industry's unique chapter of innovation.

#### START SIMPLE, AIM BIG

NOCs would greatly benefit from embracing a steady and determined method to building and then following their structured digital roadmaps. There are many distractions and conflicting opinions in circulation and trying to meet the criteria of each one will soon exhaust even the most dedicated energy and / or tech stakeholder. Find your digital edge and commit to it, delegates advised. Equally, NOCs must appreciate this will take some time as instilling digitalization into a large company's second nature is a marathon, not a sprint. Ensuring the roadmap is tailored to the NOCs' needs and goals is key, each digital step building upon the last – resulting in a cohesive fluidity on the decades-long journey to Net Zero. Making sure these details are entirely clear should be NOCs' focus in 2023. NOCs can pick up their pace of application from 2024 onwards, confident they are moving in the right direction for them.

This relatively new road for many NOCs comes on the back of turbulent energy prices, geopolitical uncertainty, a stringent climate agenda, and for some, a talent shortage. Still, NOCs have shown great ingenuity when under pressure before. When oil prices and revenues plummeted in 2016, it was the community of NOCs that reacted most proactively and effectively and the same agility was evident during the industry's response to the COVID-19 crisis, delegates said. These corporate giants' ability to pivot is vital to sustaining their elite position during the energy transition, one that invites an increasingly diverse array of competitors.

#### STRONGER TOGETHER

Alliances have long been embedded in NOCs' operational norms. Now, they need to evolve faster to specifically

### SUCCESSFUL FOUNDATIONS

NOCs that welcome digitalization often have great success, such as the \$1.1bn of business value generated by ADNOC's Thamama Center of Excellence since its inception in 2017. Thamama is a key part of the company's investments in advanced technology and digitalization to boost efficiency. Plus, the world's largest three-dimensional (3D) seismic survey of Abu Dhabi's subsurface through Thamama enabled drilling and the potential for oil and gas production, while more than \$1bn of value has been generated by another one of ADNOC's digital transformation initiatives, the Panorama Digital Command Center. To the north, state-owned Sharjah National Oil Corporation (SNOC) launched a 3D Seismic Onshore Survey in 2016, leading to the Emirate's first gas discovery in 37 years.

To the west, Saudi Aramco's Digital Transformation program since 2017 has accelerated progress and helped the company coordinate its digital projects and initiatives within flagship programs. For example, the world's biggest oil exporter cut 18% of its overall energy consumption in the Khurais oil field by deploying more than 40,000 sensors to monitor more than 500 oil wells, creating the world's first Advanced Process Control (APC) for a conventional oil field. Meanwhile, the use of big data and AI has contributed to Saudi Aramco achieving more than a 50% reduction in its flaring since 2010. This has helped the company maintain an industry-leading flare volume of below 1% of total raw gas production for the past decade.

While delegates called for a stronger region-wide approach to digitalization, they also applauded the aforementioned successes and nod to how several NOCs were very early adopters. For one, state-owned Kuwait Oil Company (KOC) launched the Kuwait Integrated Digital Field (KwIDF) pilot project its Burgan Field twelve years ago. Such forward-thinking reflects how much more all NOCs could achieve with targeted and modernized digital roadmaps.



### ULTIMATE BALANCING ACT

## 50%

of the world's oil and gas production is from NOCs and they control nearly 60% of proven reserves, which means they have the greatest opportunity to drive positive disruption.<sup>1</sup>

### 75%

of the world's greenhouse gas (GHG) emissions today are attributed to the energy sector.<sup>2</sup>

# 102.73mn b/d

is the amount of oil the world is expected to consume in 2023, higher than the pre-pandemic rate during 2019.<sup>3</sup>

### 2.4%

rise in global electricity demand is anticipated this year, on top of the 6% rise in 2021.<sup>4</sup>

## 2050

Digital technologies could deliver up to 20% of the reduction in CO<sub>2</sub> emissions needed to hit the International Energy Agency's (IEA) Net Zero trajectory in the energy, materials, and mobility industries.<sup>5</sup>

### 23

The global volume of data could reach 175 zettabytes by 2025, which is equivalent to a stack of Blu-ray discs reaching the moon 23 times<sup>6</sup> – approximately 8.9mn kilometers.<sup>7</sup> Effectively managing this numerical knowledge is essential.

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years left until the global economy is expected to be 30% larger, yet needing to use 7% less energy to have a chance of Net Zero by 2050.<sup>8</sup>

\$4trn

of annual clean energy investments are needed worldwide by 2030 to make Net Zero emissions by 2050 a possibility.<sup>9</sup>

### \$12trn

could be saved by transitioning to a decarbonized energy system by 2050, compared to continuing our current level of fossil fuel use.<sup>10</sup>

**80%** fall in the global price of solar power since 2010 has largely been powered by more advanced and efficient technologies.<sup>11</sup>

4 countries in the Middle East have set Net Zero goals: UAE (2050), Oman (2050), Saudi Arabia (2060), and Bahrain (2060).

**18** countries worldwide have woven their Net Zero goals into law. No Middle Eastern country has yet taken this step.<sup>12</sup>

Sources: 1 IEA; 2 IEA; 3 OPEC; 4 IEA; 5 World Economic Forum; 6 Deloitte; 7 Gulf Intelligence; 8 IEA; 9 IEA; 10 Oxford University; 11 World Economic Forum (WEF); 12 Energy and Climate Intelligence Unit.



support stakeholders' exploration and application of digital tools. This includes welcoming a new approach to risk-taking, which encompasses more inter-industry and cross-industry knowledge sharing and collaboration than ever. There are many examples of where this blend already works very well, such as the strategic partnership between state-owned Abu Dhabi National Oil Company (ADNOC) and French major TotalEnergies to explore collaborative opportunities in gas growth, carbon capture, utilization, and storage (CCUS), and trading and product supply. The same applies to Emerson's recent partnership with ADNOC to delve into the former's manufacturing capabilities and other solutions to strengthen the oil and gas sector in the UAE, the third biggest producer within the Organization of the Petroleum Exporting Countries (OPEC). More broadly, international forums with defined objectives like ADIPEC

and the UN's Conference of Parties (COPs), such as the one next year in Dubai, will become more critical than ever in fostering the Middle East's energy-digital-environment ecosystem.

More partnerships – such as NOC-tech, NOC-tech-IOC, NOC-tech-NOC, NOC-tech-academia, and other combinations – are expected over the coming year, as are more joint ventures, mergers, and acquisitions along supply chains. NOCs must also maximize the advantage of working with start-ups and entrepreneurs, a fast-growing part of Middle Eastern economies and one progressively involved in the energy-environment balancing act. For example, start-ups targeting sectors that are responsible for 85% of CO<sub>2</sub> emissions attracted just 39% of investment worldwide in 2021. This year, start-ups in those sectors

### LEVERAGING POTENTIAL

50%

of the reductions in CO<sub>2</sub> emissions in 2050 will come from technologies that are currently at the demonstration or prototype phase, *if* efforts continue at speed.<sup>1</sup>

### \$19.8bn

is expected to be the value of AI in energy markets worldwide by 2031, growing five-fold on 2022.<sup>2</sup>

### 39.1%

compound annual growth rate (CAGR) is anticipated in the global digital twin market from 2022-2030, rising from \$7.48bn in 2021.<sup>3</sup>

#### \$54.4bn is the estimated value of the global market for digital

oilfields by 2030, nearly doubling on \$29.45bn in 2021.4

### 38%

of the CO<sub>2</sub> emission reductions needed in the chemical sub-sector and 15% in both cement and steel could be delivered by CCUS.<sup>5</sup>

### 70%

of new value created in the global economy over the next decade will be based on digitally enabled business models.<sup>6</sup>

## 1,000+

companies in the field of blockchain and metaverse being attracted to Dubai is part of the Emirate's goal to be one of the world's top ten metaverse economies. The Emirate also wants to create 40,000 virtual jobs by 2030, strengthening the region's digital culture and skills.<sup>7</sup>

**#2** The digital

The digital economy already contributes 4.3% to the UAE's economy, the second largest in the Arab world after Saudi Arabia.<sup>8</sup>

## 2017

saw the UAE appoint the world's first Minister of AI, H.E. Omar Sultan Al Olama.<sup>9</sup>

Sources: 1 IEA; 2 Allied Market Research; 3 Grand View Research; 4 Precedence Research; 5 IEA; 6 World Economic Forum (WEF); 7 UAE Government; 8 UAE Government; 9 UAE Government.



### MAXIMIZING THE UPPER HAND

NOCs' desire to gain more digital ground benefits hugely from the region's leadership structure, which delegates said the energy companies should continue to leverage. "The decision-making process from leadership is far, far faster in the Middle East versus the West, where the same decision can take ten times longer," a delegate said. For one, the UAE's fluid approach to development has enabled one of the world's biggest oil producers to excel in the burgeoning field of green energy – a delicate balance to master. Equally, this sets a high tone of expectations that NOCs need to keep meeting, so threading digital tools into their status quo can dramatically accelerate progress during this unprecedented chapter in human history. This is especially crucial in the lead up to COP28, as the level of on-the-ground progress across the Middle East will face extra scrutiny.





### "Ask your customers: "What is the most pressing point that keeps you awake at night?" Then address it with a tailored and collaborative digital plan."

attracted 52% of climate tech investment – a 13% climb year-on-year.<sup>1</sup> This trajectory will accelerate as the region continues to invest in its start-up culture; the UAE wants to be home to 20 start-ups in a range of sectors worth more than \$1bn each by 2032, for example.<sup>2</sup>

As collaborations increase, NOCs and other stakeholders should avoid splitting their digital strategies for "energy of the future", i.e., between fossil fuels and renewables, delegates said. While differences exist, the multifaceted energy basket of the 21<sup>st</sup> Century demands as many complementary digital solutions as possible. Unified efforts that support aspects of all energy markets may focus on curating a realistic digital strategy, or sharpening technical expertise, or driving digital projects, for example. Sharing ideas on how to thread digitalization into both new-build and legacy assets is also paramount in NOCs' digital roadmaps, delegates flagged, acknowledging that established infrastructure may be trickier. Whatever the joint activity, NOCs' overarching focus must be to set clear and measurable steps that achieve a seamless, affordable, and safe digital strategy as soon as possible.

#### **POWER OF DATA**

Enhancing data capabilities is one of the surest routes for NOCs trying to decide what to prioritize in their digital strategies – those "waiting for the details of the dance," delegates shared. Clean data equals visibility, which feeds into a robust knowledge bank and ultimately greater confidence among all stakeholders. "I want to optimize my energy operations, but I cannot do it everywhere at once, so I am using data to understand where to make the fastest, most meaningful progress and going from there," a delegate detailed. NOCs can ensure data collection, harvesting, and analyses directly supports their key performance indicators (KPIs). For example, integrating blockchain into the supply chain would enable a NOC seeking more transparency to harvest real-time data on every single step of their barrel of oil. The ream of numbers would reveal the carbon footprint of that barrel, the water wastage, the transport costs, the associated fuel burn, and much more.

Improving data management is not a new conversation, for the benefits have long been clear. But now the rising pressure on NOCs makes those advantages even more obvious. Three drivers are expediting NOCs' appreciation and appetite for data. Firstly, the financial fruits of early adopters' data efforts are very impressive. Secondly, the growth of cross-industry alliances means NOCs with digital capabilities are even more attractive to international companies and top human capital: the more capable the team, the greater the company's achievements. Thirdly, being adept at data was historically and predominantly linked to reputation. Now, the rise in countries and energy majors' Net Zero targets means smart data equates to business sustainability, and in some cases, commercial survival.

The influence of all these drivers will only intensify as the world's climate agenda matures and NOCs work to keep up, or even better, help steer global progress. For example, smart data is pivotal to NOCs' ability to meet their Scope 1, 2, and 3 emissions, which are fundamental to achieving Net Zero. Scope 3 emissions will be very challenging for most NOCs to achieve, for they are emissions that result from activities from assets not owned or controlled by the NOC, or whichever company is in question, but that the NOC indirectly impacts in its value chain. This is a monumental undertaking for NOCs in the Middle East, which are typically very large with international alliances and operations that are often in developing nations where data management is not as advanced. Therefore, tackling how best to weave data transparency into operations now will pay great dividends reputationally and financially later on, especially as societal demand for Scope 3 inevitably ramps up.

Data also lies at the core of being able to put a price on carbon in the Middle East, the "quickest answer to making decarbonization a reality," a delegate said. In October this year, Saudi Arabia's Public Investment Fund announced the establishment of the Regional Voluntary Carbon Market Company with Saudi Tadawul Group Holding Company, including the region's first carbon offset auction of 1mn tons of credits, while the UAE expects to soon start a carbon offset trading exchange in Abu Dhabi.<sup>3</sup>



### INVESTING IN CHANGE 2022 saw climate tech funding represent more than a quarter

saw climate tech funding represent more than a quarter of every venture dollar spent and invested.<sup>1</sup>

# \$260bn

of aggregate funds have been raised for climate tech worldwide since the start of 2018.<sup>2</sup>

# \$1.5bn

Sustainability Fund was created by Saudi Aramco in October this year to invest in technology – one of the world's largest such venture capital funds.<sup>3</sup>

Sources: 1 PwC; 2 PwC; 3 Saudi Aramco; 4 PwC; 5 Oil and Gas Climate Initiative (OGCI); 6 Crown Oil, Gulf Intelligence; 7 Research Gate.

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#### X5 Climate tech investment grew at five times the venture capital market rate between 2013-2020.<sup>4</sup>

29 cutting-edge innovations under the Oil and Gas Climate Initiative's (OGCI) Climate Investments' (CI) umbrella have cost-effectively delivered more than 30mn tons of GHG emission reductions since  $2017^5$  – equivalent to saving all the CO<sub>2</sub> emissions from the diesel used to drive around the world 4,500 times.<sup>6</sup>

## 60mn

people in the Middle East and North Africa (MENA) suffer from prolonged power outages and an undersupply of energy, highlighting the need for increased and sustained financial support.<sup>7</sup>





### "Very few sectors are as effective at self-reflection and troubleshooting as oil and gas, so I believe the "glass half full" approach will prevail."

NOCs need to be ready to respond and engage in this market, for decades of discussions surrounding the need for a regional carbon price are gaining tangible support. "We will reach a point where customers will be willing to pay premiums for energy with a lower carbon footprint. It is already happening in steel," a delegate said. Incorporating the importance of data collection into digital roadmaps – data will help spur carbon pricing in the medium to long-term – is another way NOCs can heighten the region's competitiveness. This is especially the case in the Middle East, where progress tends to be less hindered by time-consuming red tape. So far, seventy carbon pricing initiatives have been implemented worldwide, representing 23.17% of GHG emissions, some of which are very established;<sup>4</sup> Europe's Emissions Trading Scheme (ETS) is already 17 years old.<sup>5</sup>

#### STAY SHARP

Every evolving market brings new risks, so the rise of cyberattacks on the energy sector worldwide should not hinder NOCs' digital roadmaps. The commercial threat of not having digital roadmaps is far, far greater than that of a cyberattack. Equally, vigilance is pertinent,

as highlighted last year when a ransomware attack halted systems on the Colonial pipeline, the largest fuel pipeline in the US, itself the world's biggest oil producer. The 5,500-mile pipeline is responsible for carrying 45% of the East Coast's fuel supplies<sup>6</sup> – an area home to a population nearly thirteen times the size of the UAE.<sup>7</sup>

Several steps enable NOCs to be smarter than their would-be attackers, such as utilizing an independent third-party to audit primary data centers and helping ensure alignment with ISO 27001, an international standard on information security management. NOCs can also invest in cyber security insurance, appoint third-party services to evaluate cybersecurity maturity, and test the effectiveness of their overall cybersecurity controls with bi-annual or annual penetration tests. Ingraining company-wide information security policies, procedures, and training is also imperative to ensure all employees are on-board with the company's protection plan. The appointment of Chief Information Security Officers or Chief Digital Officers is becoming more commonplace, enabling companies to roll out their digital roadmaps as safely, guickly, and affordably as possible in 2023.

# **Roundtable delegates**

- Ganesh Pattabhiraman, Vice President, Digital Transformation and Lifecycle Services, Emerson
- Hala Banihashim, IT Manager, Sharjah National Oil Corporation (SNOC)
- Janka O'Brien, Director of Sustainability, Middle East, and Africa, Emerson
- Khaled Al Blooshi, Vice President of Digital Projects & Innovation, ADNOC
- Manabu Kaneko, Digital Transformation Leader, INPEX-JODCO
- Martin Houston, Vice Chairman, Tellurian
- Mohamed Hasan, Executive Director Energy & Sustainability, Microsoft
- Ron Beck, Industry Marketing Director, Aspentech
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- Xavier Anglada, Managing Director of Innovation, Digital Transformation, Energy Transition, Accenture

Sources for main text: 1 PwC; 2 Reuters; 3 Bloomberg; 4 World Bank; 5 Gulf Intelligence; 6 New York Times; 7 Gulf Intelligence

