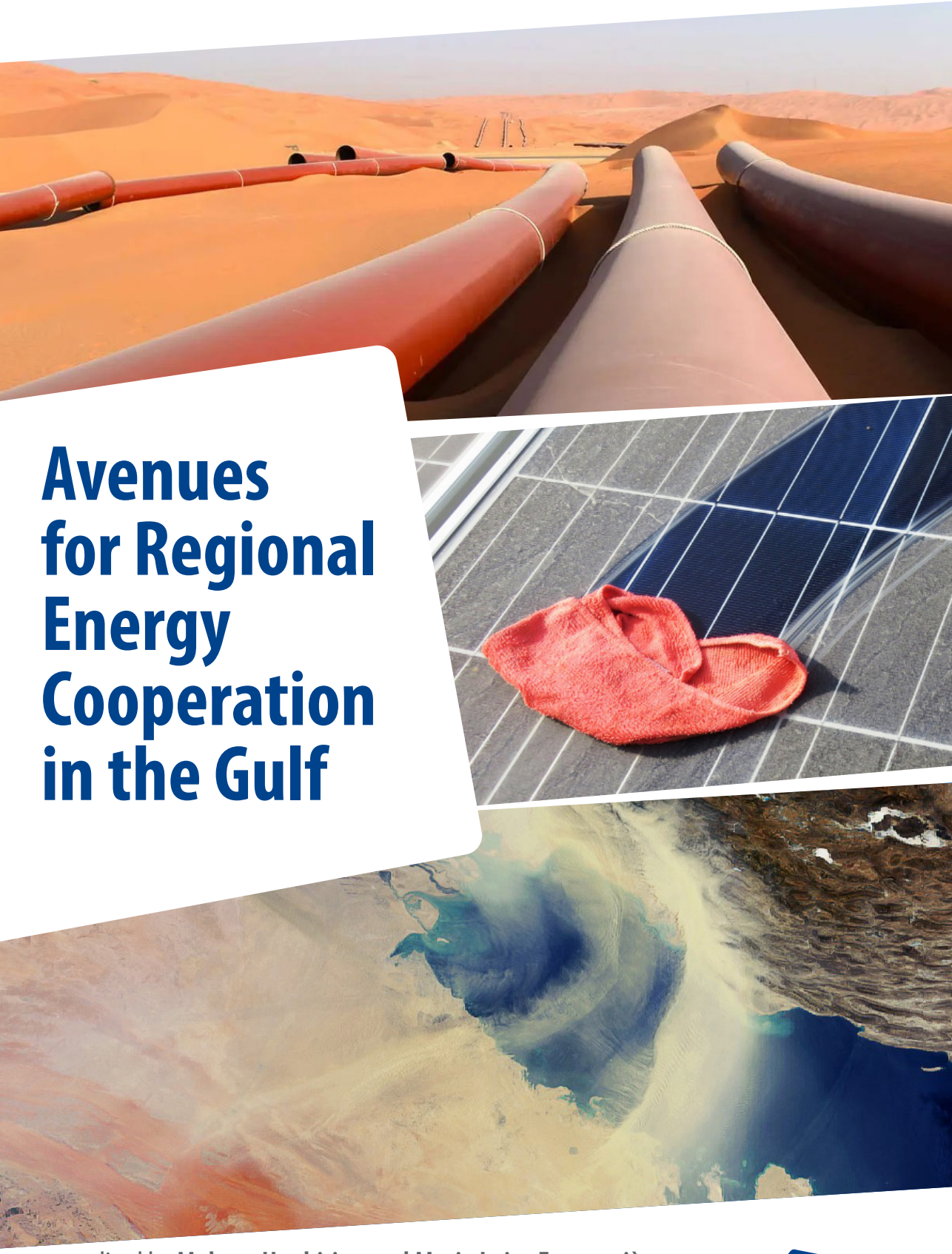

Avenues for Regional Energy Cooperation in the Gulf

edited by **Mehran Haghirian and Maria Luisa Fantappiè**

IAI

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Introduction

by Mehran Haghirian and Maria Luisa Fantappiè

As the Gulf region navigates the challenges of the energy transition and geopolitical dynamics, regional and international cooperation have become even more essential. The importance of regional energy cooperation in the Gulf has long been a focal point for policymakers, industry leaders, and stakeholders in the region and globally, even during heightened tensions and conflicts. But the journey towards sustainable energy security, the transition towards renewable energy, and the commitments to phase out oil is fraught with complexities and nuances. By addressing historical tensions, embracing the opportunities presented by renewable energy, and fostering equitable partnerships, the region can pave the way towards a sustainable and secure energy future.

To understand the opportunities and challenges ahead, the Bourse & Bazaar Foundation (B&BF) and the Istituto Affari Internazionali (IAI) organised a two-day workshop in Rome in November 2023 focused on Avenues for Regional Energy Cooperation between the Gulf, the Red Sea, and the Mediterranean. Policy and academic experts, representatives from the energy sector, and government officials from the Gulf, the European Union, and the United States participated in the workshop. This project is part of B&BF's Integrated Futures Initiative which is dedicated to supporting economic diplomacy and economic development in the Gulf region.

Mindful that the ongoing energy transition presents both challenges and opportunities for regional cooperation, this edited report aims to identify actionable proposals for regional cooperation at the bilateral and multilateral levels. Discussions in this realm have often revolved around the shift from traditional fossil fuels to renewable energy sources, however, issues such as water supply concerns in renewable energy production and the underutilisation of solar power due to maintenance issues underscore the multifaceted nature of the transition process. This also points to a gap in the research on the actual

possibilities for energy cooperation moving forward.

Highlighting the unresolved tension between shared interest for closer energy cooperation and geopolitical polarisation in a conflict-torn region, this report looks at the broader interests for regional cooperation on energy, minerals, and water resources, with the backdrop of the constantly shifting geopolitics of the region which has been impeding further integration until now. The competition between regional powers over expanding their roles and influence across the Middle East also has drawn in global powers as well. External actors have been playing significant roles in shaping regional energy dynamics in the Gulf, and the recent energy partnerships with European and Asian players have significant implications for energy initiatives in the region.

Amidst the current shifting geopolitical landscape, particularly in the aftermath of the Russian invasion of Ukraine and the conflict in Gaza, as well as the diplomatic openings following the Saudi-Iran détente in March 2023, there is a growing recognition of the need for regional cooperation and coordinated energy policies to ensure stability and inclusive economic development across the region and beyond.

This edited report includes seven short analytical pieces by leading experts and practitioners working on energy related issues in the Gulf. They provide practical policy recommendations on how to move forward with establishing closer energy cooperation in the region and beyond. The shared sentiment is that policymakers must navigate competing visions for national development and the need for regional cooperation to tackle shared challenges carefully, aiming to foster partnerships among key regional players and enabling cooperation with external actors.

Osamah Al-Sayegh argues for increased cooperation among Gulf states in energy, minerals, and water industries to boost regional security and economic development. He highlights the region's vast solar and wind resources, proposing a connected power grid to export clean energy. Al-Sayegh also emphasises joint efforts to expand the gas sector and develop mineral resources, positioning the Gulf as a key player in the global energy transition. Additionally, he advocates for shared development of oil and gas fields and the establishment of a regional water network to address water scarcity. Al-Sayegh

stresses the importance of diplomatic collaboration to achieve sustainable regional cooperation and prosperity.

Naji Abi Aad looks at how energy cooperation in the Middle East has long been pursued through petroleum pipelines to connect to broader Eurasian markets, diversify oil export routes, and reduce vulnerability. However, despite renewed regional diplomacy and increased trade, most intra-regional energy agreements have been short-lived due to political conflicts and interstate disputes. He notes that the region's major pipelines have only been operational for one-third of their lifetimes, often shutting down due to geopolitical tensions or conflicts. While pipelines offer secure energy trade, challenges include transit fees, adherence to World Trade Organisation agreements, and concerns about energy independence. Gas cooperation has seen limited success too, with few interstate pipelines and a shift towards LNG due to security and cost factors. Revitalising pipelines requires trust-building measures, gas pricing stability, and closer regional cooperation. Despite challenges, Abi Aad argues that building a regional gas network remains vital for enhancing economic development, intra-regional trade, and long-term political cooperation in the Middle East.

Kozhanov discusses the Gulf's energy transition amid the Russian-Ukrainian conflict. While it temporarily boosted oil demand, it also spurred Gulf states to accelerate their renewable energy plans. They aim to balance renewable expansion with maintaining oil revenue through a circular carbon economy. He also agrees that collaboration between Gulf states, Iran, and international partners is key. Importantly, he notes that despite the diversification efforts, Gulf countries don't intend to phase out hydrocarbons entirely, and want to continue taking advantage of the vast petrochemical sector. Success requires restructuring economies and maintaining investment in both traditional and sustainable energy sectors.

In his analysis, Robin Mills discusses the Gulf countries' role as major oil and gas producers, highlighting their potential for increased reserves and challenges in emissions. He argues that limited cross-border investment in hydrocarbons exists due to state dominance and political disputes. He writes that gas cooperation, though promising, faces obstacles like boundary disputes, but shared fields offer opportunities. Greater Gulf cooperation on hydrocarbons,

alongside climate protection strategies, could address threats and promote long-term solutions for the region's economy and the fight against shared environmental challenges.

Nadim Abillama discusses the rising demand for electricity in the Middle East region, driven by population growth and climate change effects. While oil and gas dominate, there's a shift towards renewables like solar to satisfy the demand. Cross-border electricity trading is advocated to improve renewables deployment, but regional challenges like seasonal demand variations need innovative economic models. He notes that Iran and Iraq face supply-demand mismatches, driving them to explore renewables faster. However, according to Abillama, electricity market reforms are crucial for large-scale transformations. Governments must balance priorities of providing secure, reliable, and affordable electricity while mitigating climate change impacts. In this dynamic context, climate crisis considerations are becoming central to future energy system planning and design.

Natalie Koch discusses the water challenges facing solar power in the Gulf due to dust and sand accumulation on panels, requiring water for cleaning. Despite efforts to develop waterless cleaning systems, scalability remains an issue, leading to the use of energy-intensive desalinated seawater. Additionally, the water footprint extends to mineral extraction for solar technology. Promises of green hydrogen production in the region face obstacles too, mainly due to limited renewable energy capacity and water scarcity. Koch argues that without careful consideration of water usage, renewable energy projects risk exacerbating water shortages and the climate crisis. She emphasises the need for water to be central in energy infrastructure planning to avoid local opposition and ensure effective climate action.

Mohammad Al-Saidi highlights the ongoing energy transition in the Middle East, particularly in Saudi Arabia and Egypt, where investments in renewables are vital to meet growing energy demands. Cooperation between the Gulf, North Africa, and Europe is emerging, driven by economic opportunities and climate goals. The aim is to increase renewable energy usage, with targets set for 2030 and beyond. Renewable energy projects offer economic diversification in carbon-rich countries like those in the Gulf, while reducing imports and freeing up resources for investment. Grid connections and green hydrogen

projects are key components of this transition, according to Al-Saidi, facilitating interregional cooperation. However, challenges such as differing interests and political instability must be addressed for successful collaboration. In Egypt, renewable energy initiatives are part of a broader economic vision to create new regional centres, supported by investments from Gulf states and European countries. Moreover, despite challenges, cooperation on renewables presents opportunities for job creation and economic growth in multiple countries.

These seven contributions have kickstarted the practical discussions on moving towards regional energy cooperation in the Gulf region.

1. The Case for Cooperation on the Energy Transition in the Gulf

by Osamah Al-Sayegh

Regional security and economic development among the Gulf states – Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE) – can improve if cooperation is fostered in the energy, minerals, and water industries. By jointly exploiting resources and establishing neutral regional zones and interconnecting energy sources, Factors that can contribute significantly to this project, for example, are the encouragement of joint exploitation of resources, establishing neutral regional zones, and creating energy sources that are interconnected. The positive diplomatic environment of 2023, particularly after the rapprochement between Iran and Saudi Arabia after seven years, holds the key to unlocking a new era of cooperation in the region across the resource mix.

1.1 Fostering renewable energy cooperation

The region's geographic location means it receives some of the highest annual amounts of solar energy[1] in the world – more than 2,100 kilowatt-hours (kWh) – and a wind speed that can reach about 10 metres per second (m/s).[2] These natural clean energy resources could be exploited regionally and also exported beyond the region, benefitting the economy both directly and indirectly and encompassing many sectors of industry, including energy, manufacturing, and information technology.

The Gulf Cooperation Council Interconnection Authority (GCCIA) envisions establishing a robust interconnected power grid. This would leverage the region's abundant solar and wind resources and further position the are to become a hub for producing and exporting clean energy. As of early 2024, part

1 Global Solar Atlas: https://globalsolaratlas.info/map?c=11.609193,8.261719,3.
2 Global Wind Atlas: https://globalwindatlas.info/en.

of the region is already interconnected through this grid – from Oman in the south through the UAE, Saudi Arabia, Qatar, and Bahrain, and then to Kuwait in the north. In addition, Iraq recently signed an agreement with the GCCIA to join the grid.[3] GCCIA has an ambitious plan to extend to Eurasia and East Africa.[4] Iran is also part of this planned grid, as is Turkey. Such interconnection would give domestic power grids more reliability and stability in the face of increasing challenges, such as unexpected electric load rise, as well as blackouts due to natural disasters or equipment failures.

1.2 Envisioning a gas network

Expanding the gas sector across the Gulf is a potential solution to some of these problems. Doing so would pave the way for a joint gas pipeline network that could facilitate hydrogen transmission – which is key to achieving net zero carbon emissions. Several Gulf countries have either not fully developed their gas production sectors or have insufficient resources. Iraq, Kuwait, and the UAE are net gas importers, and in 2022 imported 50, 40 and 20 per cent of their gas demand respectively (see Figure 1). For example, Iraq imports most of its gas from Iran, and the UAE sources much of its gas from Qatar through the Dolphin pipeline.

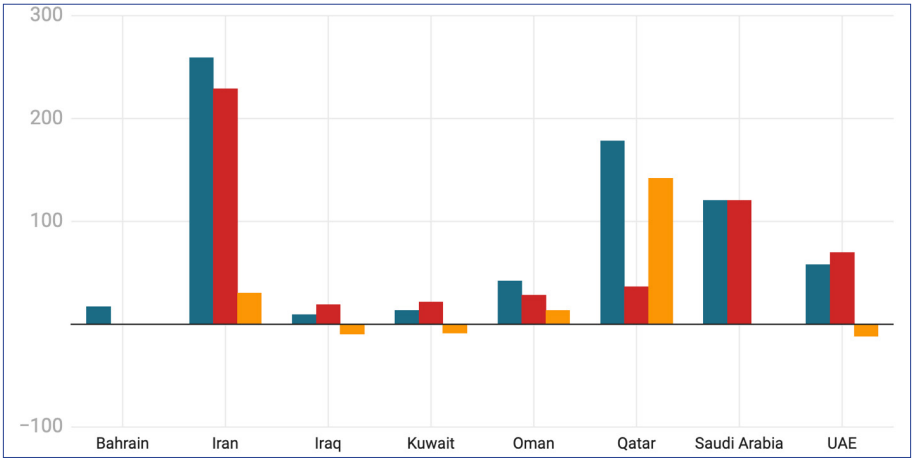
Kuwait is the only Gulf country to source a large percentage of its imported gas (46 per cent) from non-Gulf regions, such as Africa, Europe, and North and South America. This sourcing of around 4 billion cubic metres (bcm) of natural gas annually from faraway countries is deemed to be a lost economic opportunity for Gulf countries, including Iran and Qatar.

Expansion of the gas sector in the Gulf would play a key role in the region's energy transition. Having a joint pipeline network capable of carrying hydrogen products could also pave the way for the region to become a world hub in the production and export of carbon-neutral (blue and green) hydrogen.

3 "GCCIA Signs Contracts for Iraq Interconnection Project", in *Asharq Al-Awsat*, 8 February 2023, https://english.aawsat.com/node/4145581.

4 Ahmed Al-Ebrahim, *The GCC Interconnection: Supporting Energy Efficiency in the GCC*, presentation to the IEF-EU Energy Day, Riyadh, 14 February 2017, https://www.ief.org/_resources/files/events/1st-ief-eu-energy-day/1st-ief-eu-energy-day---gccia-perspective.pdf.

Figure 1 | Natural gas production and consumption in the Gulf (totals for 2022 in bcm)



Source: Energy Institute Statistical Review of World Energy.
Created by Osamah Al-Sayegh with Datawrapper (https://www.datawrapper.de/_/VHjbr).

1.3 Gulf minerals powering the future

The Gulf region's mineral wealth, essential for energy transition, has come to the forefront. Recent discoveries of lithium, cobalt, nickel, copper, and other minerals mark a turning point in the global race to secure mineral supply chains. These minerals are essential components of renewable energy technologies and energy storage systems.

Recently, Iran announced the discovery of a huge lithium deposit[5] – an estimated 8.5 million metric tonnes – on its territory. This makes the country the fifth lithium reserve resource holder after Bolivia, Argentina, Chile, and the United States. Moreover, Iran also revealed the discovery of additional vital minerals,[6] among them manganese, nickel, and cobalt.

5 Marina Yue Zhang, "Iran's Lithium Lode: A Potential Strategic Game-Changer", in *The Interpreter*, 9 August 2023, https://www.lowyinstitute.org/node/36488.
6 Farzad Ramezani Bonesh, "An Overview of Iran's Mining Industry & Opportunities", in *Middle East Briefing*, 20 November 2023, https://www.middleeastbriefing.com/news/?p=2032.

Saudi Arabia also recently announced the discovery of mineral reserves with an estimated market value of 64 billion US dollars.[7] Among the discovered minerals related to energy transition are copper, iron, and nickel.[8] Oman, too, has announced an ongoing project to update its national geographical and geological minerals database with more discoveries of copper and iron reserves.

The envisioned regional collaboration would include joint investments in developing the infrastructure needed in the region for extraction, preliminary mineral processing, and export logistics. Joint efforts to invest in the management of mineral resources could position the Gulf as a key influencer in the global transition to clean energy. This could be pursued by establishing joint venture companies where investors include the Gulf states' public and private sectors.

Working together, the Gulf states could pool resources, share costs, and achieve economies of scale. By doing so, the region would be able to collectively manage and mitigate risks associated with volatile commodity prices, environmental challenges, and geopolitical uncertainties. As a result, such collaborative ventures would contribute to political stability in the region. The Gulf countries would have broader access to markets and assert their role as key players in the energy transition agenda.

It is worth noting that Iran's current economic sanctions may discourage other states from establishing joint ventures. However, these restrictions do not prevent discussion of joint strategies for making the most of the Gulf's mineral reserves and developing regional value chains.

1.4 Developing shared fields

The collective strength of Gulf countries lies in their vast natural resources, accounting for approximately 48 and 40 per cent, respectively, of the world's

7 "Minerals-rich Aseer Boosts National Industries", in *Saudi Gazette*, 26 September 2023, https://www.saudigazette.com.sa/article/636204.

8 "Mineral Resources in Aseer... Treasures that Enhance National Industries" [in Arabic], in *Saudi Press Agency*, 11 March 2023, https://www.spa.gov.sa/5de0e6ea51r.

proven oil and natural gas reserves.[9] Shared oil and gas fields, as illustrated in the table below, are poised for active development, offering potential solutions to regional energy challenges.

In early 2022, Kuwait signed a memorandum of understanding with Saudi Arabia to develop the joint offshore Arash/Durra gas field in the partitioned neutral zone. However, Iran has objected to the agreement and demanded its share.[10] Most likely the Arash/Durra field will not be exploited in the short term until an agreement is reached on the demarcation of maritime borders between Iran, Kuwait, and Saudi Arabia. However, joint exploitation of Arash/Durra could be achieved without compromising the territorial sovereignty of the three countries; Iran is already jointly exploiting oil and gas fields with neighbouring Gulf states, including the South Pars/North Dome gas field with Qatar and the Esfandyar/Lulu oil field with Saudi Arabia. These joint models can provide lessons and open the door for pragmatic and logical negotiations to enable cooperation in exploiting other joint fields, including Arash/Durra.

1.5 Establishing a regional water network

A region is labelled as water-scarce[11] when the availability of natural renewable water (waterfalls, rivers, freshwater lakes, and aquifers) is below 1,000 cubic metres per person per year. This definition implies that all Gulf countries except Iran are under the natural water poverty line. Consequently, these countries depend on energy-intensive seawater desalination to meet their potable water demand. The power stations in these countries are mostly cogeneration systems that produce electricity and heat.

Addressing water scarcity is paramount for Gulf countries, especially those heavily reliant on desalination. Despite challenges including geopolitical tensions, a strategic imperative is to establish a regional water interconnection

9 Energy Institute, *Statistical Review of World Energy 2024*, https://www.energyinst.org/statistical-review.

10 "What Is the Kuwaiti-Iranian Dispute over the Dorra/Arash Gas Field?", in *Al Jazeera*, 4 August 2023, https://aje.io/zs2i5r.

11 Usha Kumari et al., "Global Water Challenge and Future Perspective", in Mohammad Hadi Dehghani, Rama Karri and Eder Lima, eds, *Green Technologies for the Defluoridation of Water*, Amsterdam, Elsevier, 2021, p. 197-212, DOI 10.1016/B978-0-323-85768-0.00002-6.

network. With this in mind, GCC leaders decided to carry out a water interconnection study in the year 2000.[12] The proposed network would supply fresh water to all GCC states from desalination plants that would be built on the shores of certain states. Three desalination plants were proposed – to be built in Sohar, Oman; Al-Sila in the UAE;[13] and Al-Khafji in Saudi Arabia. Unfortunately, there has been no tangible action on the project since 2013.[14]

There is an urgent need for increased cooperation in the areas of seawater desalination, water treatment, water resource management, and water transmission across the Gulf region if its future is to be more sustainable. The latter of these in particular is a key survival strategy, and such a water network would make the region resilient to natural and changing environmental conditions challenges. The feasibility of a regional water grid should not therefore purely be based on financial profits – it also needs to consider the grave water scarcity challenges the region is poised to face in the years ahead.

1.6 Moving towards sustainable horizons

While it may take time to achieve regional cooperation in energy, water, and environmental sustainability, diplomatic rapprochement between Iran and Saudi Arabia could pave the way for positive outcomes. Policies should focus on establishing interconnected regional infrastructures, including gas and water networks, and implementing a joint financing system to support balanced development across the Gulf region. It is essential to overcome political differences and address challenges through dialogue for these policies to succeed.

As we chart the course toward sustainable horizons in the Gulf, the call for cooperation echoes loudly. Embracing shared objectives, drawing on collective strengths, and navigating challenges with a collaborative spirit will propel the region towards a future defined by sustainability, resilience, and mutual prosperity.

12 GCC Secretariat General, *Water Interconnection Project* [in Arabic], 2013, https://www.gcc-sg.org/ar-sa/CooperationAndAchievements/Achievements/EconomicCooperation/CooperationintheFieldofElectricityandWater/Pages/Waterlinkproject.aspx.

13 Ibid.

14 Osamah Alsayegh, "Building Water and Energy Security in the GCC through an Integrated Policy Approach", in *Baker Institute Policy Briefs*, 24 January 2023, https://www.bakerinstitute.org/node/71721.

2. Accelerating the Gulf's Energy Transition in the Wake of Russia's War

by Nikolay Kozhanov

The 2022 Russian war against Ukraine has been both a gift and a curse for oil producers in the Persian Gulf. In the short term, the war has created restraint for the development of renewables, contributed to the high oil demand, and in doing so demonstrated the need for more international investment in oil exploration and drilling. High oil prices and the resulting profits enabled the member states of the Gulf Cooperation Council (GCC) to partially offset financial losses from previous years – and also benefitted the economies of these member states. However, the transition to a new model of global energy consumption has not been cancelled – it has only been delayed.

This conflict clearly demonstrated the economic risk of excessive dependence on hydrocarbon-based resources, and as a result the leading GCC countries began to develop clear action plans for speeding up the energy transition. For the Gulf's traditional oil producers, this is a huge challenge: after the short hiatus forced by the war, the race to switch to renewable energy will restart and force the Gulf states to once again work against time to prepare the oil sector for the "post-oil" era.

In general, most GCC states base their current strategy on an understanding of two contradictory but coexisting trends in the global energy market – trends created by the war in Ukraine. The first relates to national security issues: individual countries may find it necessary to extend their hydrocarbon use. The second and conflicting trend is that some players may accelerate their transition to renewables for the same security considerations and to reduce their dependence on fluctuating hydrocarbon prices.

2.1 Economic development and political considerations

If the GCC countries are to reduce their current economic dependence on hydrocarbon exports,[1] they need to diversify on a large scale into renewable energies. Alongside this, there is a need to maximise income from oil exports – something which can be achieved by simultaneously reducing domestic consumption and increasing oil output. However, GCC members will need to avoid increasing the volume of CO_2 emissions, as these damage the health of the population and cause environmental damage.

But the political considerations are tied to the rentier social contract model of the states in the GCC. This model is now becoming too costly; budgets are uncertain against a backdrop of fluctuating oil prices. The fourth energy transition – and related processes, such as decarbonisation, digitalisation, and the development of renewable and alternative energy sources – will enable Gulf states to generate additional sources of income to finance government subsidies and social programmes. The development of the renewables sector will additionally contribute to preserving the social contract, provided that its growth will also lead to the provision of new and high-paying jobs for the citizens in the public sector.

2.2 External influences

Other countries are placing increasing pressure on GCC states to accelerate their energy transition – and to make the oil they export more environmentally friendly (a marketing requirement formulated by the global push for energy transition). To maintain the competitiveness of their oil in the global market, Gulf producers are forced to take steps to reduce the environmental harm that can be caused by the production and transportation of hydrocarbons. The active spread beyond the United States and the European Union (including in Asian countries, who have been the traditional sales market for the GCC countries) of what some term the "green agenda" further increases the

1 Fateh Belaïd and Aisha Al-Sarihi,"Saudi Arabia Energy Transition in a Post-Paris Agreement Era: An Analysis with a Multi-Level Perspective Approach", in *Research in International Business and Finance*, Vol. 67, Part B (January 2024), Article 102086, https://doi.org/10.1016/j.ribaf.2023.102086.

importance of presenting hydrocarbon products as green and minimising the negative impact on the environment.[2]

Moreover, GCC countries will inevitably be pressured by the international community to implement international climate agreements. In 2022, the Arab states took an active part in the COP27 climate summit in Egypt, and again in 2023, when they held the COP28 summit in the UAE. The latter was a major milestone: its final document not only summed up what the international community had done within the framework of the Paris Agreement, but also recognised the need to phase out energy derived from fossil fuels.[3] In light of these developments, by early 2024, almost all GCC states had put forward their own net-zero emissions targets.

2.3 Circular carbon economy

It is important to note that the final COP28 document calls for a gradual phase-out of the use of oil in energy systems but emphasises that this process should be carried out *without prejudice to hydrocarbon producers*. This duality fully meets the needs of the Persian Gulf countries. They are ready to provide consumers with hydrocarbons for as long as they are needed – for example, the European Union, which seeks greater independence from Russian supplies – and cooperate with the international community in preparing for a "post-oil" world. Under these circumstances, most GCC states now speak not only about the need to increase the proportion of energy generated by renewables, but also about the goal of creating a special form of the Gulf's circular economy that could still be built on the base of the region's hydrocarbon riches.

Thus, the so-called circular carbon economy concept promoted by Saudi Arabia does not reject the further development of oil and petrochemical industries of the Kingdom but implies the introduction of obligatory compensation measures for emissions through the active use of carbon capture technologies

2 Abdelmounaim Lahrech, Bassam Abu-Hijleh and Hazem Aldabbas, "The Impact of Global Renewable Energy Demand on Economic Growth – Evidence from GCC Countries", in *Arab Gulf Journal of Scientific Research*, 4 May 2023, https://doi.org/10.1108/AGJSR-01-2023-0007.

3 COP28, *The UAE Consensus Negotiations Outcome*, 2023, https://www.cop28.com/en/the-uae-consensus-negotiations-outcome.

(CCUS). It also argues about the increased role of renewable energy sources in the production and transportation of hydrocarbons. Alongside these plans, the Gulf countries are also developing a strategy to become world-leading hydrogen producers.

2.4 Options for cooperation

In Iran, deteriorating climatic conditions and attendant ecological problems are creating extra incentives for the government to increase its efforts to make the energy transition and restructure its economy. In a sense, the country started investigating ways to develop its own renewable sector long before the idea became popular among its neighbours. Possessing substantial hydro, wind, and solar energy-producing potential, Iran achieved substantial progress in developing these in 2000–2010. Unfortunately, any further progress was substantially slowed and in some areas even prevented by the sanctions placed on the country from 2010 onwards, although by 2022 Iran was still among the top five countries in the Middle East in terms of how much electricity is generated by renewables.[4] Its experience in the renewables development field can still be of interest to other Gulf countries, and Tehran itself can learn a lot from the GCC member states about the use of CCUS technologies and renewables in the production and transportation of hydrocarbons.

The current situation might intensify levels of cooperation among the Gulf countries, and also between these countries and international partners. There is a good incentive to cooperate – between both the Gulf players within OPEC and those on the bilateral track – as the GCC economies and oil sectors will have a lot of challenges in common that they need to prepare for. Meanwhile, the Gulf states need to ensure a stable and long-term demand for Gulf hydrocarbons, which means regional players must invest more in Asian economies and attract Asian investments.[5] Moreover, an important element of the Gulf countries' economic strategies is now to attract and allocate in-house and international

4 International Energy Agency (IEA) website: *Iran: Renewables*, https://www.iea.org/countries/iran/renewables.

5 Laura He, "World's Largest Oil Producer Plans to Deepen Its Push into China", in *CNN*, 4 January 2024, https://edition.cnn.com/2024/01/04/business/saudi-aramco-china-rongsheng-intl-hnk/index.html.

investments in both the traditional and renewable energy sectors.[6]

Alongside other developments, the war in Ukraine has led to a clear intensification of European diplomacy in the Gulf and a revision of some past practices. Traditionally, European concerns about Gulf domestic policies limited the interaction between EU countries and GCC states in the energy field, but many of these concerns have been pushed aside. Instead, the European Union has demonstrated its readiness to help the GCC countries in their own transition to renewable energy sources, making it clear that it expects the Gulf to help the EU move away from its dependence on Russia's oil and gas and ease the influence of geopolitical factors on oil prices.

2.5 Road ahead

It is worth noting that the GCC countries do not intend to entirely replace the hydrocarbon sector with renewable energy production or to phase out oil usage or the development of petrochemicals. Instead, the Gulf states see the sustainable energy sector (as well as those industries accompanying the fourth energy transition) as a complement and addition to their hydrocarbon-based economies. The wealth they have accrued through hydrocarbons will allow them to accelerate diversification and make the "old" oil industry look eco-friendly. None of the Gulf states has abandoned plans to develop petrochemical production, seeing in it an opportunity to conveniently and easily diversify GCC economies and as a response to the question of what to do when oil is not in demand as feedstock for fuel production. As oil market analyst Tsvetana Paraskova puts it: "Renewable energy could replace more and more fossil fuels in power generation and transportation, but these are not the only industries using oil and gas. From medicines to cosmetics, clothing, and technology, the world will still need oil."[7] This is well understood in the Persian Gulf, and the various crises have shown that fluctuations in demand for hydrocarbons have

6 Marat Terterov, "The Gulf's Energy Investment in a Sustainability Era", in *AGDA Insights*, February 2024, https://www.agda.ac.ae/research/publications-multimedia-events/publication-details/the-gulf-s-energy-investment-in-a-sustainability-era.

7 Tsvetana Paraskova, "An Undisputable Truth: The World Still Needs Oil and Gas", in *OilPrice*, 16 November 2021, https://oilprice.com/Energy/Energy-General/An-Undisputable-Truth-The-World-Still-Needs-Oil-And-Gas.html.

not always depended on the demand for fuel.

In the medium and long term, adaptation to a new energy order would require Persian Gulf oil producers to restructure their economies and revise their social contracts to withstand a decline in demand and a reduction in prices for oil resources. They would need to rebuild their energy systems for a lower-carbon future while simultaneously ensuring the survival of their oil industries. Moreover, the Gulf states clearly understand the need to adapt to the growth of competition in traditional markets, particularly in Asia, and will need to consider multilateral cooperation to offset some challenges.

Looking into the future, the hydrocarbon production and petrochemical sectors will remain the backbone of the Gulf countries' economic structure. The main motivations that shape the development plans in the region are twofold: to increase sources of income through diversification, including the development of hydrogen exports; and to ensure the profitability of the traditional oil sector for as long as possible. The likely success factors in this quest will be the reduction of the cost of producing both hydrocarbon-based and sustainable energy, the reduction of harmful emissions from traditional industries, and the maintenance of the necessary level of investment in both the oil sector and the new energy sources. As UAE Minister of Energy and Industry Suhail Mohammed Almazroui succinctly put it, "drop the cost, drop the carbon, maintain the investment".[8]

8 Jamie Ingram, "Adnoc Awards Key Sour Gas Contracts", in *Middle East Economic Survey*, 19 November 2021, https://www.mees.com/2021/11/19/oil-gas/adnoc-awards-key-sour-gas-contracts/aefde540-4935-11ec-90b8-7f1dfeb4f76e.

3. Pipelines and the Challenges of Energy Integration in the Middle East

by Naji Abi-Aad

Energy cooperation in the Middle East has long been pursued through the establishment of petroleum pipelines, built with the goals of connecting to energy markets in the broader Eurasian context, diversifying oil export routes, and reducing vulnerability. After several years of renewed regional diplomacy in the Gulf and an increase in the level of regional trade and investment, energy integration is once again on the agenda in bilateral and multilateral forums.

However, in a region characterised by both internal instability and external threats, most intra-regional energy trade agreements have been short-lived. The legacies of the Middle East's major oil and gas pipelines offer important lessons for regional leaders hoping to integrate energy markets and infrastructure.

The region's seven major pipelines have existed for a cumulative 445 years. But they have only been active for 168 of those years. In other words, the seven pipelines have been operational for just one-third of their lifetimes. Every international oil pipeline in the region has also shut down at least once, and the majority remain closed today.

Political conflicts within producing and transit countries, as well as interstate disputes, remain the primary reasons for pipeline shutdowns. While the mutual dependency stabilising factor ensures continued oil supply from the region, short-term interruptions persist due to geopolitical tensions. Historical events like the Arab oil embargoes and international sanctions against Iraq and Iran underscore the region's susceptibility to temporary disruptions. The military attacks during the eight-year war between Iran and Iraq (1980–88) prompted a reconsideration in pipeline strategies in the region as the conflict both underscored the vulnerability of the infrastructure to military attacks, but also their potential in assisting countries at times of isolation.

For example, Iraq, whose meagre Gulf coastline was blocked during the war and its export outlets through the Mediterranean (Syria and Lebanon) were shut down, sought to diversify its export channels through pipelines with Turkey and Saudi Arabia. Iran, on the other hand, facing security concerns due to sporadic Iraqi air strikes on its territories, also explored pipeline options to bypass vulnerable terminals. But the 1986 Iraqi strikes on Iran's Larak and Sirri terminals[1] raised doubts about the security and usefulness of such infrastructure, resulting in the postponement or cancelation of many pipeline projects.

In the 1980s, to reduce dependence on the Strait of Hormuz and vulnerability to Iranian threats, Saudi Arabia built its main export pipeline "Petroline" from the oil-producing Eastern Province to Yanbu on the Red Sea. Yet, liftings at the Red Sea must transit through the Suez Canal which is controlled by Egypt or through the Strait of Bab Al-Mandeb which is controlled by Yemen. Oil could also be piped through the Sumed pipeline which links, within Egypt, the Gulf of Suez to the Mediterranean, or through the Eilat-Ashkelon pipeline in Israel. But these avenues pose their own challenges.

The Eilat–Ashkelon pipeline has recently gained attention, with press reports of the UAE considering it for transporting crude from the Red Sea to the Mediterranean.[2] Interestingly, this pipeline was built in 1968 as a joint-venture between Israel and Iran to transport Iranian crude oil to Europe. However, Iran ceased using the pipeline following the 1979 Revolution and the subsequent nationalisation of the pipeline by Israel. Today, with the ongoing war in Gaza and the fate of Arab-Israeli normalisation agreements mean the future of this pipeline is uncertain.

3.1 Limited success in gas cooperation

In the realm of gas pipelines, the Middle East has seen some limited success, but only few interstate gas pipelines have been built. The first interstate gas

1 Douglas A. Kupersmith, *The Failure of Third World Air Power. Iraq and the War with Iran*, Air University Press, June 1993, https://apps.dtic.mil/sti/citations/ADA425672.
2 Jonathan H. Ferziger, "UAE Deal Boosts Israeli Oil Pipeline Secretly Built with Iran", in *Foreign Policy*, 4 September 2020, https://foreignpolicy.com/2020/09/04/uae-israel-iran-oil.

line in the region was built in 1986 linking Iraqi fields to Kuwait. This short-lived pipeline closed after the Iraqi invasion of Kuwait and switched to supplying water for Iraqi troops. Around the same time, a small gas link was constructed between Oman and the UAE's emirate of Ras Al-Khaimah. That link later expanded and became the much larger Dolphin pipeline which came on stream in 2007, supplying Qatari gas to the UAE and Oman.

In the Eastern Mediterranean, a gas pipeline linking Egypt and Israel was initially built to channel Egyptian gas to Israel, before reversing its flow to supply Israeli gas to Egypt. On a more regional scale, the Arab Gas Pipeline (AGP), built in 2003, has been linking Egypt, Jordan, Syria, and Lebanon, and has plans to connect to the European network in Turkey. However, the AGP has faced serious challenges since its inauguration, including the acute shortage of gas feedstock from Egypt.

The development of liquified natural gas (LNG) has also dealt a blow to the prospects of increasing gas pipelines around the Middle East. In fact, Bahrain, the UAE, Kuwait, and Jordan are already operating LNG import terminals, while Oman, Saudi Arabia, and Lebanon are pursuing the same strategy as well. The LNG option has been favoured over gas pipelines[3] as a result of many factors, including the security related factors as well as the competitive costs and prices for building the different parts of its chain, i.e. the liquefaction plants, transport vessels, and regasification units.

3.2 Revitalising pipelines

Despite persistent challenges, international pipelines are needed in the region and they can be an efficient and secure way of energy trade, if operated properly. To turn a new page, addressing various issues is crucial. First and foremost, the issue of transit fees must be clearly resolved, especially if a third country is involved in the transit. Those fees, returned in cash or commodities, could well affect the entire economic feasibility of a pipeline network project.

3 Al-Attiyah Foundation, "GCC gas: Strategic Variations", in *Al-Attiyah Foundation Research Series*, No. 5 (January 2017), https://www.abhaf.org/assets/books/pdf/flipping_pdf/energy/FR05-01-17.pdf.

Adherence to World Trade Organisation (WTO) agreements is also a significant challenge. In fact, each member of the WTO has to give the owner or operator of any pipeline passing through its territories full and free access to its own domestic market. That right for market access has not always been admitted by all Middle Eastern countries.

There is also the question of "energy independency" which needs to be addressed. In the Gulf and the broader region, governments are hesitant to depend on neighbouring countries for their fuel supplies. At the same time, the psychological desire among oil-producing countries for self-sufficiency also promotes a greater willingness to burn more liquid fuels than import gas, despite their higher relative and opportunity costs and the damage they induce on the environment.

Trust building measures and gradual expansion of bilateral and multilateral engagements could contribute to increasing energy cooperation, in addition to increasing the interdependency between the countries along the routes of pipelines through transit fees and large reliance on the pumped supplies.

Gas pricing is a challenge which is further compounded by the fluctuations in demand throughout the year. Demand for electricity, and consequently for natural gas, peaks in the summer for the majority of countries in the region, and consequently gas sales fall in the winter. To offset these challenges, regional countries could either create storage facilities at the upstream producing end or at the downstream consuming side. This requires much closer regional cooperation on gas.

While the challenges are evident, the pursuit of energy cooperation through pipelines in the Middle East remains a complex yet vital endeavour, requiring continuous adaptation to geopolitical realities and global market dynamics. Despite the current favouring of LNG over gas pipelines, policymakers must keep the idea of building a regional gas network on the agenda.

Regional players need to learn from past failures and match infrastructure with institutions to provide platforms for dispute resolutions and enhanced cooperation. Such a way forward could bolster regional economic development, enhance intra-regional trade, and contribute to long-term political cooperation and economic integration in the broader region.

4. Climate Policy and Cross-Border Hydrocarbon Development in the Gulf

by Robin Mills

The Gulf countries are leading global producers and exporters of oil and gas. They have long reserves lives at current production levels, well beyond 2050, and substantial potential to increase reserves through field development, enhanced recovery, and exploration. They are intrinsically low-carbon producers measured by upstream emissions per barrel, although this is obscured in Iran and Iraq by high levels of flaring of unused associated gas (a by-product of oil production) and leakage of methane. They have strong involvement of state oil companies in oil and gas production, though this varies from an effective monopoly (Kuwait) to a leading role for international operators (Iraq and Oman).

With the exception of Iraq, they have large domestic petrochemical industries. Saudi Arabia and, increasingly, the UAE, have extensive international investments in refining and petrochemicals across the US, Europe, and Asia. While this is mainly on their own account, Kuwait does have a stake in the important new Duqm refinery in Oman. The region's oil exporters also make use of the extensive oil storage and bunkering facilities in the UAE and Oman. On the other hand, Qatar is the world's biggest LNG exporter and has a major expansion programme to be completed during 2026-27, Oman and the UAE are smaller LNG exporters (the UAE also expanding), while Iran is an important supplier of gas by pipeline to Turkey and Iraq.

The role of the Gulf states as oil exporters has limited the potential for cooperation between them. The dominance of the state in the upstream industry means that cross-border hydrocarbon investment is very limited. Mubadala Energy, the energy arm of the Abu Dhabi government strategic development company, has some upstream assets in Qatar and Oman, and utility Taqa has oil operations in the Kurdistan region of Iraq. QatarEnergy recently entered a project in southern Iraq led by TotalEnergies for development of oil, gas, water injection and solar power. Sanctions and political disputes have prevented any

GCC investment in Iran's hydrocarbon sector. There has been some interest, for example, and various plans since the early 2000s for gas and electricity connections, and most recently, discussions between Saudi Arabia, the UAE, and Iran in July 2023 concerning investment and the development of shared fields.

Gas is more promising for cooperation, given that some of the Gulf states are relatively gas-short. The most notable project, Dolphin, exports gas from Qatar by pipeline to the UAE, with small volumes continuing to Oman. Dolphin faced opposition from Saudi Arabia, which argued that the pipeline crossed its own maritime territory. A similar plan to supply Qatari gas to Kuwait was entirely blocked by Saudi Arabia, which did not want the smaller GCC states to be linked beyond its influence. Although LNG exports from Qatar to the UAE stopped during the boycott of Doha between June 2017-January 2021, Dolphin continued operating as normal, a sign of its importance to both countries, and of the promise of energy projects to constrain conflict.

Some oil and gas fields in the Gulf lie across borders. In general, countries have developed them competitively, extracting as much as possible without an agreement with the neighbouring state. The most notable field affected by a boundary dispute is the large gas-field Dorra, known in Iran as Arash, which lies partly in Kuwaiti waters, partly in the Kuwaiti section of the Partitioned Neutral Zone with Saudi Arabia, and partly, in Tehran's view, in Iranian waters. Kuwait's shortage of gas leads to heavy domestic use of polluting and expensive oil. An agreement on Dorra, perhaps via a joint development zone without concession of sovereignty, could be a way forward. Such agreements have enabled Saudi Arabia to supply half of the oil from the Abu Safa field to Bahrain as part of a boundary settlement and Qatar and the UAE to divide the resources of the offshore Bunduq oil-field.

The most important cross-boundary field, not just in the Gulf but in the world, is called the North Field in Qatar and South Pars in Iran. It is world's biggest gas field. The field, which also contains shallower cross-boundary oil resources, has been developed by each side without formal agreement, but there are tacit understandings to avoid one side moving too far ahead of the other on extraction levels. Qatar imposed a moratorium on further development of the North Field in 2005, and lifted it in 2017. Ostensibly this was for technical

reasons, more plausibly for gas market management purposes, but it also gave Iran time to catch up to and even exceed relative Qatari production levels. As Iran's own output from South Pars increased, so eventually Qatar was able to decide to raise production further, without risking tensions with Iran over unfair levels of extraction.

More intra-regional gas trade would enable reducing the use of oil in the power sector. Qatar, Iran (if its gas resources were properly developed), and the Kurdistan Region of Iraq, would be natural gas suppliers by pipeline to neighbours. This would require more regional trust, and transparency to put gas supplies on a reliable commercial basis. Cross-border investment in gas-using sectors such as petrochemicals, multi-country gas networks, and robust arbitration procedures, could create structures that would be more resistant to politically- or commercially-motivated cut-offs. Iran is, for example, a 10 per cent shareholder in Azerbaijan's important Shah Deniz gas field and in the South Caucasus Gas Pipeline from Azerbaijan to Turkey via Georgia, along with BP, Russia's Lukoil and Turkish and Azeri state entities. But the recent history of Russian gas supplies to Europe, and the interruption of federal Iraqi and Kurdistan region oil exports through Turkey, reveals how even long-standing pipeline deals with strong mutual profitability can be derailed.

As COP28 in Dubai signalled, climate policy will exert ever-greater influence on the oil and gas industry: first through requirements to zero-out its own emissions, second through a longer-term reduction in demand, at least for oil. The Gulf countries present a wide spread of economic and environmental vulnerability, and sophistication of climate policy ranges from the very limited (Iraq) to the relatively advanced (UAE). The Oil and Gas Decarbonisation Charter (OGDC) concluded at COP28 was signed by the national oil companies of Abu Dhabi, Sharjah, Bahrain, Oman, and Saudi Arabia, among others, but not by Iran, Iraq, Kuwait, or Qatar.

With the exception of Qatar, all of the Gulf countries are members either of OPEC or the OPEC+ alliance. OPEC and the OGDC, as well as other structures such as the Oil and Gas Climate Initiative, offer potential to foster cooperation on decarbonisation paths within the petroleum industry, which include ending flaring and methane leakage, improving energy efficiency, electrifying operations, and incorporating renewable and nuclear power, implementing

carbon capture and storage, piloting carbon dioxide removal technologies, producing sustainable aviation and maritime fuels, and developing hydrogen and its derivatives.

Specific cooperation would include aligning standards and regulations; sharing technological learnings and best practices; conducting joint studies on regional carbon dioxide storage capacity or satellite monitoring of methane leakage; and possibly some shared infrastructure, though this is more challenging and probably not essential. Joint investments, either within the Gulf countries or in third countries, could include the production of low-carbon hydrogen and sustainable fuels.

This collaboration can also include policy-related and diplomatic endeavours, on areas such as carbon caps, prices or taxes, international carbon trading under the Paris Agreement's Article 6.4, dealing with the growing use of carbon border tariffs, and appropriate certification and regulation for low-carbon hydrogen.

The global energy market has been evolving rapidly, notably with the rise of Asia as the world's key importer and consumer of energy and emitter of greenhouse gases, and the evolution of the natural gas business into a truly internationalised market via LNG trade. Most recently, the Russian invasion of Ukraine, the elimination of most of its pipeline gas exports to the EU, and a near-total ban on imports of Russian oil by the EU and other Western countries, have reshaped the global energy market and the patterns of trade in Gulf energy. The increasing US-China tensions, and the moves towards more diversity and robustness in supply chains and greater domestic self-sufficiency in key energy-related materials and technologies, is another emerging and evolving theme.

Greater Gulf cooperation on hydrocarbons, as a part of balanced strategies incorporating climate protection, could manage some of these threats and promote longer-term cooperation solutions to problems facing the region's critical economic sector.

5. Rising Electricity Demand Requires New Thinking on Gulf Grids

by Nadim Abillama

The demand for power is rising in the Middle East and North Africa (MENA) region; the 2023 Electricity Market Report by the International Energy Agency (IEA) estimates that this demand will grow at an annual rate of 2 per cent in the 2023–25 period.[1] Most of this growth is driven by Iraq, Iran and Gulf Cooperation Council (GCC) countries, notably Saudi Arabia, Oman, and the United Arab Emirates (UAE). For these countries, the same report expects electricity consumption to increase, on average, by 2–3 per cent between 2022 and 2025. The main drivers of this are population growth, and specific uses such as cooling and water desalination.

The effects of climate change, such as a higher number days when maximum temperatures exceed 35 degrees Celsius, are driving demand upwards in the region. But measures to boost energy efficiency are also on the rise. A recent IEA study based on temperature projection models shows how these trends are particularly affecting the region.[2] For example, Saudi Arabia has accelerated the roll-out of smart metres in the country[3] while partially reviewing its electricity tariffs to support more rational consumption patterns.[4] If these measures were maintained and widened throughout the region, the growth of demand for electricity would potentially be mitigated. The Emirate of Dubai currently has over two million smart metres installed.[5] Oman also has a national smart metre programme overseen by the Authority of Public Services Regulation, which

1 IEA, *Electricity Market Report 2023*, February 2023, p. 100, https://www.iea.org/reports/electricity-market-report-2023.

2 Jinsun Lim, Nadim Abillama and Chiara D'Adamo, "Climate Resilience Is Key to Energy Transitions in the Middle East and North Africa", in *IEA Commentaries*, 3 July 2023, https://www.iea.org/commentaries/climate-resilience-is-key-to-energy-transitions-in-the-middle-east-and-north-africa.

3 Saudi Ministry of Energy, *Minister of Energy Aims to Install 8 million Smart Meter Residential Sector by 2020*, 27 October 2019, https://www.moenergy.gov.sa/en/MediaCenter/News/Pages/2821441.aspx.

4 IEA, Electricity Market Report 2023, cit., p. 104.

5 Dubai Government, *Smart Electricity & Water Meters in Dubai*, 2 January 2023, https://mediaoffice.ae/en/news/2023/January/02-01/Dubai-Customers-benefit.

aims at installing 1.2 million smart metres by 2025,[6] covering all of the country's electricity consumers.

At the same time, oil and gas remain dominant in the MENA region, with natural gas playing a prominent role.[7] During 2023–25, the IEA expects gas-fired power to generate the most electrical capacity. For instance, in 2024, the same IEA report predicts that two thirds of the 60 gigawatt (GW) capacity being added to the whole Middle East region are expected to come from natural gas, with the rest being split between nuclear and renewables. At the same time, these countries are seeing the effects of renewable energy sources being increasingly deployed, in particular solar photovoltaics (PV).

Between 2023 and 2028, the IEA predicts that the Gulf region is expected to increase its renewable power generation capacity by over 40 GW.[8] This represents almost half of Saudi Arabia's current power generation and is more than the total power generated by the UAE today. This growth is dominated by utility-scale solar PV. In addition, the report cited that hydrogen also represents around 13 per cent of extra renewable power capacity, mainly enabled by government-backed incentives to stimulate hydrogen trade. Other factors supporting the growth of renewables for hydrogen include high levels of solar irradiation, land availability, and port infrastructure.

While this growth remains impressive, it could increase faster. Possible strategies to further accelerate growth might include encouraging more competition between utility providers, introducing domestic tariffs that reflect individual users' costs, addressing contractual issues with existing fossil fuel providers, and better supporting power storage systems to be flexible.

Cross-border electricity trading can also improve the deployment of renewables. However, international connections in the Gulf today only represent a small proportion of each country's electricity consumption. The six-member GCC Interconnection Authority, which has the remit to do this,

6 Conrad Prabhu, "Smart Meters to Cover Oman's Power Sector by 2025", in *Zawya*, 18 August 2022, https://www.zawya.com/en/projects/utilities/smart-meters-to-cover-omans-power-sector-by-2025-eecr7m0c.
7 IEA, *Electricity Market Report 2023*, cit., p. 21.
8 IEA, *Renewables 2023. Analysis and Forecasts to 2028*, January 2024, https://www.iea.org/reports/renewables-2023.

was established in 2001, but as of 2024 has only been able to support 1.2 GW of capacity.[9] The recent linking of Iraq to the network through Kuwait,[10] and ongoing discussions about a Saudi–Iraqi connection, would strengthen the region's interconnectedness in terms of power generation.

Of course, regional particularities need to be considered, for example consumption patterns related to climatic conditions. Innovative economic models are needed to address the need for system flexibility as a result of changes in peak demand between seasons, and between day and night. While leaders in the GCC are looking into the diversification of power supplies without compromising grid stability – whether through renewables or nuclear – leaders in Iran and Iraq face a growing mismatch between supply and demand.

For instance, in 2021, Iran had to face a 12 GW gap between peak summer demand and supply.[11] Severe droughts limited hydropower in a country that generates 4.6 percent of its electricity from that source.[12] Although there were also other factors at play, both domestic and external, the effects of climate change and limited diversification in the power generation sector cannot be discounted as factors limiting the overall resilience of the current system. Neighbouring Iraq also faced similar challenges, despite the domestic context being different. Nevertheless, both countries are investigating whether renewable power capacity can be developed faster. For example, Iran has set a 2025 target for 10 GW of renewables,[13] while Iraq is looking into linking oil and gas investments with large-scale renewables projects. However, it is worth pointing out that reforms in the electricity market[14] remain a key prerequisite to address the power sector crisis.

9 Robin Mills, "GCC Grid Infrastructure and Connectivity – An Electrifying Vision", in *AGSIW Blog*, 29 August 2023, https://wp.me/p9W40X-bAU.

10 "GCC Summit: Gulf Electricity Interconnection Project Comes to Fruition", in *QNA*, 4 December 2023, https://www.qna.org.qa/en/News Area/News/2023-12/04/0018-gcc-summit-gulf-electricity-interconnection-project-comes-to-fruition.

11 Yesar Al-Maleki, "Iran Dreams Up 14GW Renewables Target", in *Middle East Economic Survey*, 20 May 2022, https://www.mees.com/2022/5/20/power-water/iran-dreams-up-14gw-renewables-target/9b8ba140-d813-11ec-a7bb-fffd5b4aa08a.

12 IEA website: *Iran*, https://www.iea.org/countries/iran.

13 Economist Intelligence Unit, *Iran Refocuses on Renewable Energy Projects*, 26 May 2023, https://www.eiu.com/n/iran-refocuses-on-renewable-energy-projects.

14 Yesar Al-Maleki, "Urgent Reforms Needed to Unlock Iraq's Green Potential", in *AGSIW Blog*, 14 November 2023, https://wp.me/p9W40X-bPA.

There can be no large-scale transformations in electricity markets without adequate reforms. In the Gulf, there remain vast opportunities related to tariffs and subsidies. While investments in renewables in the region have been enabled by the active involvement of governments (where land availability and permissions enable large-scale projects, such as in Oman and the UAE), tariff and subsidy reforms should remain a priority. Otherwise, current and future renewables projects will not be financially viable. Reforms such as these would also allow utility companies in the region to recoup their costs and allow for investments in the grid infrastructure. These investments would pave the way for further renewables to be developed and deployed, such as decentralised solar PV.

The dynamics surrounding power markets in the MENA region require addressing a series of priorities that sometimes come into conflict with each other. Governments are expected to provide secure, reliable, and affordable electricity to all. In a geographical area significantly affected by the effects of climate change, the need to mitigate these impacts is probably more pressing than in any other region. Climate change not only creates new patterns in demand, with a heightened need for cooling and desalination, but it also affects the resilience of the power system itself.[15] Higher temperatures, droughts, higher sea levels, or flash floods can all significantly affect operations on the supply side and reduce output. This is not limited to conventional power generation (oil and gas); nuclear and solar PV units can also be affected.

In this challenging regional context, where priorities are continuously shifting, it remains important that the climate crisis increasingly plays a central role in how regional leaders think about their future energy systems. Climate change has significantly increased the complexity of power markets. It is essential to pay more attention to how systems are planned and designed, and how they must operate in the face of new demands.

15 Jinsun Lim, Nadim Abillama and Chiara D'Adamo, "Climate Resilience Is Key to Energy Transitions", cit.

6. Solar Power's Water Problem in the Gulf

by Natalie Koch

Since the inauguration of the Mohammed bin Rashid Al Maktoum Solar Park in Dubai in 2013, the Gulf Cooperation Council (GCC) has become home to an increasing number of solar power installations. Emirati leaders have so far invested the most in large utility-scale solar in the region, but their peers in Saudi Arabia, Qatar, Oman, Kuwait, and Bahrain have also begun to set up new solar parks in recent years.

The Arabian Peninsula's desert landscapes might seem to be perfect for large solar power facilities like those being developed in the GCC states. Vast and largely uninhabited, the Arabian Desert[1] gets plentiful sunshine: it receives around 3,400 hours of sunshine per year, compared with averages of around 1,600 hours in Germany or 2,900 hours in Spain.

But solar power needs much more than desert sunshine to work. Arid landscapes present various infrastructure challenges, including high temperatures that can damage solar arrays and remoteness from established energy transmission lines. And where sunshine is most abundant, water is not.

Indeed, water scarcity is the most important limit on the grand promises of GCC governments to overhaul and decarbonise the region's energy system. The Arabian Desert is one of the most arid places on earth,[2] typically receiving under 4 inches (100 mm) of rain per year, and already facing near total depletion of its groundwater.[3]

1 Donald August Holm, "Arabian Desert", in *Britannica*, last updated on 20 September 2022, https://www.britannica.com/place/Arabian-Desert.
2 Platon Patlakas et al., "Precipitation Climatology for the Arid Region of the Arabian Peninsula—Variability, Trends and Extremes", in *Climate*, Vol. 9, No. 7 (July 2021), Article 103, https://doi.org/10.3390/cli9070103.
3 Mary Caperton Morton, "Arid Arabian Peninsula Is Tapping into Vast Groundwater Reserves", in *Eos*, 5 November 2019, https://eos.org/?p=136360.

Unfortunately, today's solar technology requires substantial amounts of water. Celebratory discussions about solar power are often illustrated with photographs of sparkling photovoltaic (PV) arrays. These solar panels are always pristine, recently cleaned arrays. Unfortunately, such a scene is a rare encounter in the Arabian Desert, where dust and blowing sand is quick to cover the solar panels and mirrors of both PV systems and concentrated solar power (CSP) systems.[4]

Aware of desert solar's dust problem,[5] companies like Arizona's First Solar and Luxembourg's SolarCleano have promoted waterless cleaning systems. Yet these technologies are still not advanced enough to employ on a large, industrial scale. Solar technology companies based in the Gulf are also aware of this problem and have tried to engineer their own solutions. For example, Saudi Arabia's NOMADD has designed its namesake "NO Water Mechanical Automated Dusting Device" to address the challenge of cleaning of solar panels in the Arabian Peninsula.[6]

While robotic PV-cleaning systems are deployed in some sites today, waterless cleaning technologies are expensive and have failed to scale up beyond small, pilot projects. As a result, the GCC's small-scale solar installations and the large-scale solar parks continue to use water to clear dust and debris from their panels. Most of that water is desalinated sea water, which is produced with a huge energy cost and substantial CO_2 emissions.[7] In this case, then, solar energy produced in the Arabian Peninsula's desert parks is far from green – it is actually incredibly wasteful.

4 US Energy Information Administration (EIA), "Photovoltaics and Electricity", in *Solar Explained*, last updated on 26 May 2023, https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php; US Department of Energy website: *Concentrating Solar-Thermal Power Basics*, https://www.energy.gov/node/4622744.

5 Daniel Bardsley, "Dust Can Dramatically Reduce Effectiveness of Solar Panels in Arabian Peninsula, US Study Finds", in *The National*, 7 October 2017, https://www.thenationalnews.com/1.664896.

6 NOMADD website: The Desert Solar Challenge, https://www.nomaddesertsolar.com/the-desert-solar-challenge.html.

7 Molly Walton, "Desalinated Water Affects the Energy Equation in the Middle East", in *IEA Commentaries*, 21 January 2019, https://www.iea.org/commentaries/desalinated-water-affects-the-energy-equation-in-the-middle-east; Ashwatha Mahesh, "Carbon Footprint of Water Consumption", in *The Sustainabilist*, 10 March 2020, https://thesustainabilist.ae/?p=4725.

6.1 Renewable energy's water footprint

The water footprint of solar power extends beyond just cleaning. Water is also used in extracting diverse minerals needed to manufacture PV cells and batteries,[8] such as lithium, cobalt, tellurium, and gallium, as well as in the manufacturing process itself. Mining for the renewable energy sector largely takes place outside of the Arabian Peninsula, but Saudi Arabia's new investments in mining,[9] described as advancing global efforts to "decarbonise," will invariably expand this water footprint in the region.

Water is integral to all modern forms of electricity generation, including fossil fuels, and nuclear, alongside renewables. Required water inputs vary by the source,[10] in large part because the infrastructures needed to generate, store, and transmit energy all have different geographies. The solar water footprint contrasts to the water demands for coal,[11] for example, where water is first used to extract coal from the earth, and then in power plant cooling operations like all thermoelectric power systems (coal, natural gas, and nuclear).

Proponents suggest that the water demands of renewables are a significantly lower than those of traditional fossil fuels.[12] This is probably true. But even so, estimates from the International Energy Agency (IEA) use absolute numbers that reflect a limited proportion of renewables in the overall global energy supply mix.[13] These estimates also tend to neglect the physical geography of renewable energy installations siting – like whether a proposed solar park is located in a desert where it is liable to dust problems that increase its water needs.

8 US Geological Survey (USGS), *Critical Mineral Commodities in Renewable Energy*, 4 June 2019, https://www.usgs.gov/media/56046.

9 Rebecca Anne Proctor, "Saudi Arabia's $2.6 Billion Mining Deal Reshapes Global Decarbonization Landscape", in *Arab News*, 20 August 2023, https://arab.news/5a6q6.

10 Yi Jin et al., "Water Use of Electricity Technologies: A Global Meta-Analysis", in *Renewable and Sustainable Energy Reviews*, Vol. 115 (November 2019), Article 109391, https://doi.org/10.1016/j.rser.2019.109391.

11 Union of Concerned Scientists (UCS), "How it Works: Water for Coal", in *UCS Explainers*, updated on 7 August 2014, https://www.ucsusa.org/node/1996.

12 Tomás de Oliveira Bredariol, "Clean Energy Can Help to Ease the Water Crisis", in *IEA Commentaries*, 22 March 2023, https://www.iea.org/commentaries/clean-energy-can-help-to-ease-the-water-crisis.

13 IEA, *Global Water Consumption in the Energy Sector by Fuel and Power Generation Type in the Net Zero Scenario, 2021 and 2030*, last updated on 22 March 2023, https://www.iea.org/data-and-statistics/charts/global-water-consumption-in-the-energy-sector-by-fuel-and-power-generation-type-in-the-stated-policies-scenario-2021-and-2030.

6.2 Overpromising solar to hype hydrogen

Encouraged by partners in Europe and Asia, Gulf fossil fuel producers are increasingly keen to promote hydrogen energy[14] and state-backed efforts to develop hydrogen are now found in the UAE, Saudi Arabia, and Oman.[15] In many cases, these projects are framed as key to transforming the region into future "green" hydrogen hubs.[16] Creating hydrogen energy requires vast amounts of energy and for it to be "green", this energy must come from renewables.

To date, the amount of renewable energy produced in the Arabian Peninsula[17] is so limited that none of the impressive green hydrogen targets in the Gulf are realistic. Local programmes that position the Arabian Peninsula as a new green hydrogen hub overpromise their future solar energy capacity. They overpromise solar both in the *present*, because the production capacity simply is not there, and also in the *future*, because the region's water supplies are insufficient to deliver on local renewable energy promises. Instead, the new Gulf hydrogen programmes are on track to locally lock in natural-gas generated hydrogen.[18] Meanwhile, the water limits of solar power's expansion are a fundamental obstacle to any future for "green" hydrogen in the region.

Just like the solar power parks that they depend on, new hydrogen energy schemes can only represent an improvement on the CO_2 footprint of traditional fossil fuel energy sources if the production site decisions take water into account. If any renewable energy project's water footprint is not carefully

14 Natalie Koch, "Gulf Hydrogen Horizons. Why Are Gulf Oil and Gas Producers So Keen on Hydrogen?", in *IASS Discussion Papers*, November 2022, http://doi.org/10.48481/iass.2022.044.

15 John Benny, "UAE Not Leaving 'Any Stones Unturned' in Hydrogen Development, Energy Official Says", in *The National*, 11 October 2023, https://www.thenationalnews.com/business/energy/2023/10/11/uae-not-leaving-any-stones-unturned-in-hydrogen-development-energy-official-says; Jennifer Bell, "NEOM's Green Hydrogen Plant Will Secure Saudi Arabia's Clean Energy Transition: CEO", in *Al Arabiya*, 25 May 2023, https://ara.tv/wvez3; IEA, *Renewable Hydrogen from Oman*, June 2023, https://www.iea.org/reports/renewable-hydrogen-from-oman.

16 World Future Energy Summit, "Smooth Transition – The Middle East can become the World's Green Hydrogen Hub", in *Future Insights Blog*, 21 October 2022, https://www.worldfutureenergysummit.com/en-gb/future-insights-blog/blogs/middle-east-worlds-green-hydrogen-hub.html.

17 Aisha Al-Sarihi and Noura Mansouri, "Renewable Energy Development in the Gulf Cooperation Council Countries: Status, Barriers, and Policy Options", in *Energies*, Vol. 15, No. 5 (2022), Article 1923, https://doi.org/10.3390/en15051923.

18 Jan Rosenow and Richard Lowes, "Will Blue Hydrogen Lock Us into Fossil Fuels Forever?", in *One Earth*, Vol. 4, No. 11 (19 November 2021), p. 1527-1529, https://doi.org/10.1016/j.oneear.2021.10.018.

evaluated, then the most likely outcome will be that it turns into a big "green wash", a convoluted mess of energy infrastructure that is built in the name of being green, but does not actually result in any CO_2 reductions. And perhaps the most tragic outcome of this green theatre would be if it only exacerbates local water shortfalls that then exacerbate the climate crisis, as they are met with yet more carbon-emitting desalinated seawater.

6.3 Water and energy futures

Although water is one of the most forgotten elements in today's discussions about energy systems, the water-energy nexus[19] has come into sharper focus recently and has been integrated in the climate talks under the UAE COP28 presidency's Water4Climate initiative. Yet, similar to how mainstream climate change discussions are defined globally, water is often just reduced to an issue of "water security" for vulnerable populations. This is, of course, an important issue. But it is almost entirely divorced from the problem of water use and planning in the implementation of high-tech energy infrastructure around the world.

Regardless of whether oil and gas are "phased out" or "phased down",[20] fossil fuels are on their way out. Yet high-tech energy infrastructure, including renewables, will continue to be prioritised by political and economic leaders in the Arabian Peninsula. The question is *where* those infrastructures will be located.

Since the Gulf's energy leaders want to remain central to the post-oil energy system, they are already investing in renewable energy abroad. For example, the UAE's Masdar has stakes in solar parks, wind farms, and geothermal energy operations all across the world,[21] including in neighbouring Gulf states like Iraq.[22] Likewise, UAE-based AMEA Power was set up several years ago with

19 IEA, *Introduction to the Water-Energy Nexus*, 23 March 2020, https://www.iea.org/articles/introduction-to-the-water-energy-nexus.

20 Rosie Frost, "Phase Out or Phase Down? Fight Over Fossil Fuels Heats Up in Run-Up to COP28", in *Euronews*, 27 September 2023, https://www.euronews.com/green/2023/09/27/phase-out-or-phase-down-fight-over-fossil-fuels-heats-up-in-run-up-to-cop28.

21 MASDAR website: *Our Projects*, https://masdar.ae/en/renewables/our-projects.

22 Nadim Kawach, "Masdar to Build 4 Solar Power Plants in Iraq", in *Zawya*, 28 June 2022, https://www.

the express purpose of investing in foreign renewable energy projects – and is growing at breakneck speed. Renewables have also been major targets for foreign investment from Saudi Arabia's ACWA Power, which has also been the most aggressive actor in setting up hydrogen partnerships with foreign partners in Eurasia and the MENA region, including in Morocco, Uzbekistan, Kazakhstan, China, and beyond.[23]

These future energy partnerships are already fostering regional cooperation and they will continue to do so. However, it is essential that water be at the centre of all considerations about how renewable energy infrastructures are located. In particular, if solar parks are located in places that strain water resources in a partner country – such as with growing water problems from Morocco's Noor solar plant[24] – then they are likely to provoke local opposition and accusations of "water grabbing" and neocolonialism.[25]

No map can answer the question of how renewable energy landscapes should be ideally configured, because all geography is political. But decision-makers in the GCC, in neighbouring countries like Iraq and Iran, and in countries spearheading climate action, must think critically about where to locate renewable energy infrastructures. To take serious, coordinated action toward scaling renewable energy in a way that actually reduces carbon emissions, water usage must be the primary consideration.

zawya.com/en/projects/utilities/masdar-to-build-4-solar-power-plants-in-iraq-xpk8jgv2.

23 Souad Anouar, "ACWA Power Eyes Morocco's Emerging Green Hydrogen Market", in *Morocco World News*, 30 September 2022, https://www.moroccoworldnews.com/2022/09/351590/acwa-power-eyes-moroccos-emerging-green-hydrogen-market; ACWA Power, *ACWA Power to Develop Uzbekistan's First Green Hydrogen and Green Ammonia Projects*, 19 January 2023, https://www.acwapower.com/news/acwa-power-to-develop-uzbekistans-first-green-hydrogen-and-green-ammonia-projects; "ACWA Power Unveils Vision for Renewable Energy and Water Solutions in Kazakhstan", in *The Astana Times*, 17 November 2023, https://astanatimes.com/?p=76658; ACWA Power, *ACWA Power Signs Multiple Clean Energy Agreements with Chinese Firms*, 13 September 2023, https://www.acwapower.com/news/acwa-power-signs-multiple-clean-energy-agreements-with-chinese-firms; John Benny, "ACWA Power Plans to 'Replicate' $5bn Neom Green Hydrogen Project Abroad", in *The National*, 1 February 2023, https://www.thenationalnews.com/business/energy/2023/02/01/acwa-power-plans-to-replicate-5bn-neom-green-hydrogen-project-abroad.

24 Aïda Delpuech and Arianna Poletti, "'Preserving Oases': The Fight for Water by Morocco Farmers", in *Al Jazeera*, 11 November 2022, https://aje.io/tkby1a.

25 Hamza Hamouchene, "The Energy Transition in North Africa: Neocolonialism Again!", in *TNI Longreads*, 14 October 2022, https://longreads.tni.org/?p=16331.

7. Fostering a New Energy System for the Gulf, the Red Sea, and the Mediterranean

by Mohammad Al-Saidi

Through investments in solar and wind power, grid connections, and hydrogen, energy transition in the Middle East is well under way. This transition is urgent for large countries such as Saudi Arabia and Egypt, since their rapidly growing economies and populations have vastly increased their consumption of domestic energy. Continuing to burn oil and gas for domestic energy could lead to Saudi Arabia struggling to export oil by as early as 2030,[1] and therefore the Saudi transition to renewables alongside cutting fossil fuel subsidies has been a significant milestone in the economic development of the Arab region as a whole.[2] The story is similar in Egypt; alongside its transition away from fossil fuel subsidies,[3] the country has cut its energy import bill by investing in renewables.

The neighbouring regions of the Gulf and Europe have shown a strong interest in cooperating with North Africa on energy transition. Both regions see economic opportunities here, as well as the potential to advance their own transition from fossil fuels to renewables. With renewables now more economically feasible, this type of energy is no longer simply about electricity and is penetrating other sectors, for example desalination, agriculture and hydrogen production. Interregional cooperation on renewable energy is complex and embedded within visions for the wider economic development of the Middle East. However, cooperation is in its early stages and faces challenges.

1 Abid Ali, "Saudis May Not Have Oil to Export by 2030", in *Al Jazeera*, 6 September 2012, https://aje.io/u3bla.

2 Mohammad Al-Saidi, "Energy Transition in Saudi Arabia: Giant Leap or Necessary Adjustment for a Large Carbon Economy?", in *Energy Reports*, Vol. 8, Suppl. 3 (June 2022), p. 312-318, https://doi.org/10.1016/j.egyr.2022.01.015.

3 World Resources Institute, "Egypt: Transitioning Away from Subsidizing Fossil Fuels", in *WRI Snapshots*, 1 April 2021, https://www.wri.org/node/101573.

Cooperation between Egypt and the Gulf states will also benefit Europe, which is promoting increased grid connections with Africa and the development of green hydrogen in Egypt. Looking at the parallel pushes for energy transition in the Gulf and Mediterranean regions, one can envision cooperation between the Gulf, the Red Sea, and the Mediterranean in the field of renewable energy.

The North African countries have announced ambitious renewable energy targets.[4] By 2030, Morocco, Tunisia and Algeria aim, respectively, for 52 per cent (of power capacity), 35 per cent (of power generation), and 27 per cent (of electricity) to come from renewable sources, while Egypt is aiming for 42 per cent (of electricity) by 2035. The Gulf countries have similar ambitions, and Saudi Arabia's target of 50 per cent of electricity by 2030 seems significant considering its status as both the largest economy and heaviest energy user in the region.[5]

Motivations for energy transition in the two regions are similar – lowering emissions and meeting increasing domestic demand. However, in carbon-rich countries such as the Gulf states or Algeria, energy transition is also seen as a vehicle for economic diversification. Many of these countries still depend on carbon revenues and the public sector. Renewable energy can free up resources in North Africa by importing less fossil fuels and in the Gulf by decreasing domestic consumption and expanding exports. These resources can be invested in modernising industries or giving financial incentives to encourage innovation.

For concurrent energy transitions to work, cooperation among neighbouring states is necessary. For example, grid connections are essential in improving energy efficiency and grid stability once renewables are deployed. The 1.8 billion US dollars grid connection project between Egypt and Saudi Arabia will start trial operations in 2024,[6] linking the two major economies in the region and two different continents. Another key project is the ongoing

4 Mohammad Al-Saidi, "White Knight or Partner of Choice? The Ukraine War and the Role of the Middle East in the Energy Security of Europe", in *Energy Strategy Reviews*, Vol. 49 (September 2023), Article 101116, https://doi.org/10.1016/j.esr.2023.101116.

5 Mohammad Al-Saidi, "Energy Transition in Saudi Arabia", cit.

6 "Egypt and Saudi Arabia Set to Launch $1.8 Billion Electrical Interconnection Project", in *Oil&Gas*, 7 June 2023, https://www.oilandgasmiddleeast.com/?p=59385.

EuroAfrica interconnector, joining Egypt to Cyprus and Greece.[7] Alongside the existing connections between Morocco and Spain, this project creates further connections between North Africa and Europe.

Regional partners are also involved in the Middle East's transition to renewable energy, and European interests are particularly important as the continent explores clean hydrogen importers[8] and energy suppliers in the wake of the war on Ukraine.[9] However, there are also valid concerns that allowing big European corporations[10] (such as Italy's Eni, Germany's Siemens, Denmark's Maersk, Norway's Equinor, or Netherland's Vitol) to invest in green hydrogen projects in North Africa may lead to resource grabs and exploitation of the region. The Gulf states are also investing in blue and green hydrogen for export to Europe and Asia.[11] Asian companies – for example, Japan – have long industrial legacies in the Gulf Cooperation Council, whether in building desalination plants or in energy projects such as the Saudi–Egypt grid connection mentioned above, which is being built by Hitachi Energy.

The relationship between Egypt and the Gulf states is nowadays embedded within a broader vision for redefining the regional economy of the Middle East through new cities, and improving the water energy infrastructure. While Egypt is building its New Administrative Capital (a city with a population of 6.5 million) eastwards of Cairo, Saudi Arabia is investing 500 billion US dollars in constructing the world's largest urban megaproject, NEOM,[12] on the Red Sea, which will eventually accommodate 10 million people. NEOM uses the most advanced sustainability technologies and already involves companies from all over the world, including European countries such as Germany.[13] The region

7 See the official website: https://www.euroafrica-interconnector.com.
8 Roberto Cardinale, "From Natural Gas to Green Hydrogen: Developing and Repurposing Transnational Energy Infrastructure Connecting North Africa to Europe", in *Energy Policy*, Vol. 181 (October 2023), Article 113623, https://doi.org/10.1016/j.enpol.2023.113623.
9 Mohammad Al-Saidi, "White Knight or Partner of Choice?", cit.
10 Corporate Europe Observatory, *Hydrogen from North Africa – A Neocolonial Resource Grab*, 17 May 2022, https://corporateeurope.org/en/node/1864.
11 Dawud Ansari, "The Hydrogen Ambitions of the Gulf States", in *SWP Comments*, No. 44 (July 2022), https://doi.org/10.18449/2022C44.
12 Jennifer Bell, "Saudi Arabia's NEOM: The $500 bln Mega-Project to Be a 'Blueprint' for Going Green", in *Al Arabiya English*, 27 October 2023, https://ara.tv/n45wp.
13 Anna Gauto, "Eine Wüstenstadt aus Glas – so plant Saudi-Arabien 'The Line'", in *Handelsblatt*, 10 November 2022, https://www.handelsblatt.com/technik/28671114.html.

from NEOM to Egypt's New Administrative Capital, and perhaps northwards to Jordan and Israel, will constitute a new regional economic centre – alongside the region of Riyadh and the surrounding Gulf cities – which requires major new desalination, renewable energy, and hydrogen projects.

Cooperation between Egypt and the Gulf on clean energy is set to increase. Saudi Arabia is investing in renewable energies that will provide for NEOM's entire energy and desalination needs.[14] At the same time, it is building the world's largest green hydrogen plant[15] in NEOM, at a cost of 8.4 billion US dollars. Saudi companies have also committed billions of dollars to investments in Egypt in the areas of desalination, renewable energy, and, increasingly, green hydrogen.[16] Similarly, the UAE is using its strong experience in desalination and renewables to profit from the highly attractive Egyptian market. One example of this is the Masdar-led consortium which is set to build a 10 billion US dollars wind project in Sohag, Egypt.[17] During COP27 in 2022, Egypt's Suez Canal Economic Zone signed 83 billion US dollars in green energy deals with investors from Saudi Arabia, UAE, Norway, and the UK.[18]

The Red Sea, particularly the Ain Sokhna port area, is touted to host many of Egypt's green hydrogen projects, adding to this region's importance. However, as the country's economy has been unstable in recent years, Gulf investors have been reluctant to invest in Egypt before a deal is reached with the International Monetary Fund. However, since this deal has been formalised in in early 2024, this could be an opportunity to realise the projects that have already been announced. It is worth noting, though, that as of January 2024, European-Gulf consortia, India, and China have all expressed interest in investing in

14 "Saudi Arabia Mega City Neom to Run Entirely on Renewable Energy; Here Is the Roadmap", in *CNBC TV*, 20 February 2023, https://www.cnbctv18.com/world/saudi-arabia-mega-city-neom-to-run-entirely-on-renewable-energy-15979881.htm.

15 Florence Jones, "World's Largest Green Hydrogen Plant Reaches Financial Close", in *Power Technology*, 25 May 2023, https://www.power-technology.com/?p=262169.

16 Fatma Salah, "Saudi Energy Giant ACWA Power to Pump $10bn into Egypt's Green Sector: CEO", in *Daily News Egypt*, 28 August 2023, https://www.dailynewsegypt.com/?p=802521.

17 "Masdar-led Consortium Secures Land for $10bn Wind Project in Egypt", in *Arab News*, 7 June 2023, https://arab.news/mgrkn.

18 Nada El Sawy, "Egypt Exceeds Expectations with $83bn in Green Energy Deals at Cop27", in *The National*, 16 November 2022, https://www.thenationalnews.com/business/energy/2022/11/16/egypt-exceeds-expectations-with-83bn-in-green-energy-deals-at-cop27.

renewable energy projects in Egypt.[19] The country has set an ambitious goal of becoming a regional energy hub,[20] and plans to achieve this by investing in clean energy and gas, improving transport, and refining its infrastructure. One of its key infrastructure projects is the 23 billion US dollars high-speed train connecting the Ain Sokhna port to the Mediterranean, which is being delivered in collaboration with Germany's Siemens and has been dubbed a "Suez Canal on rails".[21]

Due to differing interests and expectations, it is difficult to predict the outcomes of cooperation between the Gulf, North Africa, and Europe on sustainable development issues. While the Gulf is seeking economic diversification via investments, Europe is mainly driven by its energy and climatic goals. Some North African countries suffer from weakened institutions and political instability. Therefore, for some countries, a cautious green hydrogen approach might be necessary. Such an approach should aim to create local value, prioritise domestic energy transition, and address social, human, and sustainability requirements.[22] North African countries might have weaker negotiating positions compared to Europe or the Gulf due to inequities in finance, capacity for negotiation, or geopolitical power. The competition between the Gulf and Europe for renewable energy projects can mobilise funds and offer more choice for North Africa, but it is important to also consider ownership of clean energy projects in the destination country.

Interregional cooperation between the Gulf, the Red Sea, and the Mediterranean is complex, and it is reasonable to assume that legacies and outcomes of joint investment in clean energy will be mixed. In the case of Egypt, cooperation on renewables has some distinctive characteristics. Egypt's renewables projects are embedded within an economic vision by Saudi Arabia and Egypt to create a new regional centre in the north of the Red Sea connecting the Gulf to Europe. In addition, relative political stability is likely to further the energy transition

19 "Egypt Receives $6 bln Requests for Renewable Energy Investment Licenses", in *Ahram Online*, 15 January 2024, https://english.ahram.org.eg/News/515737.aspx.
20 Karim Elgendy, "Egypt as an Eastern Mediterranean Power in the Age of Energy Transition", in *MEI Articles*, 18 July 2022, https://www.mei.edu/node/84525.
21 Yomna Marghany, "Egypt to Receive First Train for High-Speed Electric Railway in October", in *Ahram Online*, 3 September 2023, https://english.ahram.org.eg/News/507717.aspx.
22 Aïda Delpuech, *Who Benefits from Tunisia's Green Hydrogen Strategy?*, Paris, Arab Reform Initiative, December 2022, https://www.arab-reform.net/?p=23930.

of the Arab region's largest country which can serve as gateway for investors into the Arab region. While this transition will solicit both local and foreign investments, the domestic will to decarbonise and create job opportunities is essential if energy cooperation is to succeed.

Avenues for Regional Energy Cooperation in the Gulf

In the midst of the Gulf region's evolving energy landscape, characterised by the imperative of sustainable energy security and geopolitical complexities, regional cooperation emerges as a critical avenue for addressing shared challenges and seizing opportunities. Against a backdrop of a positive shift in geopolitical dynamics in the Gulf, this volume explores the imperative for inclusive cooperation in the energy sector between regional players and beyond, emphasising the transition towards renewable energy and the phased reduction of reliance on traditional fossil fuels. Drawing insights from a two-day workshop organised by the Bourse & Bazaar Foundation (B&BF) and the Istituto Affari Internazionali (IAI) in November 2023, this edited report delves into actionable proposals for bilateral and multilateral cooperation. Through a series of analytical pieces authored by leading experts and practitioners, the report examines the multifaceted nature of energy cooperation, addressing challenges ranging from geopolitical tensions to technical complexities. It highlights the potential for regional collaboration in areas such as renewable energy production, gas pipelines, and cross-border electricity trading, while also underscoring the need for trust-building measures and diplomatic collaboration to overcome political obstacles. Ultimately, this report underscores the importance of regional energy cooperation as a pathway towards sustainable development and economic prosperity in the Gulf region and beyond.

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