The Middle East's Energy Transition – An Investment Case A regional transition that is accelerating at pace

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An overview of the current energy transition global landscape

Renewable energy was the target of a landmark commitment by nearly 200 countries that vowed to triple capacity at COP28 in the UAE. While the sector is showing encouraging progress, backed by expectations that global renewable capacity will increase 2.7-fold by 2030, it falls short of the ambitious tripling target pledged in Dubai last year.

Climate and energy security policies in nearly 140 countries have made renewables cost-competitive with fossilfired power plants. This shift is driving new demand from the private sector and households, while industrial policies promoting local manufacturing of solar panels and wind turbines are fostering domestic markets.

However, more is needed to achieve the goal of tripling renewable energy capacity worldwide set at COP28. The steady pace of global progress on renewables expansion offers an opportunity for countries to raise their targets in the next round of Nationally Determined Contributions (NDCs), set to be submitted in 2025.

Projections show that, among renewable energy assets, new solar capacity added globally between now and 2030 will account for 80% of the growth in renewable power worldwide by the end of the decade. Despite recent challenges related to supply chains and macroeconomic conditions, the wind sector is expected to recover. In contrast, hydrogen plays a minor role in driving new renewable capacity growth.

According to the International Energy Agency (IEA), renewable electricity usage in the transport, industrial, and construction sectors will account for more than three-quarters of the projected global renewable energy demand. This growth is expected to raise the share of renewables in final energy consumption from 13% in 2023 to nearly 20% by 2030.



However, fossil fuels will still meet almost 80% of global energy demand. Outside of electricity, renewable fuels - including liquid, gaseous, and solid bioenergy, hydrogen, and e-fuels — will account for 15% of the IEA's forecasted growth. Other renewable energy sources, such as ambient heat, solar thermal, and geothermal, will account for the remaining share.

China is poised to cement its position as the global leader in renewables, as it is projected to account for nearly 60% of the worldwide expansion in capacity to 2030. The European Union and the US are expected to double their rate of renewable capacity growth between 2024 and 2030, while India is expected to achieve the fastest growth rate among major economies.

The global transition from fossil fueldependent economies to more sustainable energy sources is marked by steady and irreversible progress. Significant changes are reshaping the global energy landscape, setting the stage for a markedly different system by the end of the decade. The growing adoption of clean energy technologies, coupled with structural economic shifts worldwide, has significant implications for fossil fuels, with global demand for coal, oil, and natural gas expected to peak within this decade.

However, even stronger measures are still needed to keep the goal of limiting global

warming to 1.5°C alive. Global reliance on bid range. Solar PV capacity in the MENA fossil fuels must be reduced at a faster region is expected to grow 84 GW by 2030, with more than half coming from pace, backed by national government policies, supranational coordination, and Saudi Arabia and the UAE. private investment. These key players in Overall, installed solar PV capacity in the economic ecosystem, including the the region is expected to increase more private sector, must support clean energy than fourfold between 2024 and 2030, transitions rather than hinder them. There expanding its share in the power mix from are immense benefits to clean energy 2% to over 8%. CSP growth is expected transitions, including new industrial to slow over the next six years compared opportunities, job creation, greater energy with the previous six-year period. After security, cleaner air, universal energy expanding 1.4 GW between 2017 and 2023, access, and a safer climate for everyone. less than 300 megawatt (MW) is expected by 2030 due to the lack of a pipeline of projects in late-stage development. A 600-MW project was completed in the UAE in 2023, and no further CSP projects are under construction in the region.

Specificities of the energy transition in the Middle East and North Africa (MENA)

MENA has experienced a rising demand for renewable power, with hydrogen driving solar photovoltaic (PV) and onshore wind capacity expansion. Still, the future of concentrated solar power (CSP) is being determined. Renewable capacity in the region is forecasted to triple from 53 gigawatt (GW) in 2023 to almost 150 GW by 2030, with solar PV leading the expansion, accounting for over 85%, given the MENA's economically attractive projects.

Due to good solar resources, economies of scale, and beneficial land and financing costs, the region produces winning bids at the lower end of the world's awarded

The main reason for limited CSP growth is uncertainty over whether the government plans to implement the technology. The uncertainty is explained by CSP's high capital costs upfront and its label as a niche technology that requires a complex infrastructure. CSP also faces fierce competition from PV technologies, which have become more cost-effective while proving equally competent for deployment in regions with high solar irradiance. Governments rely on subsidies to promote CSP, and policy continuity is not yet set in stone, which hampers long-term investing decisions.

Regarding other renewable sources of

power, hydrogen production is emerging as a driver for new onshore wind capacity in the region, accounting for 40% — or 4 GW — of wind expansion by 2030, led by Saudi Arabia, Oman, and Egypt. Overall, onshore wind capacity will reach nearly 10 GW, 8% higher than in 2023, due to increased auction activity in new markets.

Saudi Arabia dominates the region's growth, accounting for over 40% of renewable capacity expansion between 2024 and 2030. The UAE, Israel, Oman, Egypt, Iraq, and Morocco represent another 44%. The two main procurement methods in the region are competitive auctions and unsolicited bilateral contracts with utilities. In addition to climate goals, the region has two main drivers of renewable energy growth: 1) the fast-rising domestic electricity demand spurred by population and 2) economic growth.

Exports of electricity or low-carbon products are the second growth driver for renewable capacity in the MENA region. Morocco and Saudi Arabia are investigating the development of new interconnections to export renewable electricity. For low-carbon products, industries are announcing plans to decarbonise their manufacturing by generating their own renewable electricity or procuring the necessary power through power purchase agreements (PPAs). Rising European



demand for low-emissions products is also spurring additional renewable capacity deployment. Morocco's stateowned mining company, OCP, whose exports are responsible for 6% of the country's GDP, has therefore announced plans to install 200 MW of PV to switch from gas to solar energy. Aluminium companies in Egypt and the UAE have also released plans to install or purchase renewable electricity, citing expectations of future global demand. In addition to electricity consumption, hydrogen and hydrogen-based fuels, which are used as feedstocks, are key drivers of renewable capacity growth in the MENA region. In fact, renewable energy capacity for hydrogen production is expected to account for 10% of the region's growth by 2030. Two of the world's first global offtake contracts for ammonia have been announced in Egypt and Saudi Arabia. At the same time, developers have been awarded plots of low-cost land in Oman to build projects to produce hydrogen for local industries and ammonia for export.

In 2024, peak energy demand reached record levels in Kuwait, Egypt, Algeria, Oman, and Iraq as soaring temperatures increased air conditioning usage. This increased the planned power cuts in Egypt and led to Kuwait's first planned power outages. Electricity consumption in Saudi Arabia also reached an alltime high in 2023 amid population and economic growth.

In response to rising electricity demand, many countries are accelerating renewable capacity deployment to reduce electricity imports or free up domestic fossil fuels for more significant exports. In 2024, Qatar announced its first renewable energy strategy, Kuwait reopened a cancelled tender for 1 GW of solar PV, and Algeria awarded winners for its 3-GW solar engineering, procurement, and construction (EPC) project.

MENA countries aim to reach 201 GW of renewable capacity in total by 2030. While the main-case forecast is 26% below this target, some countries are expected to meet their targets. Saudi Arabia, Egypt, and Algeria account for nearly 60% of the region's goal. Although the outlook is more optimistic than last year in these markets, the IEA's forecast indicates that installed capacity still falls short of their 2030 targets. However, the UAE, Oman, and Morocco are poised to exceed their targets for 2030. Meanwhile, Iraq and Jordan can potentially raise their targets, as their capacity goals for 2030 only reflect current installations.

Growth in the region could be 60% or 152 GW higher than in the main case, nearing the realisation of the 2030 ambition. To be successful and overcome their three biggest challenges, MENA

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countries should deliver a faster auction implementation, improve the regulatory and policy environment for distributed solar PV, and allow greater industrial electrification.

The Middle East's very own transition challenges and opportunities

In a successful energy transition scenario,

the Middle East find its greatest challenge in the fact that five of the world's top oil producers — Saudi Arabia, Iraq, the UAE, Iran, and Kuwait — and three of the world's top 10 natural gas producers — Iran, Qatar, and the UAE — lie within its regional borders. The region also faces demographic hurdles, as its population is expected to expand 36% by 2050, paired with a corresponding increase in demand for food production, water, and residential electricity.





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*Statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Notes: CSP = concentrated solar power; "Other" refers to bioenergy; H₂ = hydrogen.





Renewable energy shares in power generation by technology and region, 2023 and 2030

IEA. CC BY 4.0.

Notes: "Other renewable technologies" includes bioenergy, concentrated solar power, and geothermal and ocean energy. 2024-2030 values are based on the main-case capacity forecast. Electricity generation from wind and solar PV indicates potential generation under current curtailment rates, but does not project future curtailment, which may change notably in some countries by 2030. The curtailment section below (Increasing VRE Penetration Leads to Rising Curtailment) discusses curtailment trends for several countries.

On a positive note, the Middle East already witnessed five countries announcing net-zero emission targets. The UAE and Oman have committed to achieving net-zero emissions by 2050, while Saudi Arabia, Bahrain, and Kuwait have set a goal for 2060. Additionally, the UAE published its third NDC, a climate action plan to cut emissions and adapt to climate impacts, in November with a commitment to reduce emissions by 47% by 2035 from 2019 levels. It also pledged USD 30 billion to launch a climatefocused investment initiative at COP28.

The transition to a greener future in the region is a viable solution for its challenges as long as it is underpinned by strategic dealmaking in key areas, such as renewable energy projects, green hydrogen production, associated infrastructure development, carbon capture, utilisation, and localisation of industry, for the long-term benefit of the region. Besides the positive implications for the region's decarbonisation, PwC estimates that the much-needed extensive investment in clean energy generation projects could boost the Middle Eastern economy to USD 13 trillion by 2050.

There are significant opportunities in green fuels such as hydrogen, as large investments from the public and private sectors are required to meet export demand for clean hydrogen in 2050 and the growing capacity of green steel manufacturing. The Middle East has over USD 2 trillion of planned infrastructure projects, which will generate opportunities in sustainable destinations, influence global supply chains, and develop a circular economy.

The region's power sector holds a distinct opportunity for increasing investment in clean energy technologies, most notably for solar PV. Harnessing these resources could substantially decrease exposure to both oil and gas in the power sector. For example, Saudi Arabia is targeting 130 GW of renewable capacity by 2030, up from less than 5 GW today. Encouraging signs are coming from projects such as the large Al Shuaibah Solar Plant in Saudi Arabia and the Mohammed bin Rashid Al Maktoum Solar Park in the UAE. Various countries in the region have also announced blue and green hydrogen investments and greater investments in critical minerals. Saudi Arabia, for instance, has established a USD 182 million mineral exploration incentive programme. Similarly, the UAE is intensifying its efforts to establish a presence in the sector, including establishing a mining partnership in the Democratic Republic of the Congo worth USD 1.9 billion and the signing of new agreements in the copper-rich Zambia.

The Middle East can pivot from being primarily an oil exporter to a leading centre for green energy, thereby maintaining its global energy significance in a low-carbon future. However, the success of this transformation depends on governmental support, regional cooperation, strategic partnerships between public and private sectors, and investment.



The investable side of an energy transition and its gaps

Encouraging signs become clearer as global energy investment is set to exceed USD 3 trillion for the first time in 2024, with USD 2 trillion earmarked for clean energy technologies and infrastructure. In 2023, global investments already surpassed USD 2 trillion in energy transition-related technologies, setting a record high at the time. It is undeniable that the sustainable energy transition is ramping up, and investment in clean power has accelerated since 2020. Renewable energy investments across the whole value chain drive positive trends in many sectors:

- Investments in nuclear power are expected to increase in 2024, with its share of 9% in clean power investments rising after two consecutive years of decline. Total investment in nuclear is projected to reach USD 80 billion in 2024, nearly double the 2018 level, which marked the lowest point in a decade.
- Grids have become a bottleneck for energy transitions, but investment is rising. After stagnating around USD 300 billion per year since 2015, spending is expected to hit USD 400 billion in 2024, driven by new policies and funding in Europe, the US, China, and parts of Latin America. Advanced economies and China account for 80%



of global grid spending. Investment in Latin America has almost doubled since 2021, and in Colombia, Chile, and Brazil spending doubled in 2023 alone. However, investment remains worryingly low elsewhere.

 Investments in battery storage are ramping up and are set to exceed USD 50 billion in 2024, but spending is highly concentrated. In 2023, for every dollar invested in battery storage in advanced economies and China, only one cent was invested in other emerging economies. Investment in energy efficiency and electrification in buildings and industry has been relatively resilient despite the economic headwinds. However, most of the dynamism in the end-use sectors comes from transport, where investment is set to reach new highs in 2024 with 8% yearon-year growth expected, driven by strong electric vehicle sales.

• Investments in hydrogen electrolysers have risen to around USD 3 billion per year. However, they remain constrained due to uncertain demand and the lack of reliable off-takers.

- Investments in sustainable aviation fuels have reached USD 1 billion, while USD 800 million is going to direct air capture projects, representing a 140% increase from 2023.
- Some 20 commercial-scale carbon capture utilisation and storage (CCUS) projects in seven countries reached final investment decision in 2023. According to company announcements, another 110 capture facilities, transport, and storage projects could do the same in 2024.

However, the current investment gap is considerable and requires swift solutions. In the scenario of 1.5°C global warming, cumulative investment across the entire global energy system would need to reach USD 47 trillion by 2030 —USD 6.7 trillion per year on average — according to the International Renewable Energy Agency (IRENA). Annual investment would need to scale massively to remain on the 1.5°C pathway relative to the USD 3 trillion invested in 2024. Achieving the global target set at COP28 to triple renewable power capacity by 2030 would require an additional 7.3 terawatts (TW).

Although global spending on renewable power, grids and storage is now higher than total spending on oil, gas, and coal,



it is still off track to limit global warming to 1.5°C by 2050. Upstream oil and gas investment is expected to increase by 7% in 2024 to reach USD 570 billion after an increase of 9% in 2023. This is being led by Middle Eastern and Asian national oil companies (NOCs), which have increased their investments in oil and gas by over 50% since 2017 and account for almost the entire rise in spending in 2023 and 2024. Investment in low-emissions fuels is only 1.4% of the amount spent on fossil fuels, compared to about 0.5% a decade ago.

Challenges remain as low borrowing costs end and higher financing costs hold back certain kinds of investment. However, the impact on project economics has been partially offset by easing supply chain pressures and falling prices. Solar panel costs have decreased by 30% over the last two years, and prices for minerals and metals crucial for energy transitions have also dropped sharply, especially the metals needed for batteries. The IEA projects that power sector investment in PV technology will exceed USD 500 billion in 2024, surpassing all other generation sources combined. Though growth may moderate slightly in 2024 due to falling PV module prices, solar remains central to the power sector's transformation. In 2023, each dollar invested in wind and solar PV yielded 2.5 times more energy output than a dollar spent on the same technologies a decade prior, according to the IEA.

While in 2015, the ratio of clean power to unabated fossil fuel power investments was roughly two to one. In 2024, it is set to reach 10 to one. The rise in solar and wind deployment has driven wholesale prices down in some countries, occasionally below zero, particularly during peak periods of wind and solar generation. In these countries, prices occasionally drop below zero due to the low marginal costs of renewable energy, the market design, and negative pricing. However, it can also be led by inflexible generation, grid constraints, subsidies, policy incentives or a mismatch between supply and demand. This lowers the potential for spot market earnings for producers and highlights the need for complementary investments in flexibility and storage capacity.

Increased public investment is required in an energy transition that is mainly funded by private entities. According to the IEA, private and commercial sources made about three-quarters of the investments, public finance contributed around 25%, and national and international development finance institutions (DFIs) accounted for just 1%. Other financing options for energy transition have faced challenges and focus on advanced economies. In 2023, sustainable debt issuances exceeded USD 1 trillion for the third consecutive year. However, they were still 25% below their 2021 peak as rising coupon rates dampened issuers'

borrowing appetite. Market sentiment for sustainable finance is wavering, with flows to environmental, social, and governance (ESG) funds decreasing in 2023 because of potentially higher returns elsewhere and credibility concerns. Transition finance is gaining traction as a means to mobilise capital for high-emitting sectors. Still, greater harmonisation and credible standards are required for these instruments to reach scale.

Energy investment in the Middle East is expected to reach approximately USD 175 billion in 2024, with clean energy accounting for around 15% of the total investment. In the Announced Pledges Scenario (APS), by 2030, clean energy investment will more than triple compared with 2024. For the moment, spending on fossil fuel supply predominates. According to the IEA, for every USD 1 invested in fossil fuels, only 20 cents are allocated to clean energy investment, representing approximately one-tenth of the average global ratio of clean energy to fossil fuel investment. By the end of the decade, every USD 1 invested in fossil fuels in this scenario will be matched by 70 cents going to clean energy. This gap reflects significant progress but remains below the parity needed for an efficient energy transition.

The regional opportunities in the decarbonisation of energy are compelling, and concerned investors are looking at the following prospects:

- Pure-play clean tech firms directly involved in renewable energy technology or production.
- Electric utilities transitioning away from fossil fuels and toward cleaner power generation.
- Oil and gas companies investing in cleaner production through carbon capture or diversifying production through renewables.

To ramp up investments in the region, collaborative approaches will be key to the success of energy transition projects as they allow businesses to share risks, resources, and expertise. Partnerships across various industries and between public and private sectors reduce risks through reduced financial exposure and by combining different advantages, infrastructure, influence, relationships, and expertise. A recent survey by KPMG found that 94% of energy transition investors prioritise finding partners who can share risks. Policy and regulatory risks also worry investors, as these represent a top barrier to investing in energy transition assets. These risks are complex for investors, and the resulting uncertainty can delay or prevent capital flows from reaching energy transition initiatives. Stable, transparent, and consistent regulatory environments can enhance long-term



investment opportunities in clean energy and infrastructure.

The energy transition is one of history's biggest, longest, and most important investment trends. Global commitments to 2030 targets suggest that investors can look forward to many nearterm opportunities. It is estimated that investment in renewable power generation, grids, and storage will need to rise from USD 1.2 trillion in 2024 to USD 2.4 trillion in 2030, while spending on efficiency and electrification needs to increase from USD 669 billion in 2024 to USD 1.9 trillion in 2030. Many financial investors are actively orchestrating the development of assets and infrastructure to create new energy value chains. The transition's actors, challenges, policies, and economics are expected to continue to evolve. Still, at a macro level, there is strong, consistent momentum behind the technologies, policies, and supply chains driving the transition.



