THE EDGE CONSULTANCY

The Edge Economic Update

Energy Transition & Economic Diversification "Kuwait – Saudi – UAE"

January 2026

Energy Transition and Economic Diversification

Introduction

The countries of the Gulf Cooperation Council (GCC) are undergoing pivotal transformations to reduce dependence on oil and embrace sustainable economic growth. Energy transition – shifting from fossil fuels to renewables and low-carbon energy – is seen as both an environmental necessity and a strategic economic imperative.

In parallel, economic diversification aims to broaden the economic base beyond oil exports, creating new industries and jobs. Kuwait, Saudi Arabia, and the United Arab Emirates (UAE) have each launched high-profile vision strategies to navigate this transition: Kuwait's *Vision 2035 (New Kuwait)*, Saudi Arabia's *Vision 2030*, and the UAE's *Net Zero by 2050 Strategic Initiative*. While all three share common goals of reducing oil reliance, developing clean energy, and fostering new sectors, their approaches and targets differ in scale and timeframe.

Each country's strategy is explored in detail in separate sections, covering official plans, policies, renewable projects, hydrogen initiatives, recent developments through 2024–2025, and the challenges and opportunities ahead.

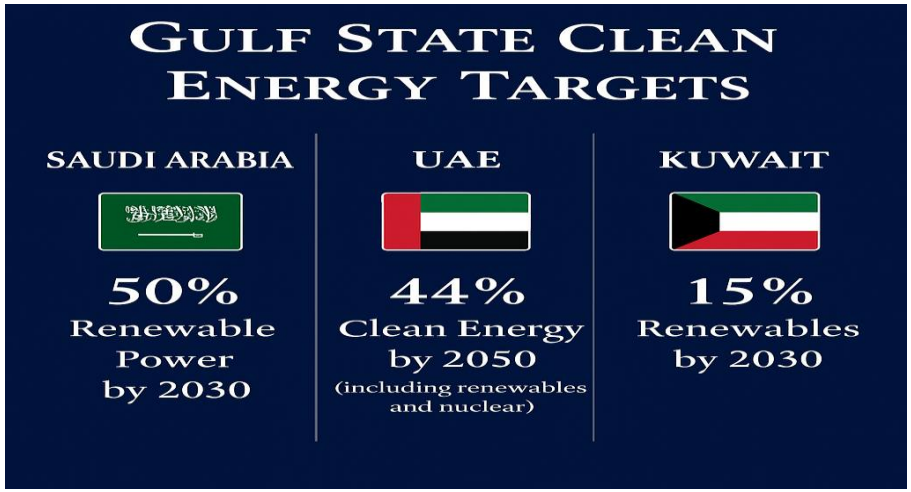

Illustration: Renewable energy targets of GCC countries as a percentage of power mix (target year varies). Saudi Arabia's target of 50% renewable electricity by 2030 is the most ambitious in the Gulf, compared to the UAE's ~44% clean energy by 2050 and Kuwait's 15% by 2030.

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Kuwait: Vision 2035 and a Sustainable Future

Official Strategy – Vision 2035: Kuwait's long-term development blueprint is *Vision 2035*, also branded as the "New Kuwait" strategy. Launched in 2017, Vision 2035 lays out seven pillars to transform Kuwait into a regional financial, commercial, and cultural hub by 2035. Key priorities include economic reform (empowering the private sector over the public sector), massive infrastructure development (ports, transport, "smart" cities), human capital investment (education and skills for youth), and environmental sustainability. A core theme is diversification of the economy to reduce the heavy reliance on oil, which historically accounted for around 90% of government revenues. By bolstering non-oil sectors and modernizing governance, Vision 2035 seeks to create a "New Kuwait" that can thrive in a future where oil is no longer dominant.

Reducing Oil Dependence – Policies and Measures: Over the past decade, Kuwait has introduced measures to address structural economic weaknesses. One focus is energizing the private sector and entrepreneurship. Programs like the Kuwait National Fund for SME Development provide funding and training to support start-ups and small businesses. Reforms in the financial sector have also been implemented: for example, Kuwait's stock exchange (Boursa Kuwait) was overhauled to improve transparency and attract foreign investors, helping increase non-oil capital inflows. To reduce the burden of public sector employment (where a majority of Kuwaitis work), the government is encouraging private employment through labor market reforms and incentives. Some fiscal reforms have targeted long-standing subsidies – a politically sensitive area. In 2016 Kuwait enacted a law to raise electricity and water tariffs (after decades of very low prices), aiming to curb wasteful consumption and ease the strain on state finances. This was a bold step given that fuel and power subsidies have traditionally been extensive; even now, heavy subsidies remain a challenge, contributing to high per capita energy use and periodic budget deficits. Nonetheless, such reforms signal recognition that the old rentier model must change. Kuwait has also discussed introducing a value-added tax (VAT) in line with GCC agreements, though implementation has been repeatedly delayed. On the social side, Vision 2035 emphasizes education reforms and increasing the role of women in the workforce to better equip the population for a diversified economy. In summary, Kuwait's policy steps have been incremental – establishing frameworks for investment, trimming some subsidies, and fostering private enterprise.

Renewable Energy Projects: Developing renewable energy is a cornerstone of Kuwait's strategy to both reduce domestic oil consumption (freeing more oil for export) and meet climate commitments. The flagship project is the Shagaya Renewable Energy Park, a vast clean energy complex in the desert about 100 km west of Kuwait City. Shagaya is planned in phases to eventually supply up to 4,000 MW (4 GW) of power from a mix of solar photovoltaic (PV), concentrated solar power (CSP), and wind technologies. *Phase 1* of Shagaya, completed in 2018, comprises a 50 MW CSP plant (with a solar tower and thermal storage), a 10 MW wind farm, and a 10 MW PV plant – totaling 70 MW that was connected to the grid as a pilot for utility-scale renewables.

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Subsequent phases are far more ambitious. *Phase 2* and *Phase 3* aim to add roughly 1,700 MW of solar (PV and additional CSP) by 2028, and *Phase 4* another ~1,700 MW by 2030. If fully realized, Shagaya would contribute significantly to Kuwait's national target of 15% renewable energy in the power mix by 2030. This 15% target, first announced in the mid-2010s, equates to about 4–5 GW of capacity given Kuwait's projected electricity demand. 2025 has brought new momentum: Kuwait's partnerships authority and Ministry of Energy have tendered several large solar projects. Notably, a 1.1 GW Al-Dibdibah Solar PV plant (in the Shagaya park) is in the RFP stage with international consortium bidders shortlisted, and an additional 500 MW of solar projects were tendered in mid-2025. If these projects stay on schedule, Kuwait could jump from essentially <1% renewable power to many hundreds of megawatts by the late 2020s. Another major planned project is a 1.5 GW solar plant originally intended for the oil fields (to power extraction operations), which has been folded into the Shagaya Phase 3 expansion. Alongside solar, Kuwait is also exploring wind potential beyond the small 10 MW pilot – wind data at Shagaya indicates decent capacity factors, and future phases could include larger wind farms. By investing in renewables, Kuwait seeks to meet domestic power needs sustainably and reduce the combustion of oil and gas for electricity. Every megawatt of solar or wind can displace fuel that Kuwait could export or save, while also cutting carbon emissions and local air pollution. Indeed, Shagaya's fully built 4 GW is estimated to avoid hundreds of thousands of tons of CO_2 per year, and Kuwait has announced a long-term goal of reaching net-zero carbon emissions (economy-wide) by 2060.

Illustration: Shagaya Renewable Energy Park (Kuwait), a vast clean energy complex in the desert about 100 km west of Kuwait City. Phase 1 of Shagaya, completed in 2018, comprises a 50 MW CSP.

Hydrogen and Green Ammonia: Kuwait is in earlier stages of considering hydrogen as a future energy vector. Given its abundant solar potential and existing ammonia industry, Kuwait could produce "green hydrogen" (via solar-powered electrolysis) or "blue hydrogen" (from natural gas with carbon capture) as a new export product. In late 2022, Kuwait declared interest in developing blue hydrogen from its oil and gas operations as part of a low-carbon strategy. The government's circular carbon economy plan includes *exploring blue hydrogen production from natural gas and petroleum*, which would leverage carbon capture and storage to create low-carbon ammonia or hydrogen fuels. Thus far, concrete projects are not yet public; however, strategic partnerships are being pursued. Kuwait has signed memoranda with countries like China to cooperate on renewable energy and environmental technologies, and these partnerships could extend

to hydrogen research and pilot projects. As a major fertilizer producer, Kuwait already handles ammonia (through Petrochemical Industries Company), so producing green ammonia for export could be a logical extension if cheap solar power becomes available. Indeed, Kuwait's climate roadmap highlights hydrogen and ammonia as areas of interest – the National Development Plan explicitly mentions "alternative sources and clean technology initiatives" including hydrogen fuel, as part of Kuwait's diversification and climate strategy. In practical terms, Kuwait may initially focus on blue ammonia (since it has ample natural gas which can be reformed to hydrogen with CO_2 capture). This would allow it to utilize existing oil/gas infrastructure to create a product (ammonia) that could be shipped to markets like Japan or the EU for power generation or industrial use. The technology and investment needed are substantial, so Kuwait is likely observing pilot projects elsewhere in the Gulf. Should Shagaya and other renewables succeed in bringing down local electricity costs, green hydrogen via solar and wind could become viable in the 2030s.

Recent Developments: In the last two years, Kuwait has shown renewed commitment to its vision goals and climate pledges. At the COP27 climate summit (late 2022), Kuwait surprised observers by announcing a national target to achieve net-zero greenhouse gas emissions by 2050 – one decade earlier than its previously signaled 2060 target. More specifically, Kuwait aims for carbon neutrality in the oil and gas sector by 2050, and full economy-wide neutrality by 2060. To reach these goals, Kuwait's government in 2023 unveiled a "Low-Carbon Strategy 2050" (developed with UN support), making it the second Gulf state to present a detailed long-term decarbonization plan. Additionally, 2023 was declared the "Year of Sustainability" in Kuwait, reflecting an elevated domestic focus on environmental issues. Tangible progress on projects has also accelerated. The Shagaya Park Phase 4 (≈1.5 GW PV) was reactivated after delays, with Chinese partners brought on board to boost capacity to potentially 5 GW in the coming years. The tenders for 1.1 GW and 500 MW solar plants in 2025 (mentioned earlier) are a major milestone, as they dwarf any renewable installations Kuwait has done to date.

If these projects reach financial close, construction could begin by 2026, putting Kuwait on a path to finally approach its 15% clean energy target by 2030. On the economic front, Kuwait's parliament passed laws in mid-2024 aimed at easing foreign investment rules and enabling public-private partnerships – important for funding diversification projects.

Regionally, Kuwait appears to be taking cues from neighbors' successes: for instance, observing Saudi Arabia and UAE's large-scale renewables and hydrogen projects has underscored the risk of falling behind. This has arguably galvanized Kuwait's leadership to reinvigorate Vision 2035 efforts as of 2024–2025. Moreover, high oil prices in 2022–2023 provided Kuwait with a fiscal windfall that can be invested into diversification projects (if saved and allocated wisely). In summary, recent developments show Kuwait acknowledging the urgency – launching updated climate targets, jump-starting renewable projects, and slowly enacting economic reforms – though execution in the next few years will determine whether Kuwait can catch up in the Gulf's energy transition race.

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Challenges and Opportunities: Kuwait faces significant challenges in its quest to diversify and go green, yet also holds strategic opportunities. On the challenges side, decades of oil dependency have created structural hurdles: a dominant public sector culture (over 80% of Kuwaiti citizens are employed in government roles) and generous subsidies have dampened private sector competitiveness. Geopolitical risk is another factor – regional tensions or security incidents can impact foreign investment sentiment in Kuwait more acutely than in the more investor-friendly UAE, for example. In terms of the energy transition, Kuwait's late start means it must build human and technical capacity rapidly; there is a shortage of domestic specialized expertise in renewable technologies and project finance. Additionally, Kuwait's climate (high heat, dust storms) poses technical hurdles for solar panels and turbines, necessitating robust maintenance and potentially raising costs. Despite these challenges, Kuwait has strategic opportunities that it can leverage. The country's oil wealth – and its sovereign assets – provide capital that can be invested in new industries (if deployed effectively rather than spent on recurrent costs). Kuwait's location and infrastructure give it potential to be a trade and financial hub bridging Gulf and Asian markets (a Vision 2035 aspiration). In the energy sphere, Kuwait's abundant desert sunshine and open land are ideal for large-scale solar farms, which could eventually not only power the grid but also generate green fuels (hydrogen/ammonia) for export. The government's recent partnership with China on clean energy is one example of how Kuwait can bring in foreign know-how to accelerate progress. There is also an opportunity in learning from others' experiences: Kuwait can observe what worked or failed in Saudi and Emirati diversification efforts and tailor its approach accordingly. If Kuwait manages to push forward, it could unlock significant benefits – a more stable economy less at the mercy of oil price swings, employment for its young population in future-oriented sectors, and a cleaner domestic environment as renewables replace polluting oil-fired power plants. In sum, Kuwait's journey is still in early stages compared to its Gulf peers, but the roadmap of Vision 2035, coupled with new climate commitments, provides a clear direction. The coming years to 2030 will be critical for Kuwait to implement reforms and projects at scale. With sustained commitment, Kuwait can move from vision to reality – securing a resilient, diversified economy and playing its part in the global energy transition.

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Saudi Arabia: Vision 2030 and the Green Transition

Official Strategy – Vision 2030: Saudi Arabia's comprehensive development agenda, *Vision 2030*, was unveiled in 2016 as a bold plan to transform the kingdom economically and socially. At its core, Vision 2030 aims to diversify the economy away from oil and create a "thriving economy" with opportunities for all Saudis. The Vision's pillars include a vibrant society (social and cultural reforms), a thriving economy (diversification, private sector growth, and employment), and an ambitious nation (effective governance). In practical terms, Vision 2030 set specific targets: for example, increasing the private sector's share of GDP, growing non-oil exports, localizing key industries, and reducing unemployment. Energy transition and sustainability are also woven into the plan – though Saudi Arabia remains an oil giant, Vision 2030 recognized that over-reliance on crude exports is a vulnerability in a changing world. The strategy spurred the launch of sub-initiatives like the *National Transformation Program*, *Public Investment Fund (PIF) Program*, *Saudi Green Initiative*, and others to drive implementation. Notably, in 2021 Saudi Arabia also announced it will strive for net-zero carbon emissions by 2060 (and later said possibly 2050 contingent on international support). This net-zero pledge complements Vision 2030 by signaling a long-term commitment to a lower-carbon future, although details remain under development. Overall, Vision 2030 has become a central reference point for all major projects and reforms in the kingdom, guiding policies to reduce the role of oil in government revenue and GDP.

Diversification Policies and Progress: Since 2016, Saudi Arabia has enacted sweeping policies to achieve Vision 2030 goals, fundamentally altering its economic landscape. One of the earliest moves was fiscal reform: Saudi Arabia introduced a 5% Value-Added Tax in 2018 (later raised to 15% in 2020) to generate non-oil revenue. It also cut or phased out various subsidies – for instance, gasoline prices were hiked and linked to international levels in 2018, with cash transfers (the Citizen's Account program) instituted to offset the impact on low-income households. These measures lowered oil's share of government revenue from ~90% a few years ago to below 70% in recent high-price years, indicating a broader base of taxes and income. Another major policy track is empowering the Public Investment Fund (PIF) – the kingdom's sovereign wealth fund – to drive new investments. PIF has taken center stage in financing giga-projects (like NEOM city, the Red Sea tourism project, Qiddiya entertainment city) and acquiring stakes in strategic industries. As a result, PIF's assets swelled from $160 billion in 2016 to over $940 billion by 2024, and the fund's 2030 asset target was raised to an astonishing $2.67 trillion. This massive war chest is being deployed to develop sectors such as tourism, mining, manufacturing, logistics, and technology – all part of diversification. The results are beginning to show: by 2024, Saudi Arabia's non-oil exports reached $137 billion, up 113% from the Vision 2030 baseline. Goods like petrochemicals, plastics, machinery, and electricals, along with services (tourism, transportation), have seen significant growth, reflecting progress in expanding the export base. Additionally, Saudi Arabia surpassed 100 million annual *tourist visits* (including religious pilgrims) ahead

of schedule, as it opens up for leisure tourism and entertainment. Social reforms – such as lifting the ban on women driving, expanding women's employment (female workforce participation jumped to 33.5%, exceeding target), and opening cinemas and concerts – have supported the growth of new service sectors and improved the investment climate. The kingdom also introduced new business-friendly regulations, created special economic zones, and privatized some state entities to encourage private sector growth. As of the Vision 2030 Annual Report 2024, *85% of Vision initiatives were either completed or on track, and 93% of key performance indicators were being met or exceeded* – a sign of considerable headway. Unemployment fell to 7% (from 11-12% a few years prior), and foreign direct investment has risen with over 600 international companies setting up regional headquarters in Saudi by 2023. These metrics underscore real diversification momentum. That said, oil is still deeply ingrained in the economy – 2023's budget revenues were still over 60% from oil, and Aramco (the state oil company) remains the largest source of national income. Saudi Arabia's economy in 2023–2024 actually saw a dip in headline GDP when OPEC+ oil production cuts reduced output. This highlights that even as non-oil sectors boom (posting ~5-6% growth), the oil sector's gyrations can dominate short-term GDP figures. Vision 2030's success will ultimately be measured by whether Saudi Arabia can sustain prosperity when global oil demand plateaus or declines. The government is acutely aware of this; Crown Prince Mohammed bin Salman has noted that Saudi Arabia must "live without oil" by 2030. Thus, the diversification drive is relentless – with investments in everything from electric vehicle manufacturing, to aluminum smelters, to a burgeoning entertainment industry. The *Saudi Green Initiative* also complements economic plans by investing in sustainability (e.g. billions of trees plantation and land restoration) which can create new jobs and enhance food security. In sum, Saudi Arabia's diversification policies under Vision 2030 have been aggressive and far-reaching. At the halfway mark (2025), clear gains are visible: a growing non-oil GDP, internationally recognized improvements in ease of doing business, and societal shifts that support a modern economy. The challenge will be to maintain this pace and ensure the huge investments yield viable, revenue-generating industries by the time oil revenues diminish in importance.

Renewable Energy and Climate Initiatives: Saudi Arabia's energy transition is notable given its status as the world's largest oil exporter. Embracing renewable energy domestically allows Saudi Arabia to save more oil for export and to position itself in new energy markets. The kingdom's official target is to have 50% of its electricity generated from renewable sources by 2030, with the remaining 50% from natural gas. This is an extremely ambitious goal: it implies on the order of 60–70 GW of renewable capacity by 2030 (depending on demand growth). In fact, Saudi authorities have cited a needed renewable capacity of about *130 GW by 2030* to reach 50% – of which ~58.7 GW would be solar PV and ~40 GW wind, plus others (possibly waste-to-energy, etc.). The initial roadmaps (set by the Ministry of Energy's Renewable Energy Project Development Office, REPDO) targeted 58.7 GW by 2030, but more recent statements suggest even higher ambitions (the figure of 130 GW reflects an updated power demand outlook). Achieving this will be a massive scale-up from the current state. As of 2023, renewables contributed only about 1% of Saudi's electricity, with roughly *2.7 GW of renewable capacity installed*. (For

context, Saudi Arabia has ~80–90 GW of installed power capacity mostly from oil and gas plants.) The kingdom was slow off the mark after announcing its first renewable goals – the initial target of 9.5 GW by 2023 was missed. However, since 2019 there has been acceleration: several utility-scale solar PV projects have been tendered and are under construction, often awarded at world-record low tariffs. The first utility-scale solar farm, *Sakaka 300 MW PV*, came online in 2019. This was followed by a larger batch of projects: *Sudair Solar* (1,500 MW, one of the largest PV projects globally, under development by ACWA Power and partners), *Al Dhafra PV* (actually in UAE but partially Saudi-financed), and others in Jeddah, Rabigh, Qurrayat, etc., totaling several gigawatts awarded in 2020–2021. Likewise, Saudi Arabia's first wind farm, the *Dumat Al Jandal 400 MW wind project* in Al Jouf, became operational in 2021–2022. Dumat Al Jandal, comprising 99 wind turbines provided by Vestas, can power 70,000 Saudi homes and is the largest wind installation in the Middle East. It displaces about 1 million tonnes of CO_2 annually. The wind resource in that northwestern region is good, and additional wind projects are planned (e.g. a 500 MW project in Yanbu and others, as Saudi aims for ~16 GW of wind by 2030).

In addition to standalone projects, mega-developments like the futuristic city of *NEOM* are designed to run entirely on renewable energy. NEOM (in northwest Tabuk province) is constructing its own solar and wind farms (totaling ~4 GW in the first phase) to supply industries and cities within NEOM. The Red Sea Project (a luxury tourism development on the Red Sea coast) is likewise deploying 100% renewables with battery storage to operate off-grid resorts. These high-profile projects serve as testbeds for large-scale renewable integration. Saudi Arabia's leadership has repeatedly reaffirmed the 50% by 2030 goal. For example, at the Saudi Green Initiative Forum, the Energy Minister noted plans to invest over $180 billion in renewable energy. By early 2023, contracts for roughly 15 GW of renewables had been signed (to be operational by 2027–2028), including major solar clusters. Implementation is now key: issues like grid infrastructure upgrades and financing have caused some delays. The Saudi Electricity Company is working to expand the grid and integrate renewables, while the PIF (via its ACWA Power unit and others) co-invests in many projects to ensure capital availability. International partnerships are playing a role too – Chinese firms have been contracted for solar panel manufacturing and project construction in Saudi (aligning with Saudi's localization goals). Despite the slow start, analysts project a sharp increase in Saudi Arabia's renewable capacity from 2025 onwards as these projects come online. The country's climate commitment is also tied to deploying renewables and other clean energy: Saudi Arabia's updated nationally determined contribution (NDC) relies on avoiding tens of millions of tonnes of CO_2 through renewables by 2030. However, it's worth noting Saudi Arabia also champions a "Circular Carbon Economy" approach, which includes not just renewables but also carbon capture, planting billions of trees, and even carbon offsets. The kingdom remains one of the world's top oil & gas producers, and its climate strategy reflects an intent to reduce emissions without aggressively curtailing fossil fuel exports. This has drawn some criticism (e.g. from Climate Action Tracker which rates Saudi climate policy as "critically insufficient"). Indeed, Saudi officials have stated they plan to continue producing oil and gas as long as there is demand, while making that production as clean/efficient

as possible (for instance, using renewables for powering oil operations, minimizing flaring, and capturing CO_2 from industrial sites). In summary, Saudi Arabia's renewable energy push is gaining momentum and is integral to its vision of a diversified, climate-resilient economy. Meeting the 2030 target will be very challenging – effectively requiring an exponential build-out – but even achieving a substantial fraction of it would place Saudi Arabia among the global leaders in installed renewable capacity by the end of the decade.

Illustration: A 400 MW wind farm in the Al-Jouf region of Saudi Arabia, developed by a Saudi-Emirati-French consortium. Dumat Al Jandal, the kingdom's first utility-scale wind project, became fully operational in 2022 and is the largest wind farm in the Middle East.

Hydrogen and Green Ammonia – A New Frontier: Saudi Arabia is positioning itself to be a top player in the emerging hydrogen economy, leveraging its natural advantages (vast land, sunlight, wind, and expertise in large-scale energy projects). The kingdom's focus is two-fold: green hydrogen (produced via renewables) and blue hydrogen (produced from hydrocarbons with carbon capture). Saudi Arabia's flagship project is the NEOM Green Hydrogen Project, which is set to be one of the world's largest green hydrogen facilities upon completion in 2026–2027. This $8.4 billion venture – a joint enterprise of Air Products, ACWA Power, and NEOM – will use 4 GW of solar and wind power to produce hydrogen by electrolysis, which will then be converted to green ammonia for ease of export. The plant, located at NEOM's port city Oxagon, is designed to produce *1.2 million tons of green ammonia per year* (the equivalent of ~600 tons of hydrogen per day). As of early 2025, the NEOM hydrogen project was about 80% complete in construction, with large-scale wind turbines, solar farms, electrolysers, and storage tanks being installed across the 300 km² site. Commissioning is expected by 2026, and first shipments of green ammonia are anticipated in 2027. Air Products has agreed to offtake the ammonia for 30 years, planning to export it to global markets where it can be cracked back to hydrogen for use as a clean fuel. In parallel, Saudi Aramco (the national oil company) has been spearheading blue hydrogen/ammonia initiatives. In 2020, Aramco and SABIC shipped a pilot cargo of 40 tons of "blue ammonia" to Japan – produced by converting natural gas to hydrogen and capturing the CO_2 emissions. Building on that, Aramco initially announced plans to produce up to 11 million tons per year of blue ammonia by 2030. However, progress has been cautious; Aramco has signaled it will only invest heavily in blue hydrogen if there are clear offtake agreements, noting that global demand uptake is still uncertain. Indeed, in mid-2023 Aramco revised its blue ammonia target down, reportedly to about 2.5 million tons/year by 2030, reflecting a more conservative, phased approach. Nonetheless, concrete

projects are moving: Aramco in 2023 acquired a 50% stake in a planned Blue Hydrogen plant in Jubail (Blue Hydrogen Industrial Gases Co.), indicating intent to scale up domestic low-carbon hydrogen production. Saudi Arabia's strategy also involves dedicated hydrogen hubs. In mid-2025, the kingdom announced a new Yanbu Green Hydrogen Hub on the Red Sea coast, which will have 4 GW of electrolysis capacity – nearly double NEOM's – and produce *400,000 tons of green hydrogen annually* (converted to ~2 million tons of green ammonia) for export[3]. The Yanbu project, developed by ACWA Power with international partners, has entered front-end engineering design in 2025. It is a clear signal that Saudi Arabia intends to *scale up* green hydrogen production rapidly if the NEOM project proves successful. To support these ambitions, the government aims to invest up to $266 billion in clean energy by 2030 and capture 10% of the global hydrogen market by 2030. This 10% target underscores Saudi Arabia's view of hydrogen as a major future export commodity – analogous to its current ~10% share of global oil supply. Regionally, Saudi Arabia's push is part of a broader Middle East hydrogen race: the UAE, Oman, and others are also investing in hydrogen (the UAE, for instance, has committed over €10 billion to hydrogen strategies). But Saudi Arabia's combination of low-cost renewables, huge tracts of land, and existing export infrastructure (tankers, ports, expertise in handling gases) gives it a formidable edge. By exporting ammonia or synthetic fuels, Saudi Arabia hopes to remain an "energy supplier" to the world even in a post-oil era. It's worth noting that challenges exist: delivering cost-competitive green hydrogen will require continued declines in renewable and electrolyser costs, and securing buyers in Europe or Asia who are willing to pay a green premium. Additionally, large-scale carbon capture will be needed for blue hydrogen projects, raising questions about storage capacity and monitoring. Nonetheless, the kingdom's approach – investing early in both green and blue pathways – maximizes its options. Already, European and Asian firms are signing preliminary agreements to source Saudi hydrogen. If plans materialize, by the 2030s Saudi Arabia could be a leading exporter of *clean fuels* (hydrogen/ammonia) just as it has long been for crude oil. This would be a significant pillar of its diversified economy and a cornerstone of its net-zero 2060 goal.

Recent Developments: Saudi Arabia is roughly at the halfway point to 2030, and recent years have seen both major achievements and new adjustments in its transition journey. In 2023, the government released a Vision 2030 mid-term report highlighting milestones: *85%* of Vision initiatives are on track, and many targets (like tourism and women's employment) have been met ahead of time. The year 2024 marked a shift into what officials call the "delivery phase" of Vision 2030, with an emphasis on executing the giga-projects and sector strategies that have been planned. Economic data from early 2025 showed the non-oil economy growing briskly (5.4% in Q1 2025 year-on-year), even as oil output cuts constrained overall GDP. Saudi Arabia's global financial standing has improved; for example, the IMF in 2024 upgraded the Kingdom's growth outlook and praised its economic reforms. One headline in late 2023 was the elevation of Saudi Arabia to an investment grade credit rating by Fitch and a positive outlook from other agencies, reflecting reduced fiscal dependence on oil and robust PIF-led investments. On the energy transition front, Saudi Arabia made waves at COP28 (Dec 2023) by signing onto a declaration (along with other GCC states) that acknowledged the

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need for a "energy transition" – though Saudi negotiators continued to resist language explicitly calling for a phase-out of fossil fuels. Tension between Saudi's role as a fossil fuel provider and its green initiatives was evident: at COP28, Saudi officials touted the kingdom's huge renewable projects and carbon circular economy efforts, even as they emphasized that oil and gas will have a continuing role beyond 2050. In practical developments, 2024 saw Saudi Aramco delaying some oil expansion plans (scrapping a plan to increase capacity to 13 mbd by 2027) due in part to forecasts of softer long-term demand. This could be interpreted as aligning investments more toward refining, petrochemicals, and new energy rather than maximum crude expansion. Indeed, Saudi Aramco has been investing downstream abroad – purchasing refinery stakes in China and elsewhere – to secure customers for its crude in a future where overall demand may be lower. Domestically, Saudi Arabia's *energy subsidy reforms* reached a new stage in 2023–2024: gasoline and diesel are now priced near international levels (with a cap and household compensation mechanism), and electricity tariffs for heavy consumers were adjusted. No carbon tax has been implemented (none of the GCC have carbon pricing yet), but the idea is being studied as part of Saudi's pledge to cut emissions (though Saudi worries a carbon tax could undermine its industrial competitiveness). A noteworthy 2024 policy was the approval of a new Energy Strategy that integrates renewables, gas, and hydrogen plans – essentially a roadmap to 2030 and beyond ensuring alignment of all energy initiatives with the Vision and net-zero goals. On hydrogen, 2025 has been significant: the NEOM project crossed 80% completion and began early commissioning tests, and as mentioned, a second mega green hydrogen project in Yanbu was launched in design phase. Additionally, Saudi entities have signed memoranda with Germany, South Korea, Japan, and others for future hydrogen supply. One can see Saudi Arabia steadily cultivating a market for its forthcoming clean energy exports. Regionally, Saudi Arabia in 2023 renewed a power grid interconnection deal with Iraq and discussed exporting electricity (perhaps from renewables) to Iraq and Jordan as a means of regional integration – a hint that excess solar power in the future might become an export commodity. However, challenges have also become clearer. Despite strong growth in non-oil sectors, Saudi Arabia's fiscal health is still oil-linked; a drop in oil price or output can swing the budget to deficit, as happened in 2023. That has prompted the government to reiterate plans to introduce new taxes (possibly income tax or expat levies) in coming years to further solidify non-oil revenue. Socially, managing expectations is key: Vision 2030 is ambitious, but if job creation in the private sector doesn't keep pace with the young population, unemployment could tick up again. The leadership has thus been communicating achievements frequently to maintain public support. Internationally, Saudi Arabia's large-scale climate-friendly projects (like NEOM) have garnered interest, but also skepticism regarding environmental impact (for instance, environmentalists question the sustainability of building a 170 km long linear city, *The Line*, in NEOM, and its impact on ecosystems). The government insists that smart planning and offsets will make NEOM net-zero and minimize ecological disruption. Summing up, as of 2025 Saudi Arabia is pushing ahead vigorously with both economic diversification and an energy transition on its own terms – investing heavily in renewables and hydrogen, while continuing to maximize value from oil in a shrinking market. The next five years will be critical to solidify the gains. If Saudi Arabia hits its

renewable energy rollout targets and its giga-projects begin operations, the Kingdom could enter the 2030s with a fundamentally different economic makeup, more resilient and less oil-dependent. Failure to deliver, however, could strain finances and leave the country exposed to the global shift away from fossil fuels. The stakes are undeniably high.

Challenges and Opportunities: Saudi Arabia's transformation is bold but not without risks and challenges. A primary challenge is managing the sheer *scale and pace* of investment – executing multi-billion dollar projects (from entire new cities to large plants) on schedule and within budget is a daunting task. Delays or cost overruns in giga-projects like NEOM or the Red Sea development could impact credibility and financial returns. Furthermore, while the government (via PIF) can bankroll many ventures, long-term success hinges on attracting significant private investment and know-how. Regulatory reforms have improved the business climate, but lingering concerns about transparency, legal consistency, and human rights issues can affect investor appetite. Another challenge is human capital: Saudi Arabia needs a workforce with the skills to run new industries (tech, tourism, renewable engineering, etc.). Despite educational reforms, there is a skills gap that requires continued training and perhaps reliance on expatriate expertise in the interim. Socially, diversifying the economy entails redefining the social contract; citizens accustomed to public sector jobs and subsidies are now being nudged into private employment and bearing new taxes like VAT. Ensuring public buy-in is crucial – hence the government's emphasis on delivering visible improvements (jobs, entertainment options, better services) to justify the changes. In the energy transition specifically, integrating a large share of renewables poses technical challenges for the grid, requiring advanced management of intermittency (hence Saudi investments in battery storage and potentially geothermal and nuclear down the line to provide steady power). Saudi Arabia's continued commitment to oil can also pose a reputation risk: at international forums, the Kingdom's climate efforts are sometimes viewed skeptically, given parallel efforts to lobby for continued fossil fuel investment. Balancing this dual role will remain a diplomatic challenge. However, Saudi Arabia also enjoys significant opportunities. Few countries have as much financial might and natural resources to leverage in an energy transition. With abundant sun and land, Saudi Arabia can produce some of the cheapest solar energy in the world – a foundation for competitive green hydrogen and ammonia production in the future. If it captures the first-mover advantage in global hydrogen trade, it could lock in long-term customer relationships much as it did for oil. The Kingdom's strategic location between Europe, Asia, and Africa also means it can become a hub for both *transport and data flows* (for example, new logistics zones and undersea data cables are being laid, aligning with diversification into logistics and digital economy). Politically, Vision 2030's success would bolster Saudi Arabia's influence as a model for economic reform in the Middle East, and could give it greater soft power (already, Saudi has been using its investments and new cultural openness – e.g. international sporting events, entertainment – to raise its global profile). The shift to high-tech industries and renewables may also create exportable expertise (e.g. Saudi firms could build projects abroad – ACWA Power is already doing this in renewables across the region). Finally, moving away from oil reduces vulnerability to the volatility of oil markets and the threat of long-term decline in

oil demand. In summary, Saudi Arabia's challenges are those of a nation attempting an unprecedented economic overhaul in a short period – but its opportunities, underpinned by significant resources and political will, could yield a diversified powerhouse that remains an energy leader in new forms. Success would mean Saudi Arabia can sustain prosperity for its citizens even in a post-oil world, and lead the region by example. Partial or complete success of Vision 2030 will have far-reaching implications for the Gulf and beyond.

Energy Transition and Economic Diversification

United Arab Emirates: Net-Zero 2050 and Economic Diversification

Official Strategy – UAE Net Zero 2050 and Energy Strategies: The United Arab Emirates has been a regional frontrunner in both economic diversification and climate initiatives. The UAE's long-term vision culminates in its commitment to achieve net-zero greenhouse gas emissions by 2050, announced in October 2021 as the *UAE Net Zero by 2050 Strategic Initiative*. This made the UAE the first Gulf state to formally pledge a 2050 net-zero target, aligning with the Paris Agreement's global goals. The net-zero initiative builds on earlier strategies: notably the *UAE Energy Strategy 2050*, launched in 2017, which set a goal to have 50% of power generation from clean sources (44% renewable + 6% nuclear) by 2050. Additionally, Abu Dhabi's Economic Vision 2030 and Dubai's Strategic Plan 2030 have long emphasized reducing reliance on oil. The national drive for diversification dates back decades – indeed, by 2023 oil and gas accounted for only about 30% of the UAE's GDP (with the non-oil economy comprising ~70% of output), making it the most diversified economy in the GCC. However, oil still contributes a significant share of government revenues in Abu Dhabi, so reducing carbon emissions and economic reliance on hydrocarbons remains a priority. The UAE's net-zero strategy is comprehensive: it involves transitioning the power sector to renewables and nuclear, electrifying transportation, improving industrial efficiency, carbon capture for hard-to-abate sectors, and investing in offsets for remaining emissions. In mid-2023, the UAE government announced an updated plan to invest $54 billion in clean energy projects by 2030 as part of the net-zero pathway. The country also updated its Nationally Determined Contribution (climate pledge), committing to reduce GHG emissions 31% by 2030 relative to business-as-usual, and aiming to peak emissions by that year. All these are stepping stones toward the 2050 net-zero goal. The UAE's strategy documents reflect a dual approach: green growth (finding economic opportunity in climate action) and economic resilience by moving beyond oil. In practice, the UAE has integrated climate and energy goals into its development plans; for example, 2023 was declared the "Year of Sustainability" culminating in the UAE's hosting of the COP28 climate conference, where it showcased initiatives and urged climate investment. It's clear that the net-zero 2050 target is not a standalone environmental plan, but rather a core part of the nation's vision for its future economy and global standing.

Diversification Measures and Economic Context: The UAE's diversification success is often held as a model in the Gulf. Over the past 20+ years, the UAE (particularly Dubai and increasingly Abu Dhabi) built robust sectors in finance, tourism, aviation, real estate, trade, and logistics. Today, the UAE is a major banking and commercial center, a tourism and airline hub (home to Emirates and Etihad airlines), and a trading gateway linking Asia, the Middle East, and Africa. Oil's share of GDP has steadily fallen (especially in Dubai, where it is under 5% of GDP). Several policy measures enabled this diversification: the UAE established numerous free zones offering tax breaks and full foreign ownership, attracting multinational companies to set up regional offices (e.g., Dubai International Financial Centre for finance, JAFZA for trade, twofour54 in media, etc.). The government heavily invested in

world-class infrastructure – ports like Jebel Ali, airports like Dubai and Abu Dhabi International, and tourism infrastructure (hotels, attractions) – to stimulate growth in non-oil sectors. In recent years, further reforms have been implemented: the UAE introduced a 5% VAT in 2018 (providing a new revenue stream divorced from oil), and in 2023 it rolled out a 9% federal corporate tax on business profits (another first in the Gulf, marking a shift from the zero-tax regime). These taxes will reduce dependence on oil revenues for the federal and emirate budgets, contributing to fiscal sustainability. The UAE also liberalized visa rules to attract talent: new long-term "Golden Visas" and remote work visas encourage professionals and investors to base themselves in the UAE. This talent attraction is part of a strategy to make the UAE a hub for the knowledge economy – for example, big tech companies have regional HQs in UAE, and investment in start-ups has been robust (Dubai and Abu Dhabi have active venture capital scenes and accelerators). Supporting SMEs and innovation has been a focus through initiatives like Dubai's Innovation Strategy and Abu Dhabi's Hub71 tech ecosystem. Furthermore, the UAE has strategically leveraged its sovereign wealth funds (ADIA, Mubadala, ADQ in Abu Dhabi; Investment Corporation of Dubai, etc.) to invest in both domestic diversification projects and international ventures that bring returns and know-how. Mubadala, for instance, invested in semiconductors, renewable energy (it founded Masdar in 2006), aerospace manufacturing, and healthcare, seeding those industries locally. Culturally, the UAE's openness – hosting expatriates who comprise ~85% of the population – has helped it become a cosmopolitan business environment, albeit with challenges of its own (such as ensuring employment opportunities for UAE nationals in the private sector via the Emiratisation policy). By Q1 2025, the UAE's non-oil sector was contributing over 77% of GDP and driving strong growth, a testament to decades of diversification. In terms of governance, the UAE's federal structure allowed Dubai to experiment with rapid diversification while Abu Dhabi, with larger oil reserves, provided financial stability. Post-2014 (after an oil price crash), even Abu Dhabi accelerated efforts to diversify – merging state oil company ADNOC's focus with new mandates to monetize assets and invest downstream, and launching Abu Dhabi Vision 2030. A key pillar of diversification now is clean and sustainable industries: the UAE wants to lead in renewable energy deployment, green finance (it issued green bonds and pioneered climate finance initiatives), and even space and advanced tech (e.g., the UAE space agency's Mars mission was a high-tech ambition to inspire youth into STEM fields). Notably, the UAE houses the International Renewable Energy Agency (IRENA) headquarters – the only major international agency in the Middle East – reflecting its commitment to the renewable agenda since 2009. All these measures have put the UAE in a strong position: it is less sensitive to oil price swings than its neighbors (though Abu Dhabi's budget still moves with oil to an extent), and it has multiple vibrant cities (Dubai, Abu Dhabi) with diverse economies. The journey continues as the UAE now focuses on *quality* of growth – moving up the value chain in industries and ensuring growth is sustainable (economically and environmentally). Hosting COP28 in 2023 was used as a springboard to announce new initiatives like the UAE's *National Hydrogen Strategy* and to double down on climate-aligned investments.

Energy Transition and Economic Diversification

Renewable Energy Expansion: The UAE has been a pioneer in the region for deploying renewable energy, despite having large oil and gas reserves. This seemingly paradoxical approach stems from a pragmatic realization: using renewables and nuclear for domestic power frees up more oil and gas to export, and positions the UAE as a future-oriented energy leader. The UAE's early steps included setting up Masdar (Abu Dhabi Future Energy Company) in 2006, which invested in solar and wind projects globally and built *Masdar City*, a low-carbon community in Abu Dhabi. On the home front, the UAE set targets to increase clean energy's share in the power mix to 50% by 2050. Significant progress has been made. The country's first renewable power plant was the 100 MW Shams 1 concentrated solar power (CSP) plant in Abu Dhabi's western region, operational since 2013. Subsequently, Dubai launched the Mohammed bin Rashid Al Maktoum Solar Park – which has become one of the world's largest single-site solar farms. As of early 2024, the MBR Solar Park has 3,660 MW of solar capacity in operation (a mix of PV panels and CSP with thermal storage). An additional 1,000 MW is under construction, and the park's capacity is slated to reach 5,000 MW by 2030 (recent Dubai plans even extended it to 7,260 MW by 2030). The solar park's phases have repeatedly broken world records for low solar power cost – for instance, Dubai achieved PV electricity prices below 2.5 US cents/kWh in later phases. Abu Dhabi, for its part, brought online the Noor Abu Dhabi PV plant (1,177 MW) at Sweihan in 2019, which was the largest single PV plant globally at the time of commissioning. Building on that, Abu Dhabi is now constructing the Al Dhafra Solar Project (2,000 MW), which when completed will surpass Noor as one of the world's largest PV installations. These projects have cemented the UAE's leadership in solar deployment. Additionally, the UAE made a bold move into nuclear power as a form of clean energy: the *Barakah Nuclear Energy Plant* in Abu Dhabi has four reactors totaling 5,600 MW capacity. As of mid-2023, three reactors (4,200 MW) were operational, and the fourth came online in 2024, making the UAE the first Arab country with a civilian nuclear plant. By 2025, nuclear energy is providing around 20-25% of the UAE's electricity, with zero emissions, significantly contributing to the UAE's decarbonization of power generation. In sum, between solar, nuclear, and some waste-to-energy projects, the UAE's power mix has rapidly shifted: clean energy capacity (renewables + nuclear) exceeded 9 GW in 2023. The UAE government claims to have invested over $40 billion in clean energy projects over the last 15 years, and plans to invest an additional $160 billion by 2050 to meet growing demand while cutting carbon. Notably, the UAE's approach also involves international clean energy investment – via Masdar and ADNOC, the UAE has stakes in renewable projects from the UK (offshore wind farms) to Uzbekistan (large solar) to Egypt and beyond. Masdar's portfolio alone spans 40+ countries and 20+ GW of projects (either operational or under development). This not only yields returns but also knowledge and influence in the global energy transition. Domestically, the UAE has implemented policies to encourage renewables: Dubai instituted the Shams Dubai program for rooftop solar net-metering, and both Abu Dhabi and Dubai offer green loans and incentives for solar adoption in industry. While utility-scale generation is the mainstay, distributed solar is gradually growing on rooftops of warehouses and villas. Energy efficiency is another prong – building standards have been upgraded (Estidama and Dubai Green Building Regulations), and demand-side management programs aim to cut

peak electricity usage growth. All these efforts contribute to a lower carbon footprint: the Dubai Clean Energy Strategy aims for 75% of Dubai's electricity from clean sources by 2050. On the federal level, the clean energy push helps the UAE meet global climate expectations while securing its own energy future. The main challenge for renewables in the UAE is the integration with the existing gas-powered grid and maintaining reliability during the hot summer peak (when air conditioning demand is enormous). The UAE addresses this by using natural gas plants as backup and exploring energy storage. A notable project is the Hatta hydroelectric storage plant under construction, which uses water pumped to a reservoir using solar power to store energy. The UAE is also studying grid interconnections beyond its borders – currently it is interconnected within the GCC grid and has been considering links to South Asia's grid in the long run. In summary, the UAE's renewable energy push is robust and decades ahead of some neighbors: it has proven that large solar plants in the desert can be built quickly and cheaply, and that alternative energy (like nuclear) can play a big role even in oil-rich states. By achieving tangible capacity in clean energy, the UAE has reduced domestic consumption of natural gas and oil for power, cutting per capita emissions and setting itself on a path to the net-zero goal.

Illustration: The 800MW third phase of Dubai's Mohammed bin Rashid Al Maktoum Solar Park, developed under the IPP model, became fully operational in 2020. Led by a Masdar consortium, it achieved a record-low tariff of USD 2.99 cents/kWh when awarded in 2016. This pioneering project in the MENA region integrates advanced solar tracking systems, boosting output by 20–30% compared to fixed installations, and comprises over 3 million photovoltaic modules. It supplies clean electricity to more than 240,000 Dubai residences, offsetting around 1.055 million tonnes of CO_2 annually.

Hydrogen and Green Ammonia Initiatives: Alongside renewables, the UAE views hydrogen (H_2) – especially green and blue hydrogen – as a key component of its future energy export portfolio and industrial strategy. In 2023, the UAE government unveiled its *National Hydrogen Strategy 2050*, which targets an annual production of 14 million tons of low-carbon hydrogen by 2050 (with interim goals of ~1 million tons by 2030). This strategy envisions the UAE as a top 10 global hydrogen producer, capitalizing on its competitive solar power and existing infrastructure. To achieve this, the UAE is pursuing multiple hydrogen pathways:

Green Hydrogen: The UAE's renewables arm Masdar is leading several green H_2 projects. Masdar aims to develop up to *1 million tons per year of green hydrogen production by 2030* in partnership with international firms. One flagship example is *Project Green Falcon* in Abu Dhabi – a consortium including Masdar, Siemens Energy, Marubeni, TotalEnergies, and local authorities – which is piloting green hydrogen and synthetic fuels (e.g., sustainable aviation fuel) production. Another major collaboration is between Masdar and France's ENGIE to invest $5 billion in a 200 MW green hydrogen plant, intended to produce green ammonia at industrial scale in the UAE. The plant would produce roughly 100,000 tons of green ammonia annually (as a transportable form of hydrogen) to supply fertilizer or fuel markets. These projects are still in development stages, but signal a strong commitment. Additionally, in May 2023, Masdar, ADNOC, and BP launched a pilot plant in the UAE to produce green hydrogen for aviation fuel, demonstrating multi-sector integration.

Blue Hydrogen/Ammonia: The UAE's oil company ADNOC is aggressively pursuing blue ammonia as a new export commodity. ADNOC is building a *world-scale blue ammonia plant* at the TA'ZIZ industrial zone in Ruwais (Abu Dhabi's chemicals hub). The facility, set to start production by 2027, will have a capacity of 1 million tons per year of ammonia made from natural gas with CO_2 capture. Construction began in mid-2024 after ADNOC and partners (Fertiglobe, Mitsui, and GS Energy) reached financial agreements. The plant will capture up to ~2 million tons of CO_2 annually from the process, storing it geologically so that the ammonia product is low-carbon. Japan has already signed on as a key customer: Mitsui will offtake a portion of the output to ship to Japan, where blue ammonia will be used in power plants to lower emissions. ADNOC has also already delivered test cargoes of blue ammonia to Japan in 2022–2023, and in mid-2023 it acquired a 5% stake in a Japanese company focused on fuel ammonia value chains, cementing ties. Furthermore, ADNOC and Fertiglobe (which is a joint venture of ADNOC and OCI) are expanding existing ammonia facilities to have blue ammonia capability. Fertiglobe's existing ammonia plants (built for fertilizer) can be fitted with carbon capture to produce blue ammonia relatively quickly. The UAE sees Asian markets (Japan, South Korea) and possibly Europe as key destinations for its clean ammonia. Notably

at COP28, the UAE and Japan signed cooperation agreements on fuel ammonia trade.

Domestic Hydrogen Use: The UAE is also preparing to use hydrogen at home. Dubai's utility DEWA in 2021 inaugurated a green hydrogen pilot plant at the Mohammed bin Rashid Solar Park – a small facility but the first solar-driven hydrogen plant in the Middle East. This pilot produces hydrogen which is being tested for various applications, including potential use in fuel cell vehicles and industrial processes. Dubai has even deployed a few hydrogen fuel cell cars and installed a hydrogen refueling station, as a proof of concept. In the longer term, the UAE is exploring using hydrogen for decarbonizing its steel and aluminum industries (Emirates Steel and Emirates Global Aluminium have both studied hydrogen-based processes). It's also looking at blending hydrogen into natural gas for power plants and using hydrogen-based fuels for ships and aircraft in line with global decarbonization of transport.

Infrastructure and Partnerships: The UAE is investing in related infrastructure – for example, storage and export terminals for ammonia. Abu Dhabi's Khalifa Port is being developed to handle ammonia exports safely. International partnerships are central: beyond ENGIE and Siemens, the UAE has hydrogen MoUs with Germany (as part of the UAE-Germany Energy Partnership) and with India, among others, to collaborate on technology and trade. The US-UAE Partnership for Accelerating Clean Energy (PACE), announced in late 2022, mobilizes $100 billion for clean energy projects, including hydrogen, in both countries and emerging markets. This shows the UAE leveraging diplomacy to bolster its hydrogen agenda.

Looking ahead, the UAE aims to capture 25% of the global hydrogen market by 2030 (as stated by Emirati officials) – an ambitious target that reflects its desire to replicate its oil market success in the clean fuels era. It has certain advantages: some of the lowest solar power costs globally (ideal for cheap green H_2), existing LNG export infrastructure that can be repurposed for liquid ammonia, and access to capital through ADNOC and sovereign funds. However, it faces competition from others like Australia, Saudi Arabia, and Oman. The UAE's approach is to move quickly and secure offtake deals early. By building a reputation as a reliable supplier of clean ammonia (as it has as a reliable oil supplier), the UAE hopes to lock in demand. One example of progress: in 2022, Abu Dhabi's Fertiglobe delivered test shipments of blue ammonia to several Japanese and Korean companies, effectively marketing the UAE's product.

Recent Developments: The period around 2024–2025 has been momentous for the UAE's sustainability and diversification drive. Foremost, the UAE hosted the COP28 UN Climate Conference in Nov–Dec 2023 at Expo City Dubai. Using this spotlight, the UAE made several key announcements: it raised its 2030 emissions reduction target and rolled out new initiatives like the UAE Carbon Alliance (to develop carbon trading) and the National Hydrogen Strategy mentioned earlier. It also unveiled plans to triple the UAE's installed renewable energy capacity from 9 GW to 28 GW by 2030, aligning with a global call (from COP28) to triple

renewables worldwide by 2030. In July 2023, the UAE updated its *Energy Strategy 2050* to accelerate near-term deployment – committing AED 150–200 billion (~$40–54 billion) by 2030 to renewable projects, which will more than triple the current capacity. Projects benefiting from this include the huge solar farms in pipeline (like Abu Dhabi's 1.5 GW PV3 and 1.8 GW PV4 projects, Dubai's Solar Park expansion, and potential new offshore wind prospects that are being studied). On the economic side, 2024 saw the UAE's non-oil economy growing ~4%, and a federal budget that for the first time gets a notable slice from VAT and corporate tax, indicating decreasing reliance on oil. The UAE's diversification was further highlighted by new trade deals (Comprehensive Economic Partnership Agreements signed with India, Israel, Indonesia, Turkey, etc.) which boost non-oil commerce and investment. In early 2025, data showed non-oil foreign trade hitting record highs, and non-oil GDP contributing 77% of the economy, giving the UAE arguably the healthiest economic mix in the GCC. Another milestone: in mid-2024, the UAE's Barakah nuclear plant had three reactors online, significantly cutting domestic natural gas usage – Emirates Nuclear Energy Corporation announced that Barakah alone was reducing UAE power sector emissions by 10 million tonnes CO_2 annually. The fourth reactor's completion in 2024 means the UAE should reach its goal of 25% clean electricity from nuclear ahead of schedule.

In the private sector, 2024–2025 saw major Emirati companies pivot to green opportunities: DP World (the ports operator) invested in electric vehicles and green logistics, airline Emirates started developing a roadmap for sustainable aviation fuel use (some of which could come from UAE's green hydrogen projects), and Dubai's real estate developers incorporated green building standards into new mega-developments (like solar panels on rooftops, district cooling for efficiency, etc.). The UAE also launched a federal Electric Vehicle Incentive Scheme in 2024, aiming to raise EV adoption (e.g., Dubai wants 10% of cars to be electric/hybrid by 2030). These efforts complement the clean power supply by tackling the demand side.

A challenge that crystallized in 2023–2024 is the global scrutiny over the UAE's dual role as an oil producer leading a climate summit (COP28). The UAE appointed Sultan Al Jaber, head of ADNOC and founding CEO of Masdar, as COP28 President – a move that drew some criticism from climate activists concerned about fossil fuel interests. Al Jaber's message was that the oil and gas industry must be part of the climate solution, focusing on decarbonizing operations and investing in renewables. During COP28, the UAE supported a goal to "phase out unabated fossil fuels", but also highlighted carbon capture and the need for a just transition. Domestically, the UAE announced it is exploring carbon capture utilization and storage (CCUS) on a larger scale, potentially expanding ADNOC's existing Al Reyadah facility (which currently captures CO_2 from a steel plant) and aiming for 5 million tonnes/year carbon capture by 2030. This aligns with ADNOC's 2045 net-zero operational goal (ADNOC declared its own company net-zero target for 2045, one of the earliest for a national oil company). Meanwhile, the OPEC presidency of 2023 was held by the UAE's energy minister, who navigated the balance of keeping oil markets stable while also promoting climate action – emblematic of the tightrope the UAE walks. In late 2024, the UAE's national climate change law came into effect, formalizing

the net-zero target and giving a framework for emissions monitoring and green investment promotion.

In summary, recent developments reinforce the UAE's profile as a proactive, innovative state in the energy transition. It has significantly ramped up both rhetoric and action towards sustainability (with COP28 as a catalyst), while also continuing pragmatic use of its hydrocarbon sector to fund and facilitate the transition. The economy remains strong, diversified, and attractive to global investors – for instance, Abu Dhabi's ADNOC and Emirates Global Aluminium launched IPOs of some subsidiaries in 2023–2024, which were oversubscribed, reflecting confidence in their forward strategies. As 2025 unfolds, the UAE stands at the forefront of Gulf states in implementing tangible climate and diversification measures, though it must continue to reconcile the expansion of some fossil fuel operations (like recent oilfield capacity increases) with its net-zero pathway.

Challenges and Opportunities: Despite its leadership position, the UAE faces its own challenges in sustaining energy transition and diversification momentum. One challenge is long-term competitiveness: the UAE's success has attracted many imitators in the region (Saudi Arabia's Vision 2030, Qatar's diversification, etc.). To stay ahead, the UAE must continually innovate and move up the value chain – for instance, not just deploying renewables but manufacturing some components locally, or not just attracting tourists but becoming a culture/education hub. Another challenge is managing population growth and resource consumption. The UAE has one of the world's highest per capita carbon footprints, partly due to water desalination and air conditioning in a hot climate. While clean energy helps, demand-side measures (like stricter efficiency standards, public transit adoption in place of cars, etc.) will be needed to truly bend the emissions curve. Culturally, as the UAE diversifies its economy, it also diversifies its society – millions of expatriates call the UAE home long-term. The government has begun offering longer residency and even citizenship to select talented individuals to retain human capital. Ensuring social cohesion and national identity in a highly internationalized setting is an ongoing task, albeit one the UAE has managed fairly well so far. Economically, the UAE must guard against potential real estate or financial bubbles that can come with rapid growth; prudent regulation and economic management are needed to avoid volatility. In the energy sector specifically, integrating a high share of renewables will require investments in energy storage and grid modernization – which are underway but must keep pace. Additionally, water-food-energy nexus issues are a challenge: the UAE's water is almost entirely desalinated (energy-intensive), and agriculture is minimal; the country is focusing on improving water and food security (like investing in indoor farming, efficient hydroponics, and even exploring using nuclear heat or spare renewables for desalination to reduce costs).

The opportunities for the UAE are plentiful. By virtue of its head start, the UAE can capture a significant portion of emerging green industries. For example, by developing a domestic hydrogen value chain early, it can become a supplier of not just hydrogen but also downstream products like green steel or sustainable fuels, adding value internally. The UAE's location between East and West gives it the chance to be a *global logistics and data hub*: projects like the UAE's participation in the India-Middle East-Europe Economic Corridor (announced at the G20 in 2023) will bolster trade routes

through the UAE. In technology, the UAE has invested in artificial intelligence (AI) (it even has a Minister for AI) and could apply AI to optimize energy systems and city management, enhancing its smart city credentials. Another opportunity lies in finance – green finance. Dubai and Abu Dhabi are vying to be green finance centers, issuing green bonds and setting up exchanges for carbon credits. If they succeed, they can attract billions in climate investments regionally. The UAE's stable political environment and business-friendly policies position it as a safe haven for investment in a volatile region, which is an ongoing opportunity to capture capital that can fuel its diversification. Soft power is another opportunity: hosting events like Expo 2020 (in 2021-22) and COP28, and initiatives like sending the first Emirati to space, have raised the UAE's global profile, which can translate into influence and partnerships that benefit its economy and citizens. Moreover, as the world transitions to clean energy, the UAE can repurpose some of its oil & gas expertise – for example, using drilling know-how for geothermal energy development (the UAE is exploring pilot geothermal projects for sustainable cooling) and using its petrochemical plants to eventually produce biofuels or recycled plastics as part of a circular economy.

One must note the UAE's resilience to oil shocks will be tested as oil demand eventually plateaus – but thanks to diversification, the UAE is relatively well cushioned, with substantial sovereign wealth funds to support any needed adjustments. The net-zero commitment itself, while challenging, offers an opportunity: it galvanizes public and private sectors toward a common goal, spurring innovation and potentially giving the UAE a leadership voice internationally in climate tech (the UAE is already pushing the concept of *low-carbon oil* and advocating for methane controls and flaring reductions globally).

In conclusion, the UAE's path underscores that a Gulf state can be an oil exporter and a clean energy champion at the same time – but it requires vision, investment, and continual reform. The country's clear strategic planning (exemplified by initiatives like Vision 2021, Vision 2071, Energy Strategy 2050, and the Net Zero 2050 plan) and its track record of policy execution give confidence that it will continue to seize opportunities in the transition. The UAE of 2035 or 2050 might be a very different economy – one where perhaps petrochemicals, aviation, renewable hydrogen, high-tech manufacturing, and tourism form the backbone, with oil playing a smaller role than today. By proactively managing challenges and leveraging strengths, the UAE aims to ensure prosperity and sustainability go hand in hand for decades to come.

Energy Transition and Economic Diversification

Conclusion and Regional Outlook

Kuwait, Saudi Arabia, and the UAE are all navigating a historic transformation toward economic diversification and energy transition, each with its own pace and priorities.

Kuwait, through Vision 2035, is building the foundations of a diversified economy and has launched major renewable projects aiming for 15% of power from renewables by 2030. While progress is at an earlier stage, Kuwait has the advantage of learning from regional best practices and aligning its efforts with emerging global standards.

Saudi Arabia, under Vision 2030, is advancing ambitious reforms and mega-investments, targeting 50% renewables by 2030 and spearheading projects such as NEOM's hydrogen hub.

The UAE benefits from decades of diversification, already hosting over 9 GW of clean energy capacity (solar and nuclear) and leading the region with its net-zero by 2050 pledge.

Across the Gulf, the shared goals are clear: reducing reliance on oil, creating private sector opportunities, and developing new energy industries such as renewables, hydrogen, and clean petrochemicals. Regional cooperation—whether through a GCC power grid or shared hydrogen infrastructure—offers opportunities to complement national efforts, even as healthy competition drives innovation and higher standards.

On the global stage, the Gulf's transition carries weight: success will not only strengthen regional economies but also accelerate international climate goals by supplying clean fuels and investment. With financial resources, abundant renewable potential, and strategic geography, the Gulf is well-positioned to become a key player in the emerging green economy. The coming decade will be decisive, but momentum across Kuwait, Saudi Arabia, and the UAE suggests a region moving with determination toward a more sustainable, post-oil future.

Sources: The information in this report is drawn from official strategy documents, government statements, and recent analyses. Key references include Kuwait's Vision 2035 plan and climate commitments, Saudi Arabia's Vision 2030 progress reports and the Saudi Green Initiative data, and the UAE's government reports on Energy Strategy 2050 and its National Hydrogen Strategy, among many others as cited throughout the text. These sources collectively provide a detailed picture of the policy measures, project developments, and targets that make up the Gulf's energy transition narrative in 2024–2025.

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