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الشركة العربية للاستثمارات البترولية
Arab Petroleum Investments Corporation

MENA ENERGY INVESTMENT OUTLOOK 2022-2026

ENERGY INVESTMENTS GROW DESPITE GLOBAL VOLATILITY

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About APICORP

The Arab petroleum investments corporation (APICORP) is a multilateral development financial institution established in 1975 by an international treaty between the ten Arab oil exporting countries. It aims to support and foster the development of the Arab world's energy sector and petroleum. APICORP makes equity investments and provides project finance, trade finance, advisory and research. Its headquarters is in Dammam, Kingdom of Saudi Arabia. APICORP is rated 'Aa2' with stable outlook by Moody's and 'AA' with a stable outlook by Fitch and 'AA-' by S&P Global.

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Although 2021 was a tumultuous year with bouts of volatility in the trifecta of the health, economic and financial fronts, we enter the year of 2022 expecting that it will be no less of a rollercoaster as several uncertainties loom. On the geopolitical front, the Russia-Ukraine conflict is triggering worldwide spillovers through commodity markets, trade, and financial channels. Fuel and food prices have increased rapidly, with vulnerable populations –particularly in low-income countries– most affected.

On the economic front, public debts and inflation rates are at a record high, with fiscal austerity measures anticipated to cool off the market overheating and restraint commodity prices. Interest rates are expected to rise as central banks tighten policy, exerting pressure on emerging market and developing economies. According to the IMF, inflation in 2022 is projected at 5.7% in advanced economies and 8.7% in emerging market and developing economies. Worsening supply-demand imbalances and further increases in commodity prices could lead to persistently high inflation. Elevated inflation will complicate the trade-offs central banks face between containing price pressures and protecting growth.

On the health front, new variants are expected to emerge as the virus mutates while the viral spread may be shifting from 'pandemic' to 'endemic'. Although many parts of the world appear to be moving past the acute phase of the COVID-19 crisis, death rates remain high, especially among the unvaccinated. Moreover, recent lockdowns in key manufacturing and trade hubs in China will likely compound supply disruptions elsewhere.

The fear of stagflation looms, as fiscal stimulus packages are being withdrawn, asset purchasing programs are being tapered and interest rates are to be hiked. The economic recovery will slow down amid a vicious inflationary cycle that turned out not to be transitory after all.

Impact of Inflation: ICIS Petrochemicals Index – Summary

INDEX	Apr-22	MoM	YoY
GLOBAL	248.4	1.64%	**20.02%**
NE Asia	235.8	-1.54%	**9.66%**
NW Europe	368.2	13.24%	**49.89%**
US Gulf	285.1	3.15%	**36.37%**

Although the global growth momentum is experiencing a cyclical slowdown ahead, the outlook for the MENA region is relatively positive –compared to the past two years– driven by the energy exporters, particularly the GCC, Iraq and Algeria. MENA energy exporters are set to benefit from the spike in energy prices which will result in higher government and private energy sector revenues. Such revenues will activate higher public capital spending and improve the general business sentiment in the private sector, thus facilitating longer-term expansion plans.

Several headwinds still pose a threat to the economic recovery in MENA, mainly: tighter monetary policies and higher interest rates which will drive FX outflows from emerging economies, commodities entering a super-cycle mode, prolonged Russia-Ukraine conflict into 2023, continued supply chain disruptions, food insecurity, and the threat of Covid variants causing key trade and manufacturing hubs in China to undergo lockdowns beyond Q2 2022.

Inflation in the GCC countries is expected to be on the lower side where the economy is supported by a strong windfall from oil & gas export revenues, currency pegs to the dollar and high forex reserves. As for the net-energy importers in North Africa and Levant regions, more suppressed growth rates are expected in 2022 as countries in these regions are more exposed to the macroeconomic risk imposed by the Russia-Ukraine conflict, food and commodity insecurity, higher inflation and less fiscal room for governments to withstand external shocks to their economies.

O&G market fundamentals and geopolitical strains.

The MENA region shoulders the largest portion of global investments in O&G going forward in a bid to avoid an impending super-cycle that can severely hamper the world economy. Global O&G capital expenditure was historically low in 2020 and 2021 and the world's O&G investments are not yet back to 2019 figures. The IEA already notes that production from existing fields will decline by 8% p.a. in the absence of any new investment, a supply decline that significantly outpaces any likely demand scenario.

Both KSA and UAE warn of a mismatch between the ongoing energy needs and the IOCs' reluctance to spend on replenishing their hydrocarbon reserves base due to anti-fossil fuel pressures. This will compromise energy security and economic activity should triple-digit oil prices become a norm. For instance, the declines experienced in OPEC members Nigeria and Angola, led both countries to fall short of their OPEC quotas in 2022.

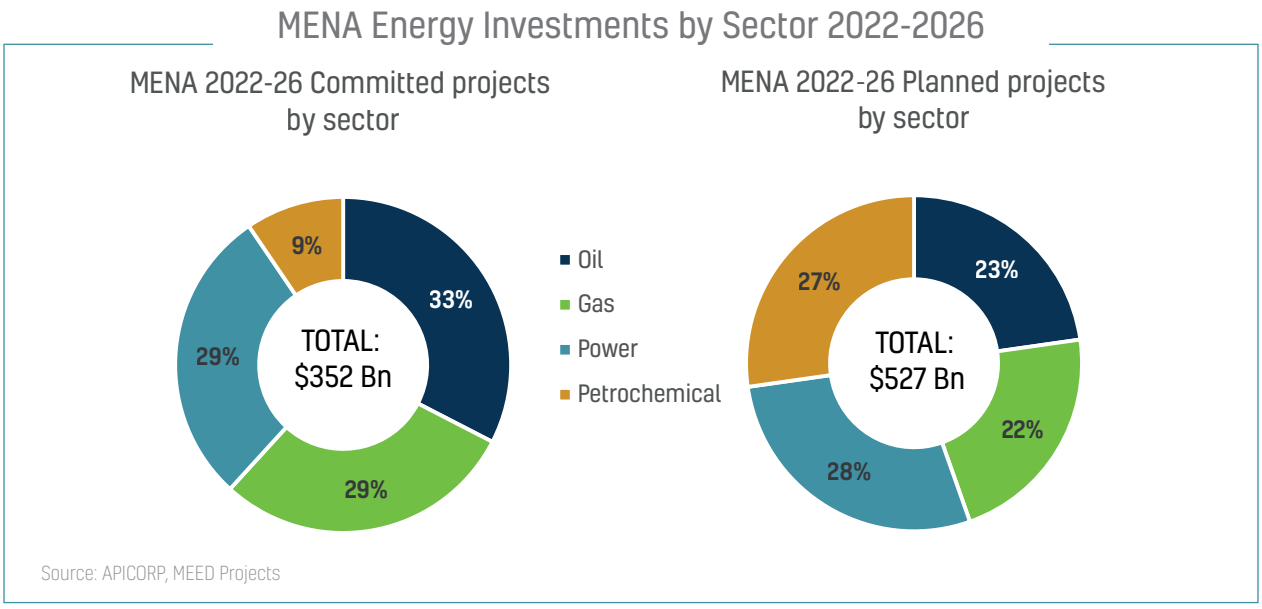
The ability of OPEC+ members to abide by the target increases to reach pre-pandemic levels by mid-year will be under the lens as SPR (strategic petroleum reserve) releases in the US, EU and SE Asia are not enough to compensate the loss of Russian supply oil. This is mainly due to lower overall output due to historically low upstream E&P investments over the past years and decline in Russian production due to sanctions/self-sanctions. Replenishing SPR stocks will be needed by Q3 2022 as huge withdrawals will leave these countries (US, EU, Japan and South Korea) exposed to very low storage levels, compromising energy security and further triggering an oil price spike by Q4 2022 / Q1 2023. The market is already taking this into account, and this is the reason oil futures remain elevated despite SPR releases.

Brent is expected to experience bouts of sharp volatility due to tight energy markets, before stabilizing at an average price revolving around USD 100/bbl. in 2022, as existing market fundamentals imply. As for natural gas, the JKM and TTF/NBP hub prices in Asia and Europe are expected to cool down during the summer season due to lower energy demand but remain poised to climb back near record high levels with the onset of winter in Q3 2022, since global gas markets will remain fundamentally under-supplied until late 2025.

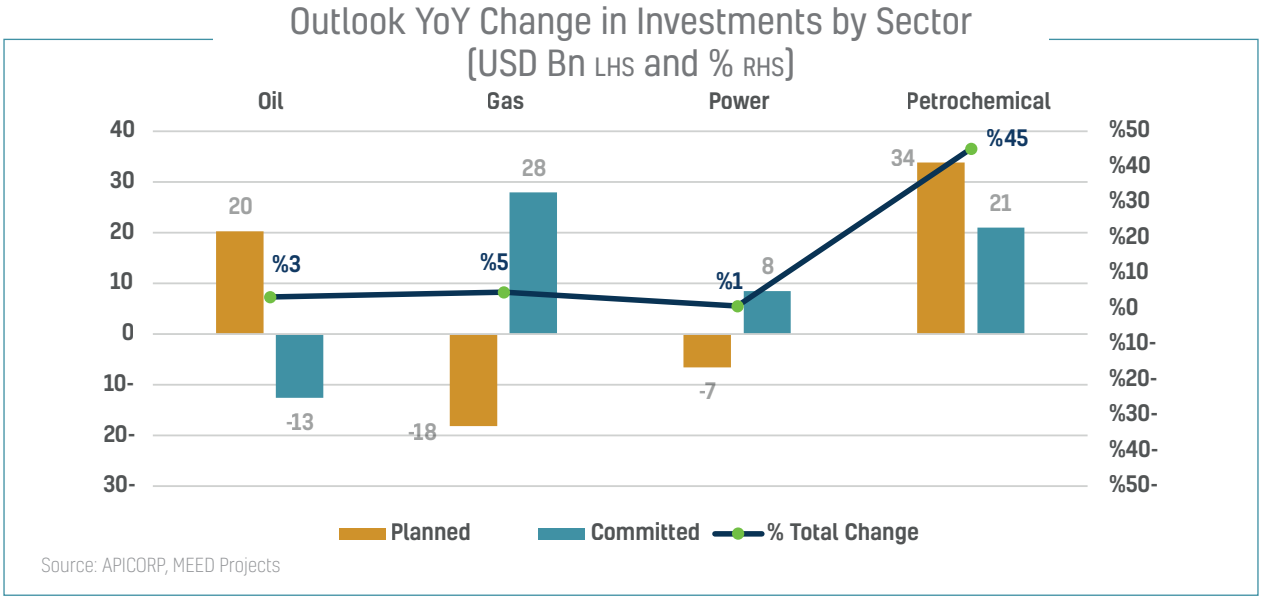
Strong growth in MENA energy investments driven by O&G.

Data compiled and analyzed in Q1 2022 shows that MENA's 5-yr forward-looking energy investments register a total of **USD 879 Bn**, **a 9% increase over last year's 2021-2025 figure** of USD 805 Bn. Of this total, committed projects (i.e. projects which have entered the execution stage) make up around 30%, while planned projects (i.e. projects still in the planning phase) constitute the remaining 70%.

The increase in project expenditure is spearheaded by the GCC, with committed projects making up more than 45% of the Gulf states' total energy investments thanks to the windfall from oil and gas export revenues. As for North African countries, which skillfully managed to offset the decline in committed projects during the pandemic years (2020-2021) due to the resilience of their diversified economies, the strains of inflation and debt burdens are beginning to show and impact investments (with the exception of Algeria, buoyed by bumper O&G exports revenues).



On a YoY analysis (year-on-year) of the 2022-2026 outlook vs *last year's outlook*, crude oil –the region's main energy export commodity– sees a 3% increase, thanks to strong capacity increment targets in KSA, UAE, Kuwait and Iraq. Libyan planned projects remain uncertain as the country suffers political setbacks.



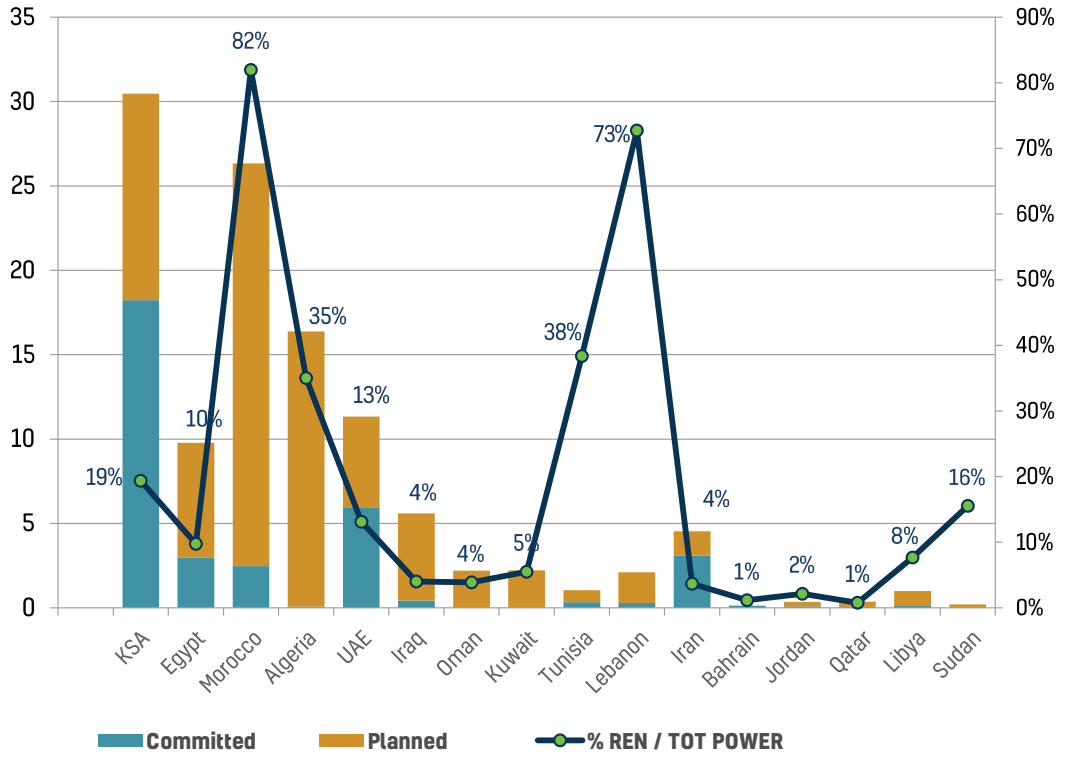
Natural gas investments are forecast to grow by 5% owed to Qatar LNG expansion projects, UAE sour gas developments (plus a newly planned LNG terminal on the Indian ocean straddling the Hormuz Strait chokepoint), and Iraq GTP projects. Committed projects in North Africa register a growth –especially in Algeria and Egypt– to stem gas exports in light of recent MOUs with EU countries to substitute part of the Russian gas imports.

Petrochemicals investments show the highest increase at 45% YoY —as several projects were put on hold in the last two years due to the combined crises where the focus was more on power sector and maximizing oil & gas export revenue to support the squeezed state budgets.

The power sector investments remain almost unchanged as MENA countries carry on with investments across the power value chain —in generation and T&D. On the supply power mix, natural gas and renewables drive the power decarbonization momentum via switching to natural gas as a cleaner fuel and leveraging sizeable renewables capacities. Although few MENA countries have already pledged their net-zero targets by 2050 (UAE) and 2060 (KSA, Bahrain), electrification via renewable energy sources will be a key driver to reach those targets. However, due to the intermittency of renewable energy sources and the lack of utility-scale grid storage solutions to date, fossil fuels and nuclear will remain indispensable in the power supply mix in the foreseeable future.

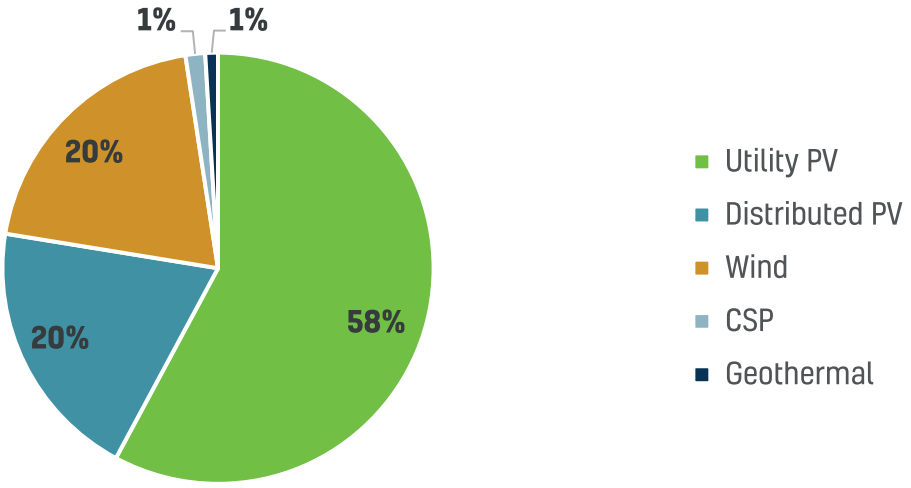
The national renewable energy targets for 2030 –ranging between 15% and 50% of electricity generation– portray the governments' will to double down efforts and increase the share of renewables in the energy mix. As of 2021, the total renewables additions reached 3 GW across MENA, with almost 5.6 GW to be added during 2022. The MENA region is expected to add around 33 GW of renewables by 2026 (by installed capacity), with around 26 GW as utility and distributed solar PV.

Renewables Projects Value by Country and Status (USD Bn) and Share of Renewables to Total Projects (RHS)

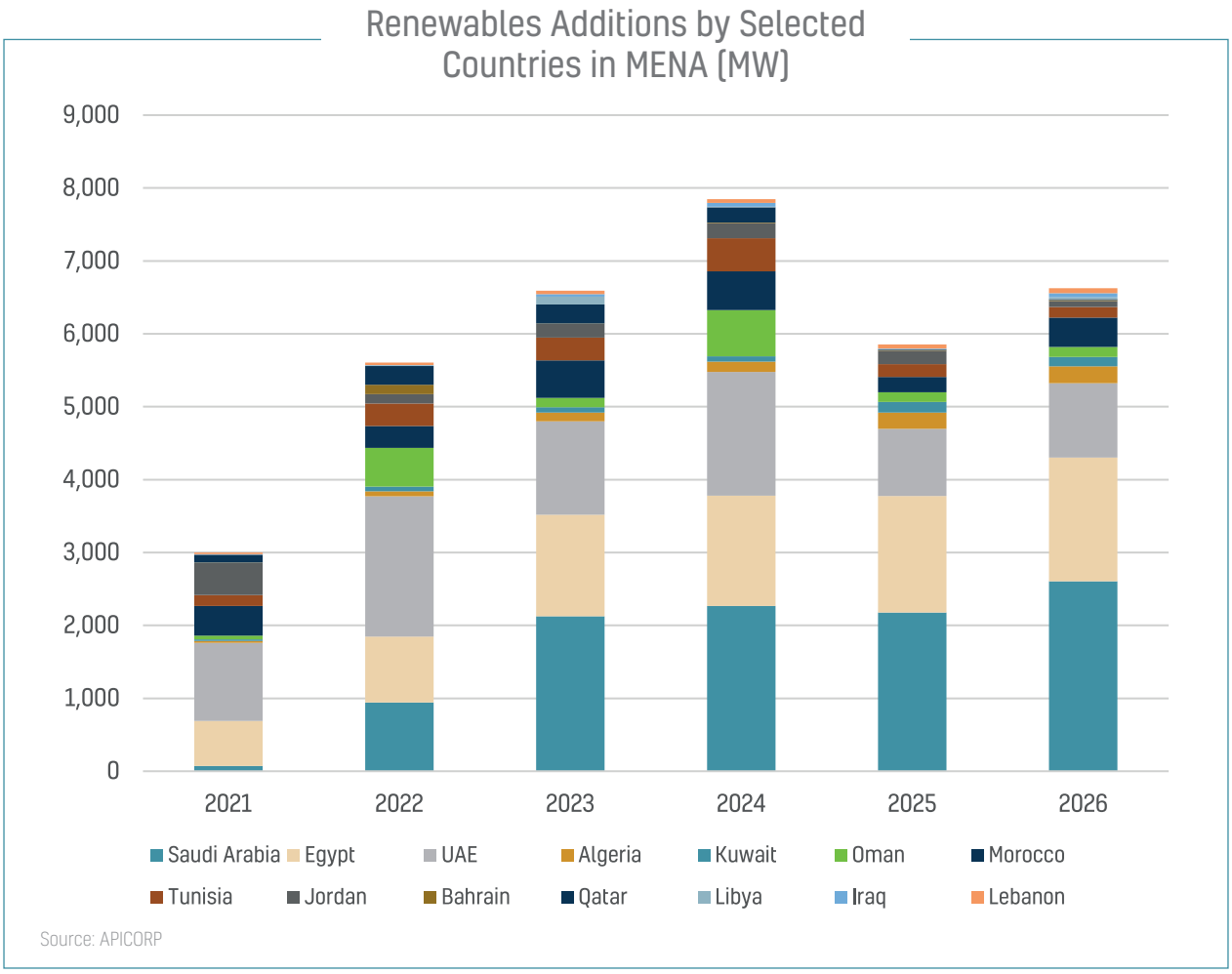


Source: APICORP, MEED Projects

Renewables Additions by Technology in MENA 2022-2026



Source: APICORP



Hydrogen gains momentum among the traditional energy vectors in MENA.

As for the energy vectors constituting the power mix in MENA, natural gas –which is already a dominant fuel for power generation– is expected to grow to maintain a power generation share of around 70% to 75% across MENA by 2024. Another positive sustainability signal is given by the region where oil-fired power is set to drop from 24% of total generation to almost 20% by 2024.

The most remarkable addition to the MENA's downstream sector is hydrogen as the region targets capturing considerable future market share of this nascent commodity based on its strategic advantages. At the time of compiling this outlook, the MENA region has registered more than USD 26 Bn in hydrogen projects, mostly in the planned phase.

In light of the gradual energy transition towards a low-carbon future, hydrogen will play a central role due to its versatility as a clean energy vector. Hydrogen can be an energy carrier and/or an energy storage medium given its high energy content per mass. Hydrogen can also support the MENA countries' energy security by diversifying the energy mix and boosting the resilience of localized energy systems.

By leveraging its strong potential, the MENA region is well-positioned to supply around 10% to 20% of the global hydrogen market by 2050. It is expected that the hydrogen markets in MENA will pass through three phases before transforming into a fully established commodity market where several aspects need to be addressed to ensure an attractive investment environment. We provide our original research and insights on hydrogen in MENA in *Section IV–2–iv*.

The energy transition drive in MENA takes shape in equity and financial markets.

With decarbonization efforts growing across the globe to counter climate change, O&G companies are facing tighter financing conditions and evolving regulatory frameworks while trying to keep contributing to socioeconomic development and providing affordable energy to stem economic activity.

MENA equity markets in 2021 witnessed the return to healthy deal flow volumes in both conventional and renewable energy given the region's dual approach to the energy transition. We expect the strong regional privatization drive to continue in 2022, with increased PPPs and IPOs to unlock value from world-class hydrocarbon assets, while targeting synergies through Public-Private-Partnerships.

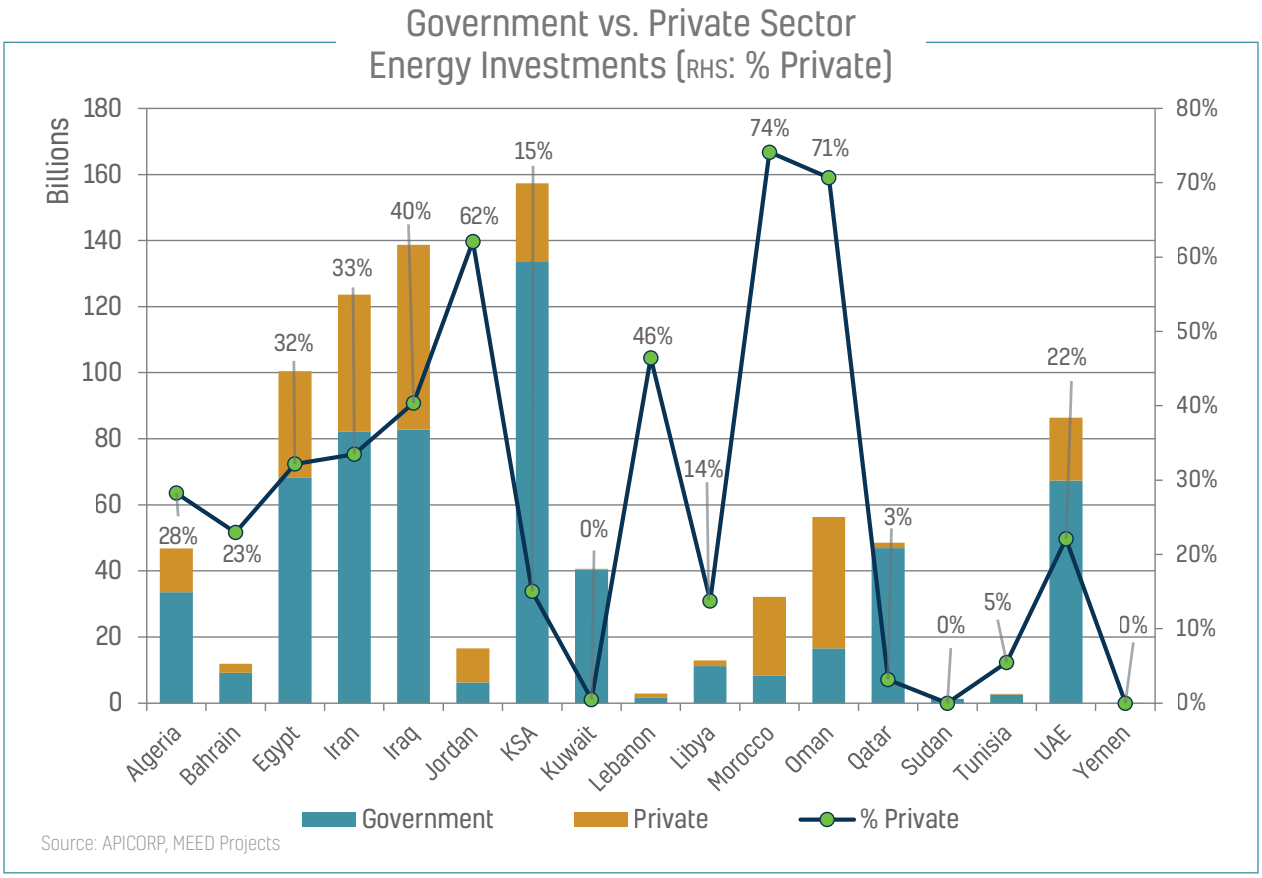
MENA green and sustainability-linked bonds issued in 2021 more than tripled from 2016-2020 to USD 18.64 Bn with an increase of a staggering 123% from the previous 2020 record of USD 4.5 Bn. This includes APICORP's USD 750 Mn ICMA-aligned Green Bond (Sep 2021) —following the development of APICORP ESG policy. Green and Sustainable Sukuk issuances also continued their growth in 2021 with a 17.2% YoY increase, (Fitch). MENA's most notable issuance for 2021 was Islamic Development Bank's (IsDB) USD 2.5 Bn Sustainability Sukuk in March, which is also its biggest USD public issuance to date.

2021 also witnessed MENA's First voluntary carbon trading scheme by Saudi Stock Exchange (Tadawul), paving the way for the development of a formal carbon market for trading credits and offsets. Under the recent net-zero pledges of the UAE, KSA, and Bahrain, carbon markets are expected to flourish in the region.

APICORP and IsDB kicked-off 2022 with the '*Infra Initiative*' —a USD 1 Bn private sector-focused infrastructure financing initiative to identify and deliver structured finance facilities to utilities projects with limited access to international financing. Under this initiative, funds will be allocated to electricity generation and transmission projects which utilize renewable energy or natural gas, as well as water and waste management facilities. The involvement of the private sector at the local, regional, and international levels will also be a priority in the project selection process.

MENA private sector investments continue to grow.

The share of private investments in MENA committed and planned projects for 2022-2026 increased from 27% (2021-2025) to 30%. In the GCC and North Africa, the percentage slightly increased from last year outlook: 22% for GCC and 36% for North Africa, while in the Levant countries –Iraq, Lebanon and Jordan– the figure goes down to 43% as compared to 52% in last year's outlook.



MENA to lead climate action in COP27 and COP28.

After the COP26 summit held in Glasgow in November 2021, there was a global consensus that our future shall be low-carbon. Although the 'what' is well defined, the 'how' remains debatable. Every country will chart its path as a function of energy security, level of socioeconomic development, financial capabilities and inherent energy mix.

As a direct result of COP26, we expect the focus to shift to assuring a sustainable energy transition for all nations ('SE4ALL') –with the UN SDGs in mind– and on how the required financing will be mobilized (the main task for the UN Glasgow Financial Alliance for Net Zero —'GFANZ'). We also expect the 'Emissions Trading Schemes' (ETS) and voluntary carbon trading to substantially increase in volume from 2022 and beyond, as a result of the activation of Article 6 of the Paris Agreement.

The MENA region will take center stage in the ongoing global energy transition as all eyes shift to Egypt, which will host COP27 in November 2022, and UAE hosting COP28 in 2023. While the transition continues to steadily gain momentum, governments face the challenge of balancing imperatives which are oftentimes very difficult to align: energy security, energy affordability, emissions reduction, and maximizing gains from core competitive markets to fund socioeconomic development targets.

As for the upcoming COP27 summit, the work has already started as several key decisions that were supposed to be taken at COP26 were postponed. The COP26 produced substantial progress on cutting greenhouse gas emissions, but the national carbon targets laid out fell far short of the near-halving of emissions required to stay within 1.5°C of pre-industrial levels. Recognizing that, nations agreed to review their targets before they convene this November.

The COP27 summit will underscore the sustainability aspect of the energy transition from the developing nations' perspectives –including MENA– which have been calling for a more 'inclusive' energy transition.

We expect the focus at COP27 to be in areas such as climate financing, adaptation, and loss and damage, to keep pace with the progress that the world hopes to achieve in mitigation and carbon neutrality efforts. Governments will be under pressure to act on their pledges from COP26 as the momentum builds ahead of the summit next November.

II. Macroeconomic trends governing the economic recovery

Although 2021 was a tumultuous year with bouts of volatility in the trifecta of the health, economic and financial fronts, we enter the year of 2022 expecting that it will be no less of a rollercoaster as several uncertainties loom. On the geopolitical front, the Russia-Ukraine conflict is triggering worldwide spillovers through commodity markets, trade, and financial channels. Fuel and food prices have increased rapidly, with vulnerable populations –particularly in low-income countries– most affected.

On the economic front, public debts and inflation rates are at a record high, with fiscal austerity measures anticipated to cool off the market overheating and restraint commodity prices. Interest rates are expected to rise as central banks tighten policy, exerting pressure on emerging market and developing economies. According to the IMF, inflation in 2022 is projected at 5.7% in advanced economies and 8.7% in emerging market and developing economies. Worsening supply-demand imbalances and further increases in commodity prices could lead to persistently high inflation. Elevated inflation will complicate the trade-offs central banks face between containing price pressures and protecting growth.

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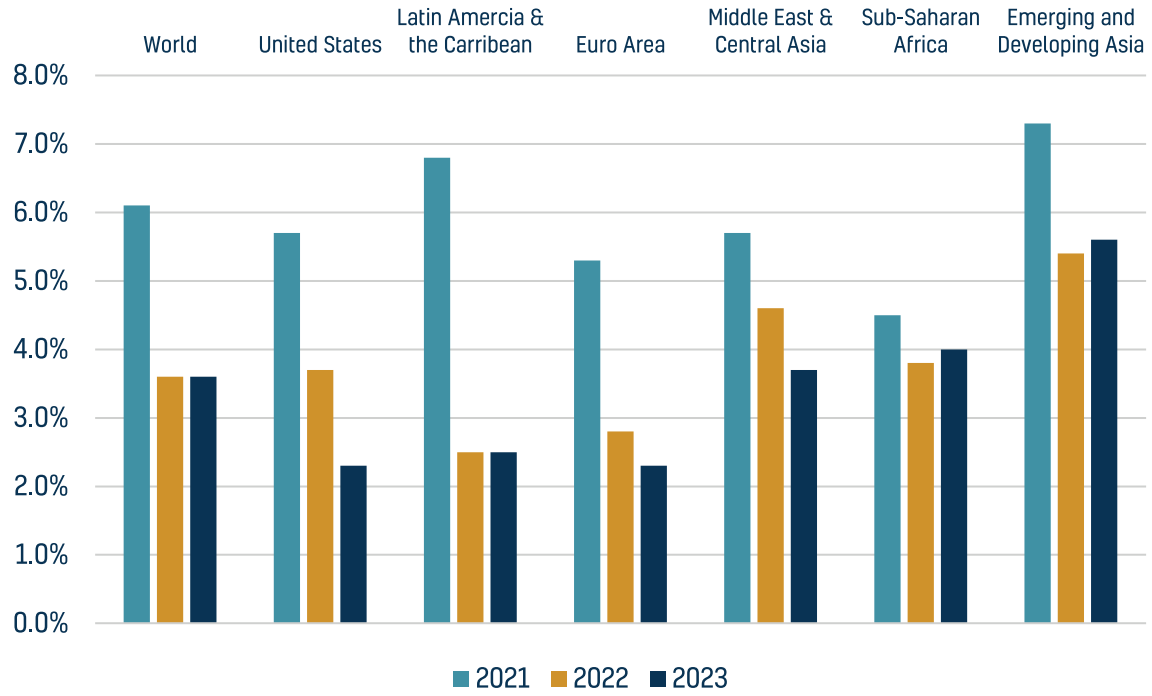
1. Global perspectives

The latest headwinds of geopolitical tensions, supply chain disruptions and surge in Covid cases globally will continue to weigh down on global trade and supply chains while sporadically disrupting international travel and tourism which will leave a dent in the economic growth during 2022. This prompted a significant downward revision of the 2022 GDP growth forecasts by the IMF forecasting a 3.6% global growth in 2022 as compared to 6.1% in 2021. We still expect the global economic recovery to be asymmetric, K-shaped and not necessarily sustainable for all countries.

The Quantitative Easing (QE) monetary policy adopted by the Fed led to soaring inflation rates and record-high public debts as a result of the fiscal stimulus packages deployed to boost the economic recovery. Although the markets ended 2021 with high returns (the S&P500 index ended 2021 with a 27% end-year return), inflation rates increased accompanied by a modest recovery in labor markets and soaring commodity prices. As of April 2022, most global financial markets experienced a bearish retreat while experiencing a dip in prices. The markets are registering the geopolitical risk premiums and the possibility of several hikes in interest rates.

A fear of stagflation looms as fiscal stimulus packages are being withdrawn, asset purchasing programs are being tapered and interest rates are to be hiked. The economic recovery will slow down amid a vicious inflationary cycle that turned out not to be transitory after all. 2022 will be a year of transition from active fiscal stimulus to fiscal restraint aimed at stabilizing or reducing debt burdens. This transition will begin with the withdrawal of emergency support measures and will lead to more deliberate fiscal rebalancing that will play out in 2023 and beyond.

Global Growth Projections by Region (% Change)



Source: APICORP. Data adapted from the International Monetary Fund, April 2022.

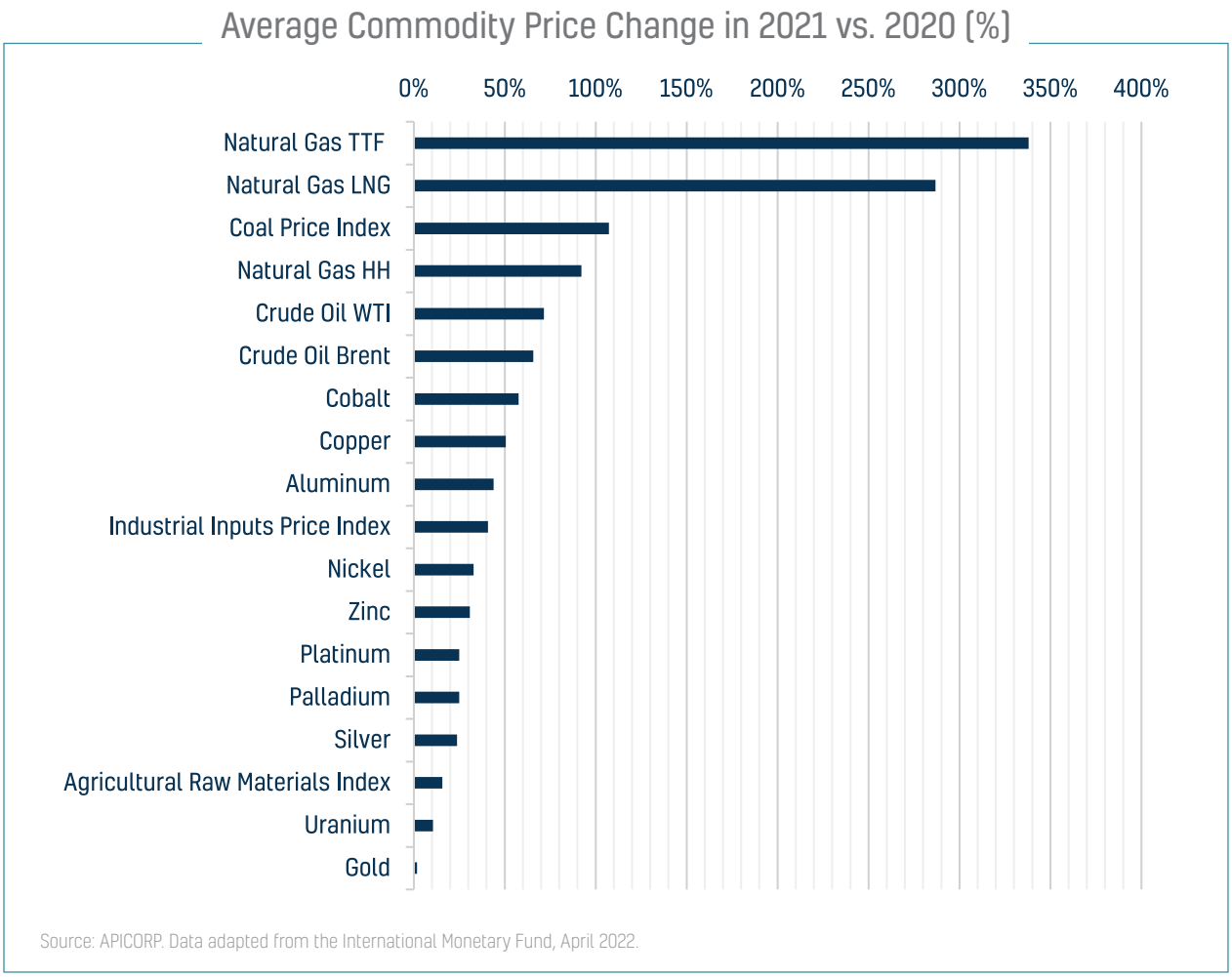
Central banks are expected to start gradually increasing interest rates in 2022 where the Fed is expected to taper asset purchases and continue increasing interest rates throughout 2022 –between four to seven rate hikes are expected of 25 to 50 bps each to reach a policy target range to 2.25%-2.5% by year end– in an attempt to stave off soaring inflation. Although inflation rates might fall, there will likely be persistent underlying pressure on prices due to tight labor markets and an increase in wages.

Many countries have used the favorable market conditions and the very open recent financing environment to lock in longer maturities and to manage their liabilities, reducing near-term capital repayments. Official bodies like the IMF also appear more flexible in this cycle and less demanding regarding near-term fiscal austerity than perhaps in previous cycles. We are also seeing some MENA renewable energy projects refinanced under generous green and sustainable schemes, particularly projects that have been de-risked after uninterrupted commercial operations, e.g. Benban in Egypt.

Although commodity prices enjoyed a modest and uneven correction during 2021, it will take time for this change to migrate downstream and cost pressures to ease during 2022. Energy markets are naturally price-inelastic and thus volatile due to their basic nature of necessity and the lack of fuel substitutes. Volatility in commodity markets will persist in 2022 as they grapple with the effects of the pandemic, geopolitical risks, uncertainty over macroeconomic policy, and supply chain disruptions.

Although the energy markets have been a source of inflation this past year, they are expected to relatively stabilize during 2022 with increases in oil production by OPEC+, non-OPEC countries, increased gas production, LNG supply and coordinated SPR releases (from US, Japan and South Korea) —in case the Russia-Ukraine conflict widens to a global armed confrontation. The ability of OPEC+ members to abide by the planned increases to reach pre-pandemic levels by mid-year will be under the lens as SPR releases are not enough to compensate the loss of Russian oil. This is mainly due to lower overall output due to historically low upstream E&P investments over the past years and decline in Russian production due to sanctions. Also replenishing SPR stocks will be needed by Q3 2022 as huge withdrawals will leave these countries (US, Japan and South Korea) exposed to very low storage levels, compromising energy security and further triggering an oil price spike in Q4 2022 / Q1 2023. The market is already taking this into account, and this is the reason oil futures remain elevated despite SPR releases.

Brent is expected to experience bouts of sharp volatility due to tight energy markets, before stabilizing between at an average price revolving around USD 100/bbl. in 2022. As for gas, the JKM and TTF/NBP hub prices in Asia and Europe are expected to cool down during the summer season due to lower energy demand but remain poised to climb back near record high levels with the onset of winter in Q3 2022. Global gas markets will remain fundamentally under-supplied until 2025 when Qatar NFE LNG project becomes operational, injecting 60 MTPA into the global LNG supply.



Source: APICORP. Data adapted from the International Monetary Fund, April 2022.

2. MENA perspectives

Although the global growth momentum is experiencing a cyclical slowdown ahead, the outlook for the MENA region is relatively positive than seen over the past two years, driven by the energy exporters, specifically the GCC. MENA energy exporters are set to benefit from the Russia-Ukraine war, as the spike in energy prices will lead to higher government revenues. Such revenues will activate higher public capital spending and improve the general business sentiment in the private sector, which will lead to longer-term expansion plans.

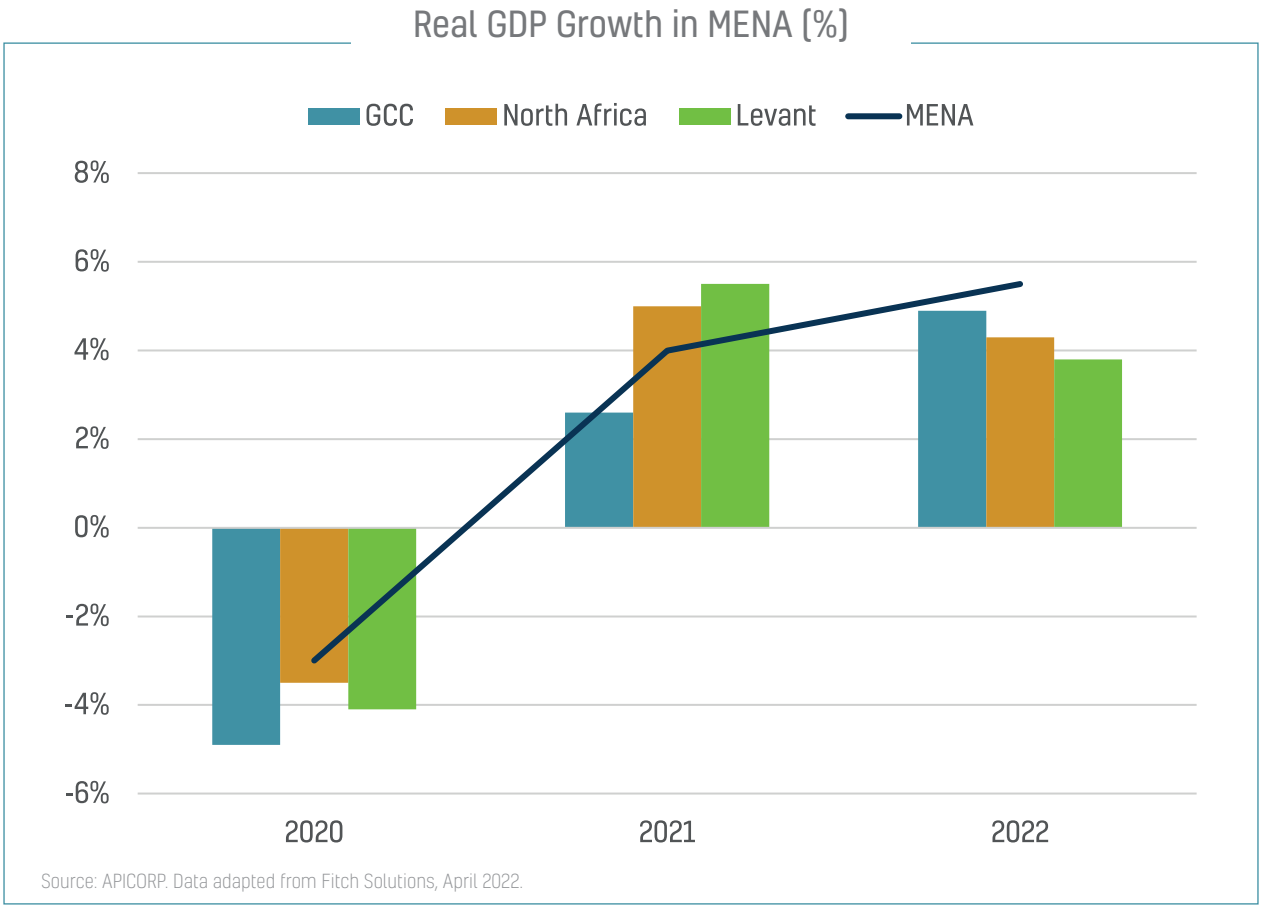
The triple crisis of 2020 spurred a previously shy privatization activity in GCC, unlocking the value of O&G assets. This also boosted green & sustainability financing across MENA and pushed for capital and operating discipline — especially in Iraq, Kuwait and Algeria. The ripple effects of the global crisis of 2020 accelerated the implementation of structural reforms, as in the case of Algeria and Kuwait and underscored the importance of diversifying the economy, as in KSA, UAE and Kuwait.

The solid investment momentum will counteract the negative impact of higher inflation on domestic consumption in the GCC. Economic diversification and strong non-oil GDP growth in the GCC region will be key to decouple growth cycles from the oil and gas price volatility and enhance the robustness and resilience of their economies.

As for the net energy importers in MENA, these countries will suffer the most from the Russian invasion of Ukraine driven by the surge in commodity prices, elevated inflationary pressures and negative repercussions on private consumption and net exports. Higher inflation, tighter monetary policies, higher interest rates and limited fiscal room to ease the impact will dampen spending. Global inflation and persistent supply chain bottlenecks will also weigh on the post-pandemic recovery, leading to lower remittance inflows, weaker demand for exports and slower recovery in tourism.

Several headwinds still pose a threat to the economic recovery in MENA, mainly: tighter monetary policies and higher interest rates which will drive FX outflows from emerging economies, commodities entering a super-cycle mode, prolonged Russia-Ukraine conflict throughout 2022, low probability of a nuclear deal with Iran, continued supply chain disruptions, food insecurity, continued threat of Covid variants causing key trade hubs in China to undergo lockdowns at the time of writing this report.

For the net-energy exporters in MENA, Saudi Arabia will leverage stronger oil and gas sector growth and drive a headline GDP of 7.6% from an estimated 3.2% in 2021. This comes on the back of the surge in oil prices following Russia's invasion of Ukraine, which will have positive spillovers on the economy and accelerate progress in planned projects. At the same time, elevated oil prices will boost confidence across the private sector, which will translate into higher volume of M&As and expansion-related investment.



For the UAE, real GDP growth is expected to rise from 2.3% in 2021 to 4.2% in 2022 driven by rebounding tourism and increasing domestic demand. The rising hydrocarbon output due to the easing of OPEC+ supply restrictions, along with the ongoing recovery in private consumption, will support robust economic activity. In Qatar, the non-hydrocarbon sectors will see a fast growth boosted by hosting the FIFA World Cup in Q4 2022, with the oil & gas sector also expected to expand leading to an overall growth of headline GDP to 3.4% in 2022 compared to 1.5% in 2021.

As for Bahrain, the fiscal reforms and higher VAT will register a headline GDP growth of 3.3% in 2022 compared to 2.2% in 2021. Driven by the improvement in oil and gas revenues in 2021, Oman is expected to register a 5.6% growth in 2022 versus a 2% in 2021. Kuwait's real GDP growth reached 1.3% in 2021 and is forecasted to accelerate to 8.2% in 2022 driven by higher oil revenues.

Higher oil prices will boost government revenues in Algeria, offering Algerian authorities more leeway to increase capital spending, which will stimulate investment growth. However, the government might still use additional revenues to expand its subsidy bill in an attempt to absorb the negative inflationary pressures on the population. The IMF projects a 2.4% GDP growth in 2022 as compared to 4% in 2021.

As for the net-energy importers in North Africa and Levant regions, more suppressed growth rates are expected in 2022 as countries in these regions are more exposed to global geopolitical risk led by the Russia-Ukraine conflict, food and commodity insecurity, higher inflation and less fiscal room for governments to withstand external shocks to their economies.

Egypt is strongly affected the negative impacts of the Russia-Ukraine conflict on its economy in 2022 through a surge in inflation, with food security being paramount due to dependency on Russian and Ukrainian wheat imports, and a slower rebound in tourism. Nevertheless, The IMF forecasts the country will register a 5.9% GDP growth in 2022 as compared to 3.3% in 2021. The Tunisian economy is expected to contract to 2.2% during 2022 as compared to a 3.1%

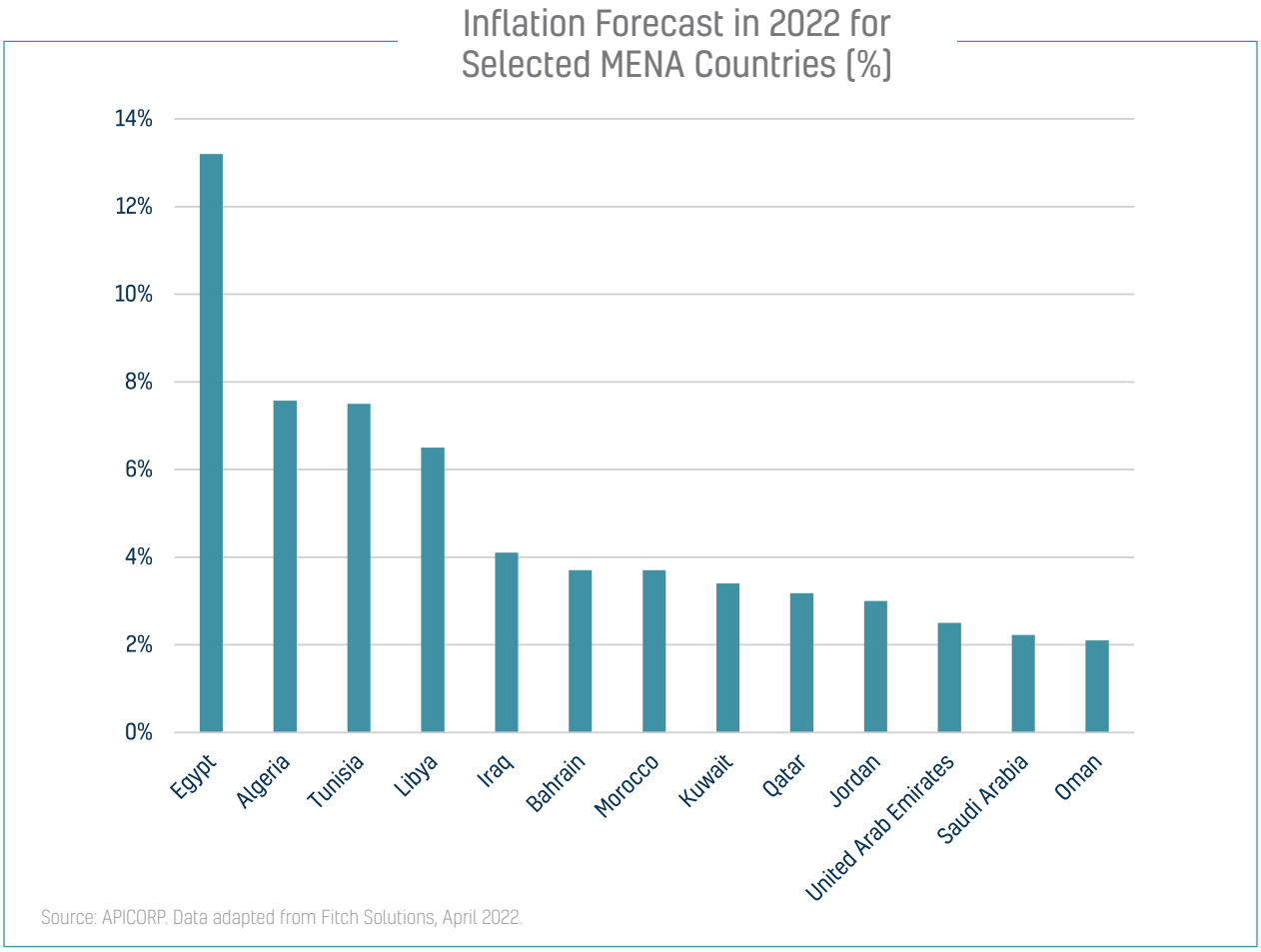
growth in 2021 as the direct repercussions of the Russia-Ukraine conflict on the country's post-pandemic recovery are felt. Private consumption will be hit as a result of higher inflation, fueled by the surge in commodity prices, and lower remittance inflows from Europe.

The IMF projects a contraction in Morocco with a 1.1% GDP growth in 2022 as compared to 7.2% growth in 2021 as a direct impact of the Russia-Ukraine conflict placing significant downward pressure on the Moroccan economy, with higher inflation weighing on domestic consumption and slowing remittance inflows.

In the Levant region, Iraq is expected to experience a 9.5% GDP growth as compared to 5.9% in 2021 on the back of higher oil price environment improving its fiscal position and hence investments. As for Jordan, the country is expected to register a modest 2.4% growth in 2022 as compared to 2% in 2021.

High levels of inflation in MENA are driven by a spike in commodity prices with Brent averaging USD100/bbl. as compared to an average of USD71/bbl. in late 2021. Additionally, wheat prices are nearly 50% higher than their 2021 average. Global inflation, supply chain disruptions and tighter monetary policies will also add to inflationary pressures in MENA countries. North African economies will be the most affected given the large weighting of food in their CPI baskets.

Inflation in the GCC countries is expected to be on the lower side where the economy is supported by a strong windfall from oil & gas export revenues, currency pegs to the dollar and high forex reserves. It is also worth noting that the Middle East SWFs have a collective of about USD 3 Tn of international assets.

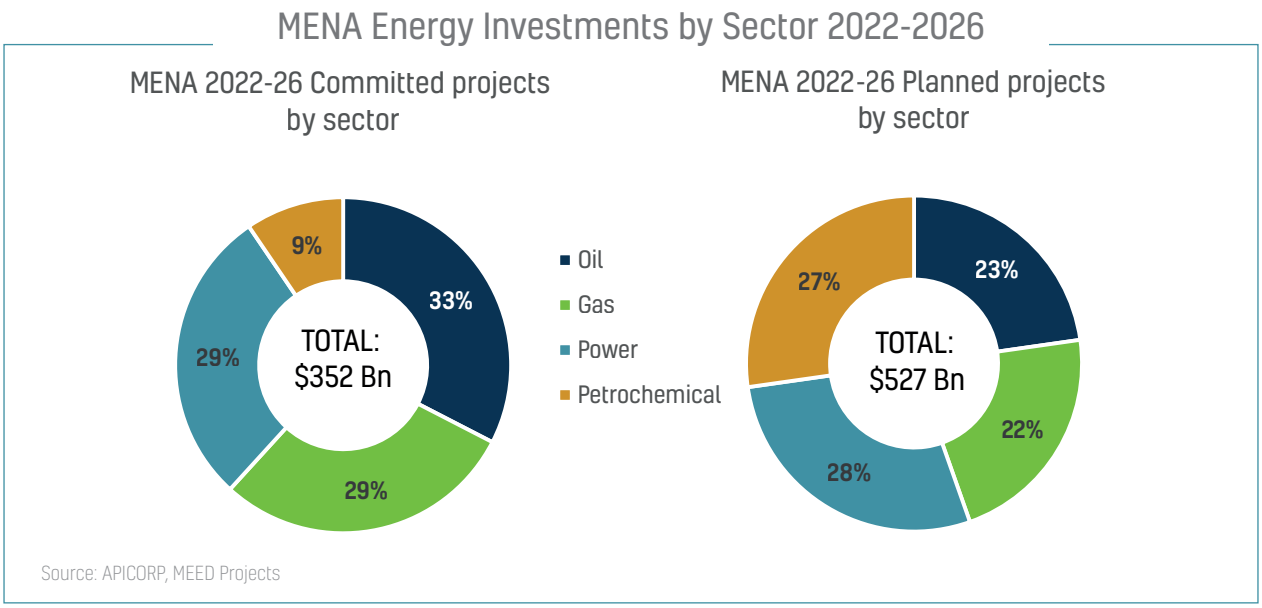


Source: APICORP. Data adapted from Fitch Solutions, April 2022.

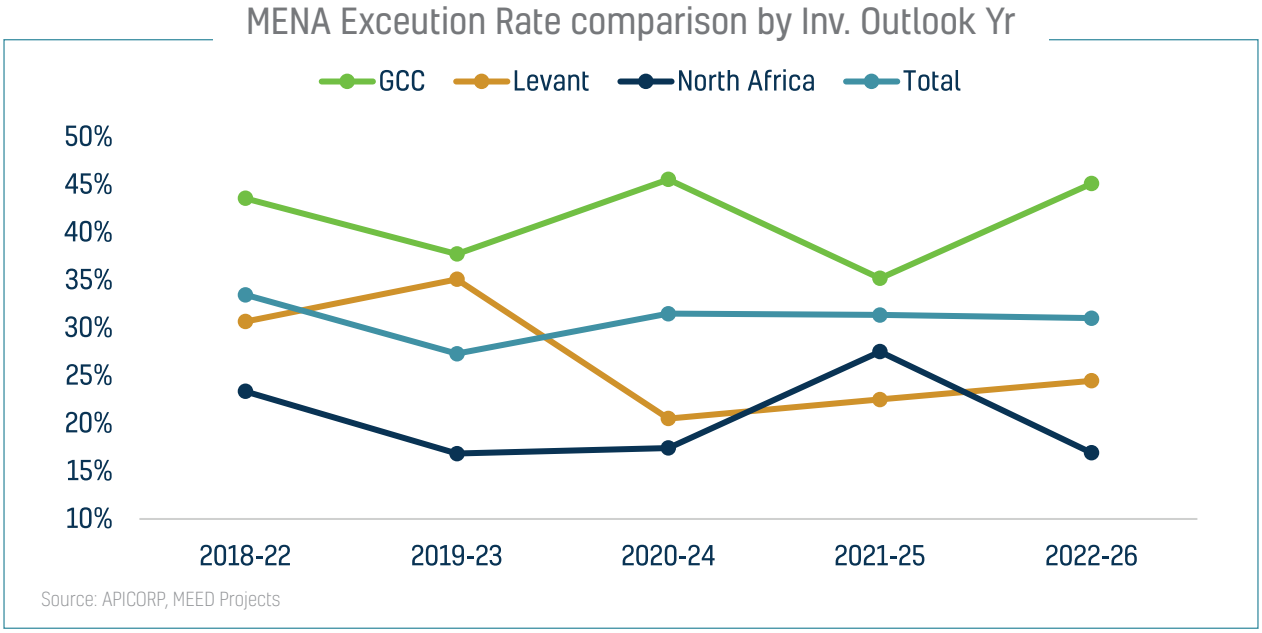
III. 2022-2026 MENA energy investment outlook

1. MENA 5-yr energy investments highlights

Data compiled and analyzed in Q1 2022 show that MENA's 5-yr forward-looking energy investments register **USD 879 Bn**, a 9% increase over last year's 2021-2025 figure of USD 805 Bn.



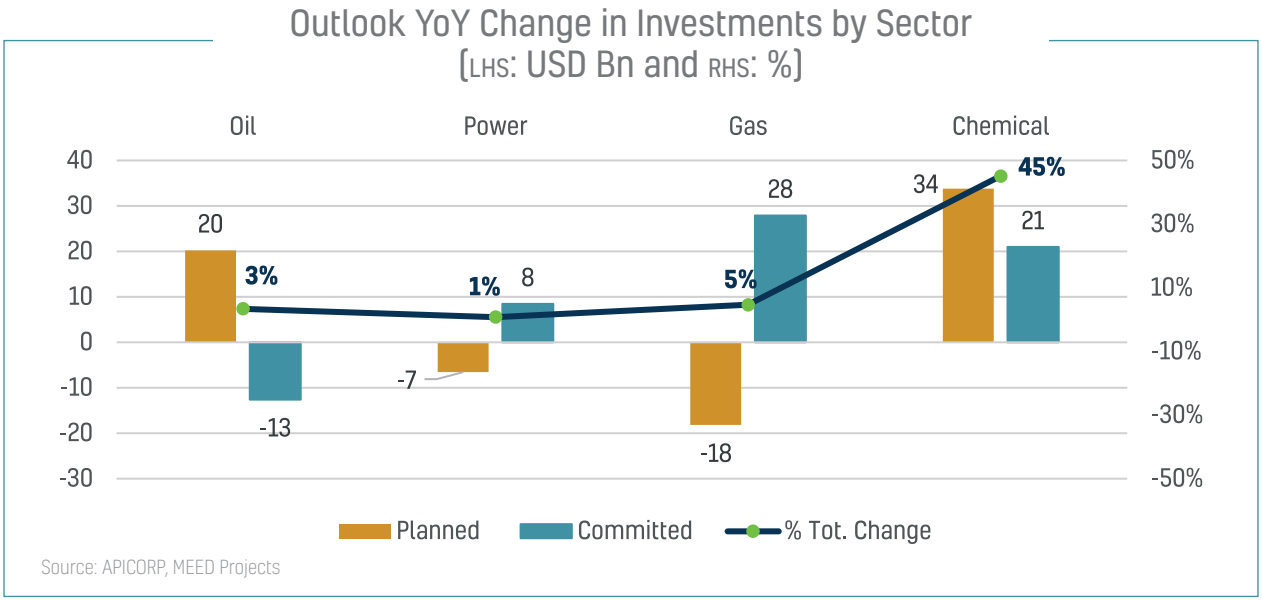
Committed investments (i.e., investments in execution stage) make up 30% of overall investments. While North Africa had offset the decline in committed projects during the pandemic years (2020-2021) due to the resilience of their diversified economies, this year's outlook shows the straining impact of inflation and debt burdens on North African economies hitting projects sanctioning. The GCC spearheads projects expenditure for 2022-2026 thanks to the windfall from oil & gas export revenues with committed projects making up more than 45% of total projects by value.



The growth in committed gas investments in MENA is the highest as compared to the other energy sectors thanks to world-class megaprojects NFE (Qatar) and Jafurah (KSA), in addition to ADNOC sour gas developments and Iraq gas to power projects. In North Africa, Egypt and Algeria continue to boost their natural gas capacities, especially after high-profile agreements were signed with Italy and Spain to increase the offtake from the two OAPEC countries to decrease European reliance on Russian gas. Iran has also been expediting the development of its South Pars field since Qatar lifted the self-imposed moratorium on its southern section of the field in 2017.

One notable planned gas development is the UAE constructing a new LNG plant on the Arabian sea near Fujairah to increase its gas export capacity. UAE's sour gas production continues to build up making gas a hot export commodity in the coming years in time with a surge in global LNG demand.

Algeria has a number of high-profile gas projects to increase exportable gas production in presence of increasing domestic demand. As for Egypt, its successful award of deep-water exploration blocks to international O&G operators put the East Med in focus again, particularly in light of Europe's policy to replace Russian gas imports. Egypt targets further consolidation of its role as an integrated energy hub via the EMGF (East Med Gas Forum), and also as a regional power hub through its plans to export electricity to Europe via subsea cables (2 MOUs were signed in 2021 with Cyprus and Greece).



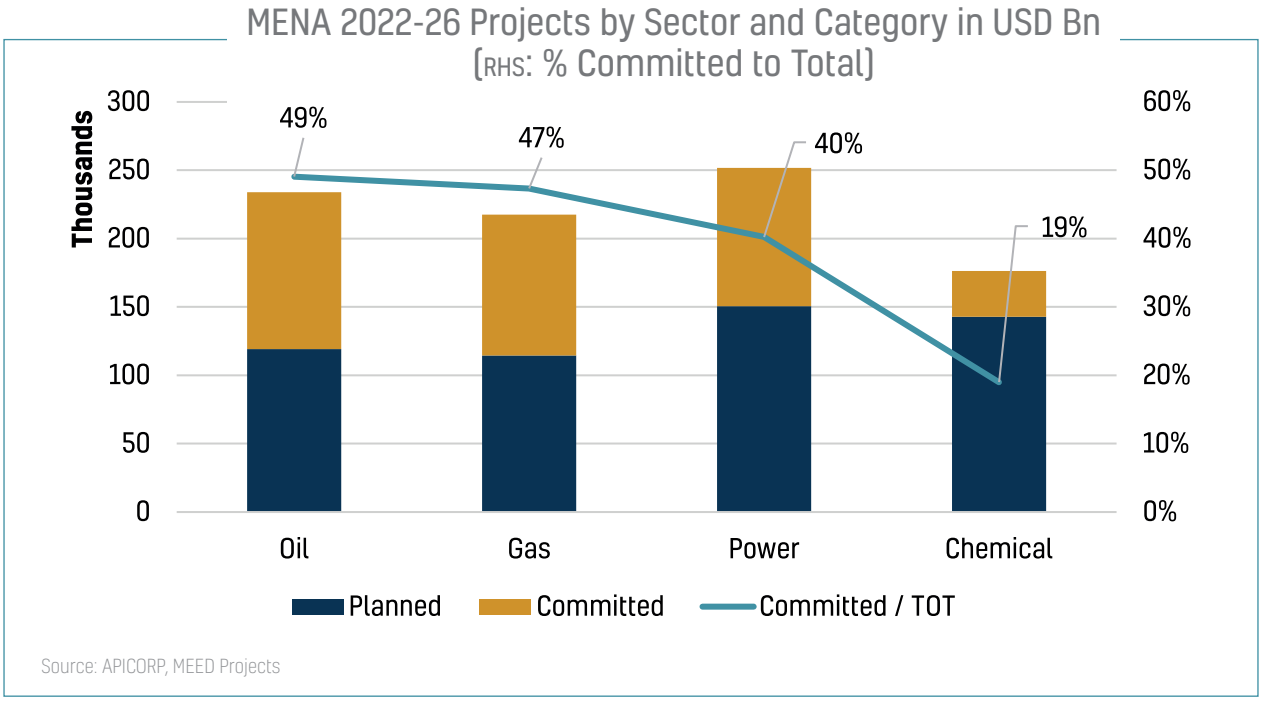
Oil investments show a 3% increase in total investments as GCC countries and Iraq continue to maximize production capacity, while recent Saudi discoveries announced in Q4 2021 are not fully captured in this outlook at the time of analysis. KSA and Iraq lead oil investments in the region as both countries aim to hike production capacities, while the UAE continues to progress on its 5 Mbopd capacity target by 2030.

Power investments remain stable on a YoY level at approximately USD 250 Bn for the upcoming 5 yr. period as MENA countries continue their drive to decarbonize their power grids. The region is expanding its clean power generation mix by the increased utilization of natural gas (GCC and Iraq) and scaling up renewables projects (almost all MENA countries have ambitious renewables targets as elaborated in *Section IV* titled *Power, Renewables & Hydrogen in MENA*).

After a period of pause and re-evaluation, petrochemical investments resume growth with a staggering 45% increase, owed to megaprojects in Egypt and Iraq to substitute hefty imports and supply the domestic markets while in KSA and the UAE, downstream integration projects continue in key clusters (e.g. Amiral in Jubail and Borouge in Fujairah). As for Algeria, the country is embarking on a petchems development plan to increase resource monetization and job creation. Waste-processing will be widely adopted in the following years after pilot projects in UAE, Egypt, Jordan and Kuwait proved to be commercially successful.

Looking at the percentage of projects in execution to total projects by value, nearly 50% of oil and gas projects are committed, signaling the region's attention to boost exports of the two commodities. Committed power projects are at 40% led by natural gas and renewables, whereas most petrochemical projects are in the planned phase (only 19% committed).

On a country-level energy investments, Saudi Arabia –MENA's largest economy and OPEC leader– tops the chart with Jafurah and NEOM megaprojects, in addition to gas to power and oil capacity development —including unconventionals. Iraq comes second for this year's 5-yr outlook as the country races to use its windfall of oil revenues to develop its power and downstream infrastructure and enhance its oil and gas production capacities. Similarly, Iran is trying to catch up with development of its gas resources, particularly South Pars (as Qatar speeds on with developing its North Dome section world's largest shared gas field), as lifting of oil sanctions seems unlikely.

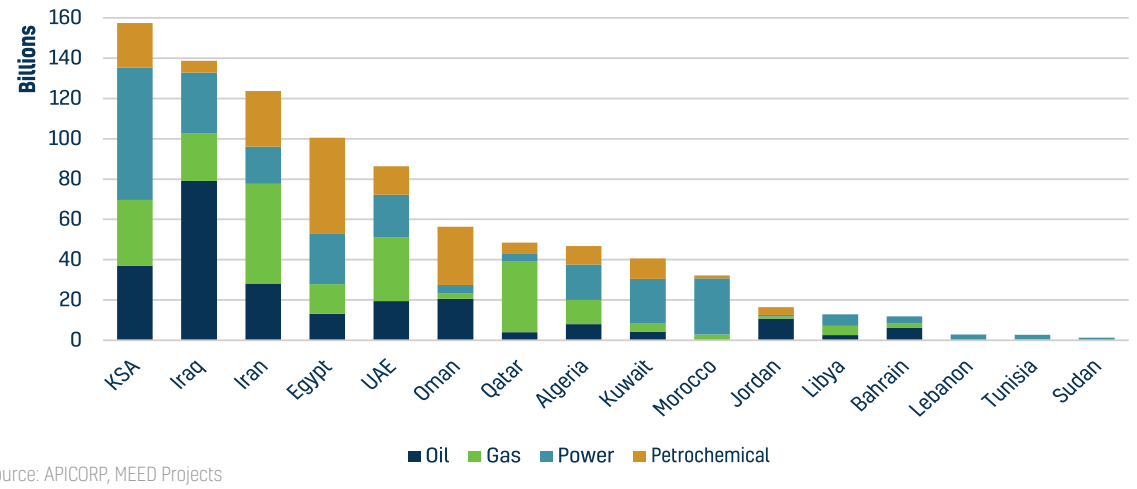


Source: APICORP, MEED Projects

As for Egypt –the region's most populous country– petrochemical projects dominate the 2022-2026 investments horizon with two megaprojects in the western desert (Mediterranean) and Suez, followed by continued progress on power sector modernization and interregional connectivity (as the republic also targets boosting electricity exports, in addition to gas, to become an integrated energy hub).

The UAE with a natural gas surplus –thanks to ample sour and unconventional gas developments and multi-GW nuclear power to free up natural gas consumption– is sanctioning a new LNG export terminal in the strategic energy hub of Fujairah, outside the gulf, making the country a sizeable future oil & gas exporter. The UAE is also adding new petchem plants to its Borouge cluster.

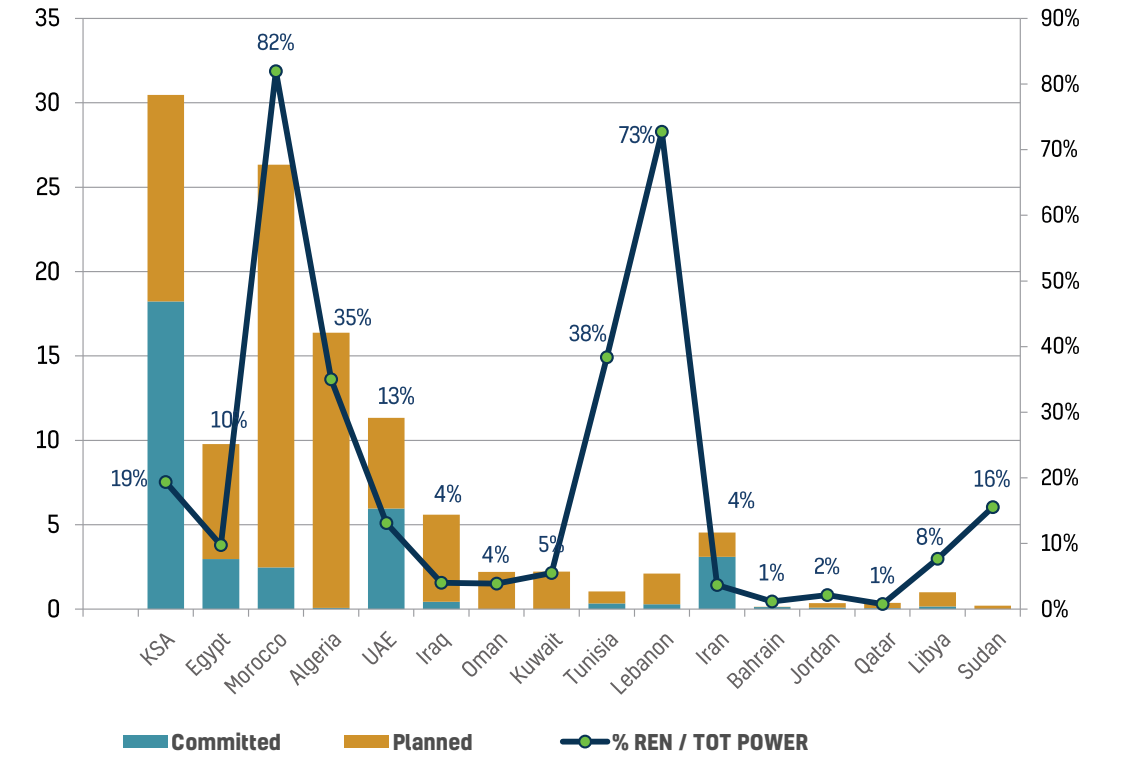
MENA 2022-26 Total Projects Value by Country



Source: APICORP, MEED Projects

As for the power investments which are driven by renewables, KSA, Morocco, Algeria and the UAE top the list as these countries double down their efforts to scale up renewables projects and meet their ambitious RE targets. It is worth noting that Algeria has put in place a national strategy for renewables, in addition to setting up a new energy transition ministry to supervise the progress on its ambitious target of 37% renewables in power generation mix by 2030 —an impressive turning point for the OPEC member which relies on O&G exports in 90% of its government revenues.

Renewables Projects Value by Country and Status (USD Bn) and Share of Renewables to Total Projects (RHS)



Source: APICORP, MEED Projects

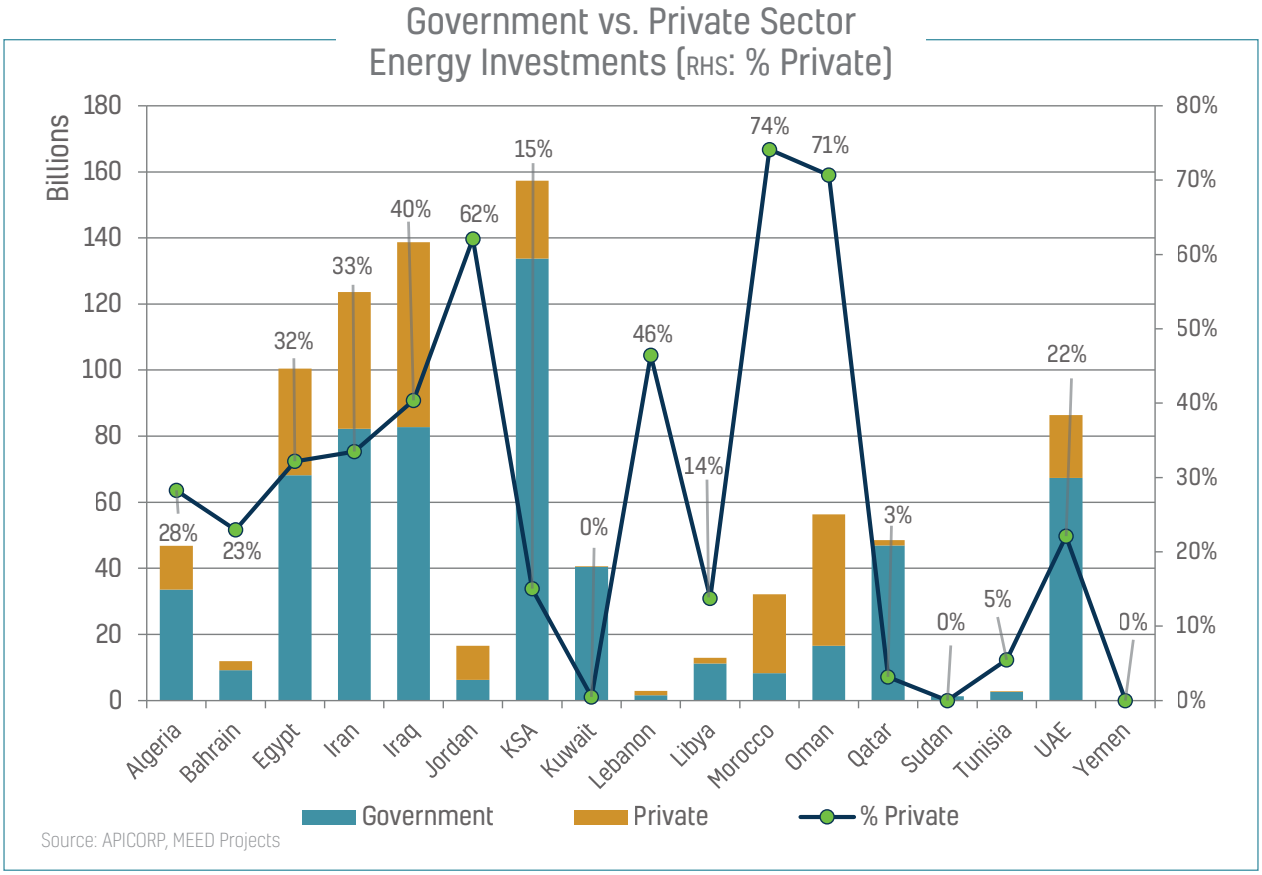
2. The role of private and public financing

The share of private investments in MENA's committed and planned projects for 2022-2026 increased from 27% (2021-2025) to 30%. In the GCC and North Africa, the percentage slightly increased from last year's outlook: 22% for GCC and 36% for North Africa, while in the Levant countries Iraq, Lebanon and Jordan, the figure goes down to 43% as compared to 52% in last year's outlook.

KSA's and UAE's growing private sector participation is dwarfed by the size of their respective energy investments portfolio, but a trend analysis shows an increasing share of the non-governmental sector that echoes the huge strides taken by the two countries' governments to strengthen their non-oil economies.

As for the green/renewable energy industry, it is getting gradually de-risked as more and more participants are getting involved in the trend (aggregate effect), in addition to localizing the production of some PV components like solar panels, smart meters and electronic components, that can also feed into EV manufacturing. It is worth noting that the Public Investments Fund (PIF) is a major shareholder of Lucid, the luxury EV manufacturer.

In Feb 2022, Saudi Aramco announced the execution of an agreement to sell a 49% stake in the newly-formed Aramco Gas Pipelines Company for USD 15.5 Bn to Blackrock and private Saudi firm Hassana Investment co. The gas pipelines company has rights to 20-years of tariff payments for gas transported through Aramco's gas pipeline network. The agreement is considered the newest of MENA's flagship NOC drive for unlocking value from domestic core assets. In April 2022, the Egyptian government announced a plan to privatize a number of government-owned assets in the energy, services and infrastructure domains through a mix of equity share sales and IPOs depending on the best mechanism for each asset.



In 2022, APICORP and IsDB kicked-off the '*Infra Initiative*', a USD 1 Bn private sector-focused infrastructure financing initiative to identify and deliver structured finance facilities to utilities projects with limited access to international financing. Funds will be allocated to electricity generation and transmission projects which utilize renewable energy or natural gas, as well as water and waste management facilities.

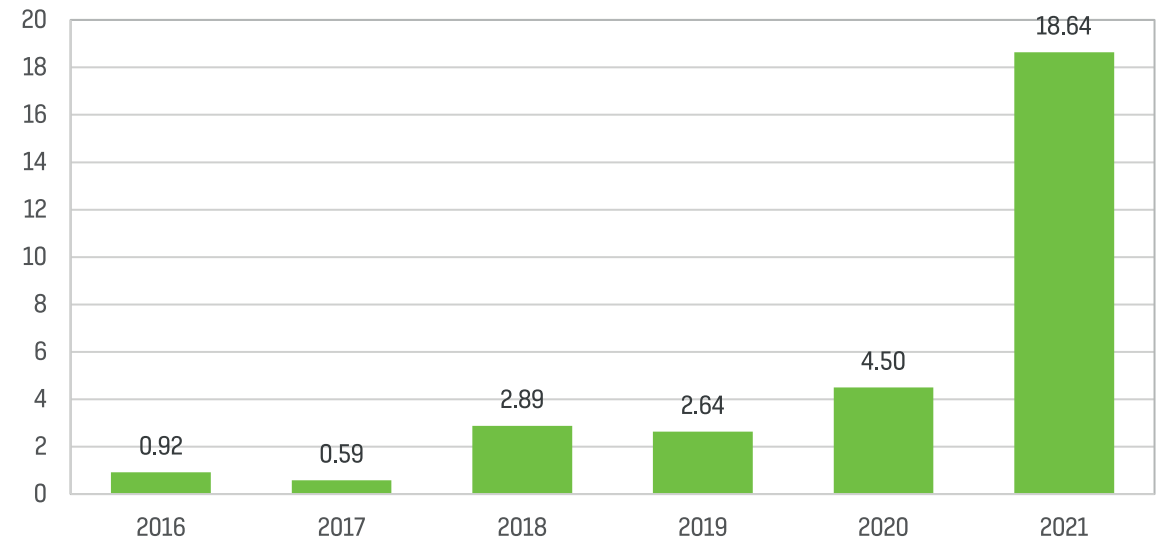
3. Sustainable financing: 2021 a remarkable growth year for MENA

The total market value of ESG-driven investments is expected to reach USD 53 Tn by 2026, and ESG-aligned projects will represent a third of the assets under management, as per Bloomberg. The global volume of ESG-related issuances more than doubled in 2021 from 2020 (USD 1.6 Tn in 2021 vs USD 765 Bn in 2020 as per Bloomberg).

H1 2021 saw ESG funds' monthly turnover tripling on a YoY basis to around USD 3 Bn according to German stock exchange operator 'Deutsche Boerse', with assets under management almost quadrupling in size to approximately USD161.6 Bn compared to just USD43 Bn one year ago. Central banks are increasingly incorporating ESG considerations across their mainstream activities —from bank supervision to monetary policy and financial stability.

MENA green and sustainability-linked bonds issued in 2021 more than tripled from 2016-2020 to USD 18.64 Bn. This includes APICORP's USD 750 Mn ICMA-aligned Green Bond (Sep 2021) —following the development of APICORP ESG policy. All projects funded by APICORP's green bonds will be aligned with the UN SDGs, focusing on renewables, green buildings, pollution prevention and control, and low-carbon technologies and solutions.

MENA Green & Sustainable Finance in USD Bn Equivalent



Source: APICORP, Bloomberg, CEBC.

Green and Sustainable Sukuk issuances also continued their growth in 2021 with a 17.2% YoY increase (as per Fitch). The trend is poised to continue in 2022: MENA's most notable issuance for 2021 was IsDB's USD 2.5 Bn Sustainability Sukuk in March, which is also its biggest USD public issuance to date.

MENA Equity markets in 2021 witnessed the return to healthy deal flow volumes in both conventional and renewable energy given the unique MENA region's dual approach to energy transition. We expect the strong regional privatisation drive to continue in 2022, with increased PPPs and IPOs to unlock value from world-class hydrocarbon assets, while targeting synergies through Public-Private-Partnerships.

Multilateral banks are naturally poised to play a leading role in issuing financial products with ESG elements due to their foundational mandates. Development banks have since been major issuers of sustainable financial products, and even within developed economies public financiers have generally taken the first steps in issuing green and sustainability-aligned or cleantech-supporting debt. MENA's MDBs are no exception with APICORP's benchmark issuance, the 1st green bond in the MENA region issued by an energy-focused investment institution, was nearly three times oversubscribed, garnering USD 2.2 billion in orders from more than 80 institutional and sovereign investors.

A key indicator of the significance of ESG-aligned investments is the quick rise in carbon price from 2020 to date —from USD20-USD30 per ton CO_2 to currently above USD50 per ton of CO_2. This is a natural trend as more countries and jurisdictions announce net-zero targets (EU, Japan, South Korea, UK, and China —with its national ETS commencing trade in July 2021 to cover more than 2000 companies and more than 4 Bn TPA of CO_2).

2021 witnessed the start of MENA's first voluntary carbon trading scheme by Saudi Stock Exchange (Tadawul), paving way for the development of a formal carbon market for trading offsets and credits. Under the recent net-zero pledges of the UAE, KSA, and Bahrain, carbon markets are expected to flourish in the region as hydrocarbon, petchem and heavy industry producers will need carbon trading platforms to offset part of their 'unabatable' emissions.

IV. MENA sectoral deep dives

1. Oil, Gas & Petrochemicals:

i. Investment in upstream oil and gas is needed.

As oil demand rebounds post-pandemic, investment in new oil supply needs to keep pace, else there would be a future period of pronounced market tightness. This will lead to widespread market volatility and uncertainty, which is not in the interest of both producers and consumers. Withholding investments in the medium to long-terms could lead to a disorderly, volatile and one-sided energy transition as the world continues to need oil.

O&G capital expenditure in 2020 and 2021 were lowest in the decade. 'WoodMac' projects that upstream spending will rise again, by a modest 10% in 2022 while 'Rystad' believes a recovery will take longer, seeing very flat spending in 2021-2022, and a more sizeable rise of 11% only in 2023. With the exception of OPEC countries —which are on the course of expanding production capacity, the world's O&G investments are not back yet to 2019 figures. The IEA already notes that production from existing fields will decline by 8% p.a. absent any new investment, a supply decline that significantly outpaces any likely demand scenario.

TOTAL UPSTREAM CAPEX (USD Bn)	2019	2020	2021	2022
Global	504	352	409	494
MENA	78	72	86	90
MENA percentage of Global	**15%**	**20%**	**21%**	**18%**

Source: APICORP, compiled from multiple sources

With decarbonization efforts growing across the globe to counter climate change, O&G companies are facing tighter financing conditions and ever-evolving regulatory frameworks while trying to keep contributing to socioeconomic development and providing affordable energy to stem economic activity. A rapidly-evolving financial environment focused on sustainability, led by the growth of (ESG) investing, is reshaping future capital investment into oil and gas projects.

The International Energy Forum (IEF) recently stated that two straight years of massive capex cuts are leading to a supply shortage that could destabilize the global economy. IEF's secretary general stated that "the world can't let the climate crisis turn into an energy crisis". Even the IEA relatively agrees that the practical realities for hydrocarbons are hitting hard as Executive Director Mr. Fatih Birol warned, "we are not investing enough to meet for future energy needs, and the uncertainties are setting the stage for a volatile period ahead".

The MENA region shoulders the largest portion of global investments in O&G going forward to avoid an impending future super-cycle (Brent has marked its new floor at above USD 90-100/bbl. and is expected to stay above that mark for 2023-2024). Both KSA and UAE warned of a mismatch between the ongoing energy needs and the IOCs' reluctance to spend on replenishing their hydrocarbon reserves base due to anti-fossil fuel pressures —which will compromise energy security and economic activity should triple-digit oil prices become a norm. The declines experienced in OPEC members Nigeria and Angola —both countries falling short of their OPEC quotas in 2022.

Both Saudi and Emirati energy ministers stated that a sharp pick up in FIDs is needed to avoid future shortages in global O&G supply. KSA announced its oil capacity expansion target of 13 Mbopd by 2027 by fast-tracking development of new discoveries. The UAE is on track towards its 5 Mbopd target for 2030 and is now capable of sustaining a production of circa 3.5 Mbopd. Kuwait is also boosting its capacity by 0.5 Mbopd during 2022-2023 while Oman and Qatar are investing into maintaining plateau production circa 750 Kbopd.

Algeria and Egypt are seeking to award new gas exploration blocks to extend production plateaus by incentivizing IOCs to invest, especially in light of recent MOUs signed with several European countries to decrease reliance on Russian gas imports. Iraq is pushing IOCs for developing upside production from key oil and gas fields, in addition to negotiating construction of new refineries to meet domestic demand. On the other hand, Iran is racing time to develop its gas fields –particularly South Pars– to meet soaring local demand and tap into the lucrative export markets incase sanctions are partially lifted.

ii. Geopolitics shake up O&G market fundamentals.

The global economic recovery during 2021 reflected positively on the energy industries (global energy demand increase recovered to more than 4.6% in 2021, higher than 2019 levels). Unfortunately, the recovery was severely interrupted with the onset of 2022 and the Russia-Ukraine conflict. Sanctions imposed on Russia as well as the halt in Ukrainian exports resulted in heavy shortages of feedstocks and increased supply chain disruptions while exacerbating shipping & logistics costs as risk premiums surged.

A near-term full substitution of Russian oil is practically impossible due to the fact that Russia supplies more than 10 Mbopd (circa 40% of OPEC+ production). Less than a handful of global exporters currently possess the surplus capacity to instantly ramp up to 3 Mbopd of crude production: KSA, UAE and Kuwait, which are committed to OPEC+ policy of only 432 Kbopd increment as of May 2022. Therefore, even if full global spare capacity is utilised, only about a third of Q1 2022 Russian output level can be subsituted.

The US and Canada are already producing at peak capacities and further shale production additions are not expected to kick in before 2023. The US's decision on April 1st, 2022, to release 180 MBO from SPR (1 Mbopd for 6 months), following OPEC+ decision for a small increase in May (432,000 b/d vs 400,000 b/d), will not balance the market before Q4 2022.

Russia has not –yet– cut oil & gas supplies to Europe yet the effect is already being felt. The US and UK are less dependent on Russian crude exports and have already banned Russian imports. Conversely, EU countries are vulnerable to Russian energy imports and will take a hit on GDP growth in 2022, even with partial reduction in inflows at current levels.

Germany stands most exposed with a quarter of its oil supplies originating in Russia and is estimated to lose circa EUR 180 Bn if it stops Russian energy imports, Austria-Czech-Slovakia-Hungary are also among most dependent on Russian energy exports. Thus, imposing a full embargo on Russian O&G from the EU will severely impact socioeconomic and even political stability in Europe as it may put unbearable pressures on the European consumers.

Despite nations engaging in self-sanctioning of Russian energy products, March's imports of refined products (e.g. diesel or gasoline) into OECD Europe are at highest level in 6 years. Russian LNG imports into the bloc hit a new 10-day rolling average high with record prices.

An Iranian full re-entry to the global oil markets will only give a short-lived kick-in of stored oil in floating tankers –around 20 MBO– and boosting Iranian production will take time due to effects of years of sanctions.

The shutdown of a major portion of Libyan production in April 2022 further stresses global supply. On the other hand, COVID-19 lockdowns in China pose a slight risk to demand in case the situation worsens, prompting a downward revision of 2022 demand forecasts.

2022 Forecasts	Dec 2021 Forecasts			April 2022 Forecasts		
	IEA	OPEC	EIA	IEA	OPEC	EIA
Global Demand Inc.	3.3	4.15	3.63	1.9	3.7	2.4
Global Demand Tot	99.6	100.76	100.95	99.4	100.5	99.8

Source: APICORP. Data compiled from published reports.

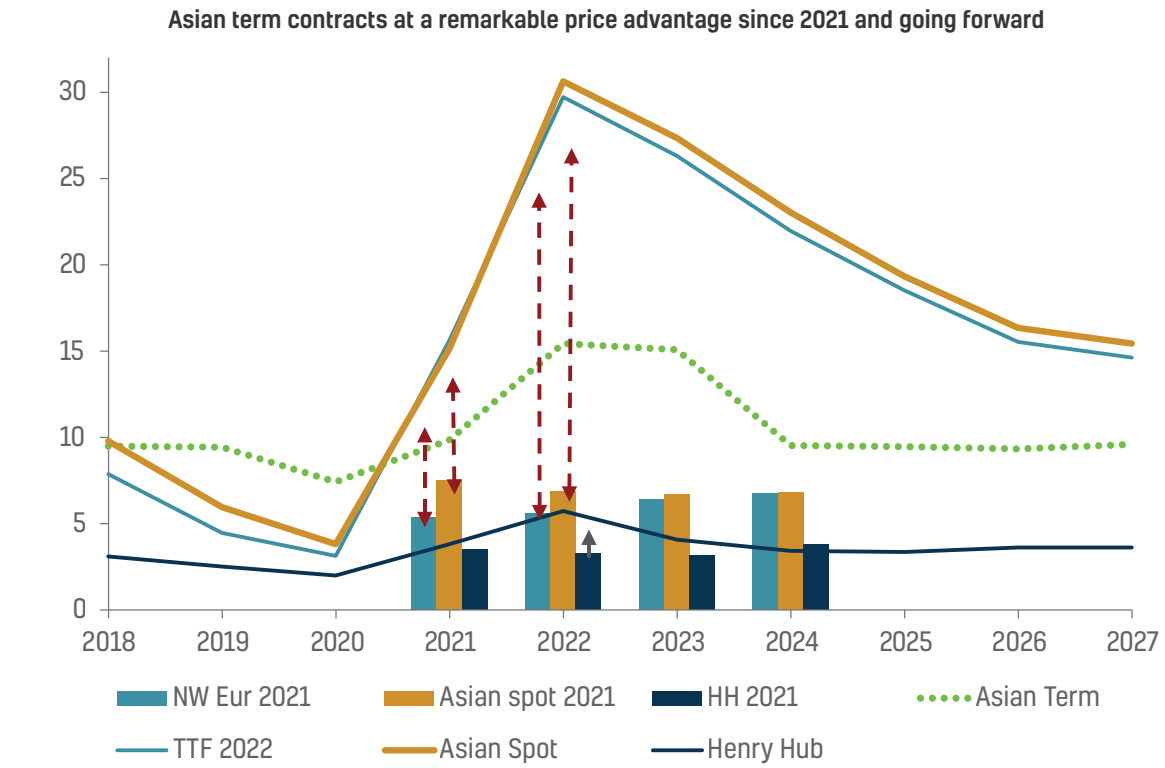
The global oil market may not be reflecting the real price risk of enduring impacts, leading to further price spikes. Brent price forecasts under a full curtailment of Russian oil range from USD 135/bbl. to + USD 150/bbl. Conversely, reference scenarios like the EIA's and OIES' (March 2022) have Brent averaging USD 116/bbl. in Q2 before cooling down to a USD 102/bbl. in H2 2022. Again, all forecasts do not account for the event of a wider Russia-NATO war, or a prolonged downtime of critical O&G facilities.

Global gas markets will continue to be squeezed until 2026 with global spot gas hub prices at elevated levels. Algeria, Norway and Azerbaijan can technically offset only 10-15% of Russian pipeline exports to Europe. Global LNG exporters –with the exception of US which is already hiking LNG exports to Europe to record levels– are committed to long-term supply contracts that even if waived, would not fill the gap from Russian pipeline gas imports into Europe.

EU's hesitance in classifying gas –whether it is transition fuel or part of its future low-carbon energy mix– resulted in reluctance of European energy companies to renew expiring long-term gas/LNG agreements (e.g. expired Algerian LNG contracts of 2020/2021) or enter new ones (East Med), and thus putting it into a vulnerable position towards existing Russian supply. Conversely, Asian companies with long-term LNG agreements with Qatar and Australia are now at an advantage as they are protected from the ongoing unreasonable surge in prices (see chart). And while the US, EU and UK are trying to induce both exporters (e.g. Qatar) and importers (e.g. Japan) to temporarily waive the destination clauses to reroute some LNG to Europe to ease the current crisis, any offset volumes would be marginal at best, and may only transpire into few cargoes released by their Asian owners. The ongoing crisis gives high leverage to gas and LNG exporters to lock-in long-term gas offtake agreements but less so on destination clauses that restrict the usage of gas in a certain country, since the EU as a jurisdiction would like to keep the flexibility of moving its energy sources to where it is most needed within the union (gas and electricity), which is a predicament to exporters as traders can make profits from resale of the gas. Another issue is the oil indexation of LNG prices in long-term agreements, which is a standard practice that major EU countries like Germany want to abolish.

As previously stated in APICORP's *2020 Gas & Petrochemicals Outlook*, LNG is advancing towards more commoditization, where long-term agreements will have shorter durations yet keeping indexation to oil. However, new contractual and commercial mechanisms to solve the issue of destination clauses will need to be devised to protect the interest of suppliers in case contractual off takers are to resell the gas, and we may see such agreements developed with Egypt since almost all of its existing 12MTPA LNG capacity is uncommitted (sold on spot basis), or UAE's future Fujairah LNG terminal (Qatar favors long-term offtake agreements due to the high costs and size of its NFE & NFS projects, which include state-of-art CCUS facilities).

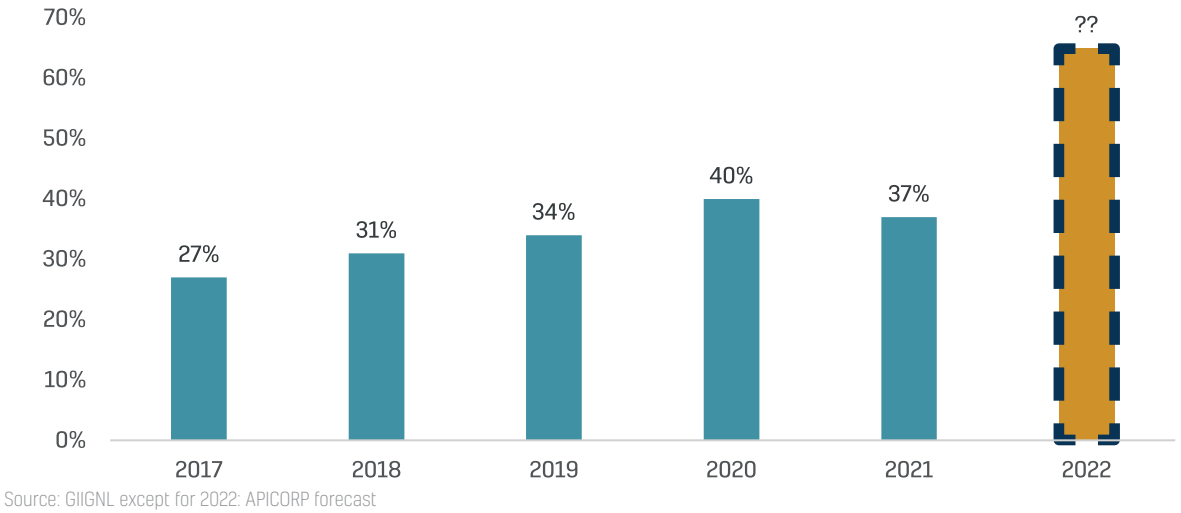
LNG Price Overshoot at Key Hubs [$/mBTU]: Q2 2022 vs Q2 2021 Forecasts



Source: APICORP, compiled from multiple sources

After slowly but steadily growing, we expect spot and short-term LNG trade to comprise about two-thirds of the total imported volumes for 2022 and 2023. While having a more 'liquid' global LNG market is a positive step towards higher commoditization of gas, the unreasonably high prices seen since last year are going to incentivize importers to engage in term-contracts in a suppliers market, favoring countries with uncommitted capacity like the US and regionally Egypt, Algeria and the UAE to lock in favorable terms for the medium-term. Nevertheless, contract durations will be shorter.

Spot & Short-Term LNG to Total Imports % (Annual)



Source: GIIGNL except for 2022: APICORP forecast

For petrochemicals, producers may enjoy a windfall from elevated prices for the short term (H1 2022), but margins may be further hit due to spike in energy and feedstock prices. For the petrochemical products with high-elasticity, producers will be unable to pass on higher costs due to faltering demand and a slowing global economy marred by the worst inflation spike in decades. They may have to cut output as their margins continue to be squeezed by soaring feedstock costs with some struggling to stem losses.

Conversely, both MENA and the US will be benefiting from current market environment thanks to their strategic advantage in terms of access to low-cost feedstocks. However, upstream volatilities, tightening refining & petchem margins, and the possibility of enforcement of domestic market obligations clauses/export limits in exporting countries, all remain key risks. Ballooning logistics costs and limited vessel availability have already been restricting global trade since Q3 2020 and are further feeding into the spiraling global inflation.

It is worth noting that globally marketed refined products and petchem coming from processed Russian O&G feedstocks (e.g. diesel, fertilizers, methanol) are not recognizable as Russian, since there is no global mechanism to identify source of refined products feedstock. As a result, some refineries can make huge refining margins from buying the highly discounted Russian crude while selling petroleum products at global market prices.

iii. The energy transition journey is at a crossroad.

The energy transition will require radical capital reallocation putting investors and capital allocation at the center of the challenge. Under the IEA net-zero 2050 scenario, annual average energy capital investments would rise from around USD 2 Tn at present, or 2.5% of global GDP, to 4.5% of GDP in 2030. The positive thing is that the green/renewable energy industry is getting gradually de-risked as more and more participants are getting involved in the trend (aggregate effect). In addition, various countries are moving towards localizing the production of some components like solar panels, smart meters, electronic components and even EVs —thus decreasing reliance on the handful of current exporters, led by China.

2021 witnessed a wide-scale decarbonization action by major IOCs to counter climate change. Now, O&G companies are struggling to overcome tighter financing conditions and ever-evolving regulatory frameworks. Despite the fact that investor action is a powerful lever to push for more decarbonization, it sometimes leads to opposite effect. The chronic shortage in supplies of natural gas has induced consumers to increase crude oil –and even coal– usage to alarming levels in 2022, contrary to the required action to phase-down coal as COP26 recommended. Moreover, the scramble by medium-large IOCs to dispose O&G assets to rapidly decrease their carbon footprint due to mounting public pressures, moved these assets off the radar to less-prudent less-accountable small and private/non-listed IOCs. The problem has now been compounded with the net-zero pledges that are highly ambitious and still lack the comprehensive mechanisms, tools and KPIs to measure progress.

PwC's State of Climate Tech 2021 report shows that there is a mismatch between where investment is needed to reduce emissions and where investment is actually funneled. As mentioned, public company assets disposed of due to climate action are purchased by private investors and small IOCs. This underlines the need to consider holistic solutions like carbon pricing that affects all stakeholders regardless of ownership. Building a broader conception of value that includes environmental, societal and governance benefits (ESG) while simultaneously fostering the understanding of net-zero alignment as an opportunity for value creation, which will help realize the long-term net-zero targets.

Most emission pledges are focused on scope 1 and scope 2 emissions while in reality scope 3 emissions account for 80% of the overall carbon footprint. This has placed additional scrutiny on global supply chains, and calls for a boost in standardization, certification and specialised energy services companies (ESCOs). One notable development is the 'GIIGNL' standard for carbon-neutral LNG, released in 2021, that covers Monitoring, Reporting and Verification (MRV) of greenhouse gas (GHG) over the LNG cargo lifecycle.

A hurried transition away from hydrocarbons will be rough, difficult and hard on the majority of consumers with consequences that are hard to predict, as the current global energy crisis proves. While the need for short-cycle investments in new energy sources is required, this is challenging for natural gas, since onshore gas discoveries are mostly reaching the end of their creaming curves and new plays are mostly offshore/arctic.

The transition has to be just, since ESG (environmental, social, and governance criteria) is not just 'E,' there's also an 'S' part, which is the social impact that humans incur. Leaders must take into consideration the differing abilities of nations to transition to a net-zero economy. Clean-tech alternatives can be delivered at a pace, cost and scale that enables countries at all stages of development to transition to net-zero in a just way.

All the above underscores that the O&G industry at large must also be part of the broader net-zero conversation, as they can be key players with their international experience, technologies and business models needed to decarbonize the industry.

iv. COP27: Inclusion and sustainability are key themes, standardization remains paramount.

The COP26 summit held in Glasgow showed a global consensus that our future shall be low-carbon. But although the 'what' is now well defined, the 'how' remains debatable. Every country will chart its path as a function of energy security, level and priorities of socioeconomic development, financial capabilities, and inherent energy mix. We therefore expect the focus to shift to assuring a sustainable energy transition for all nations ('SE4ALL') –with the UN SDGs in mind– and on how the required financing will be mobilized (the main task for the UN Glasgow Financial Alliance for Net Zero —'GFANZ'). We also expect the 'Emissions Trading Schemes' (ETS) and voluntary carbon trading to substantially increase in volume from 2022 and beyond, thanks to the activation of Article 6 of the Paris Agreement.

COP26 produced substantial progress on cutting GHG emissions, but the national carbon targets laid out fell far short of the near halving of emissions required to stay within 1.5°C of pre-industrial levels. Recognizing that, nations agreed to review their targets for COP27, but we expect this to efforts to wane due to the escalating energy crisis that started with the Russia-Ukraine conflict.

The COP27 summit, to be held in Egypt, will underscore the sustainability aspect of the energy transition from the developing nations' perspectives which have been calling for a more 'inclusive' energy transition. Although climate financing and adaptation may keep pace with COP26, governments will not be under pressure to act on their pledges due to the ongoing energy crisis and battered global economy. This may change next year in COP28 in the UAE if the energy and economic crises ease.

During COP26, the UAE, KSA and Bahrain took the world by surprise announcing ambitious net-zero targets, 2050 for UAE and 2060 for KSA and Bahrain. These net-zero targets come after huge strides taken by MENA countries to advance renewable energy developments. Strides have also been taken on replacing crude oil with natural gas for power generation, energy efficiency, grid modernization and waste processing and management.

COP27 will feature the participation of energy players from all segments, and not only renewables and clean energy. O&G companies need to put more effort into communications and stakeholders' engagement and fully make this as important as focusing on their operational and investment practices. This will help bring energy providers and the public to better understand the energy transition issues. This will also alleviate pressures on governments to take radical actions that can compromise energy security and affordability (as has been the case in the EU since 2019), thus ensuring coordinated planning and actions.

On a regional cooperation level, the GCC is spearheading the advancement in decarbonizing conventional energy sources, ensuring global energy security from conventional sources, while at the same time investing in clean energy development.

KSA sponsors the 'MiddleEast Green Initiative' which it initiated during in 2021 after hosting the G20 clean energy ministerial summit earlier, pledging USD 10.4 Bn in green energy investments across the region. Moreover, KSA, UAE, Iraq, Kuwait and Jordan are signatories of the 'Global Methane Pledge' to reduce emissions of the damaging greenhouse gas 30% by 2030.

The 'Oil & Gas Climate Initiative (OGCI)' –of which Aramco is a member– is piloting the mass development of CCUS and hydrogen hubs across major O&G and heavy industry clusters globally. In North Africa, Algeria is a pioneer in CCS (Salah gas field), while Egypt's ministry of petroleum announced in 2022 that it is studying installing CCUS facilities in Egyptian O&G fields where viable, in partnership with international partners.

COP27 host country, Egypt, had issued the first MENA sovereign green bond in 2020 for USD 750 Mn (after developing its national green financing framework) and targets renewable energy contribution to 43% of its energy mix by 2035, while pledging to increase green projects from 15% to 30% in its investments plan by 2025. Thirty key Egyptian projects that have been implemented to address the effects of climate change, in addition to an ongoing 300 MW waste-to-energy plant and Egypt's flagship green hydrogen plant in Sokhna, will be presented during the COP27 event in November.

COP28 host, the UAE, has earmarked more than USD 163 Bn for a wide-reaching decarbonization plan that includes all its O&G operations, including upgrading its Al-Reyadah facility (the region's first commercial-scale CCUS facility) from current capacity of 800,000 tons of CO_2 p.a. to a staggering 5 million tons of CO_2 p.a. by 2030 —the equivalent of the annual carbon capture capacity of around 5 million acres of forest. The Emirates is also banning single-use plastics before 2023 and expanding industrial and municipal waste processing.

v. Global and MENA Petrochemicals trends:

Increasing efficiency, refining complexity & flexibility, import substitution and circular products:
The drive for further integration and rationalization will continue in petrochemicals. Reconfigurable petrochemical plants shifted to high-margin/high-priority products during the pandemic (e.g. plastic packaging films, healthcare and hygiene products) and this showed that increasing complexity and flexibility of plants meant stronger resilience to abrupt market shifts/shocks and higher profit upside and improved risk mitigation. With the region having an absolute competitive advantage in petchem production even under the most radical energy transition scenarios –due to the abundance of long-term feedstock surpluses of both crude oil and natural gas and low carbon footprints– we may see a wave of influx of global chemicals producers to MENA. The global industry will reposition itself since that this decade may be the 'last window' for low-cost producers to re-establish their global market share.

In 2021, the global –and GCC– chemicals industry started to prioritize capital and operating efficiency over absolute growth, with few exceptions like 'Amiral' in KSA and Egypt Suez and Western Desert Clusters. For North Africa and Iraq, projects are focusing on import substitution to decrease reliance on imports, especially for feedstocks for domestic industries and job creation.

The MENA region's strong appetite for directing more funds to petrochemicals, especially for planned projects stems from: 1) GCC producers' desire to capitalize on the strategic advantage, which is the proximity to abundant low-cost feedstocks, 2) For Egypt, Algeria and Iraq, the focus is import substitution and value chain integration and monetization —producing materials that feed into other sectors like industry and agriculture (fertilizers) and even energy transition (EVs, solar panel components, etc. —following the successful path of KSA and UAE).

The most remarkable addition to the MENA petchem sector is Hydrogen (green, blue, pink or turquoise) and its commonly used carrier, Ammonia. At the time of compiling this outlook, the MENA region has registered more than USD 26 Bn in hydrogen projects, mostly in planned phase, and which will be elaboratively covered in the following section titled *Power, Renewables & Hydrogen in MENA*. It is also worth noting that Algeria is currently studying exporting hydrogen to Europe via its network of subsea pipelines. Algiers can be a strong future green hydrogen supplier to Europe due to its immense renewables potential and proximity to Europe.

A significant regulatory development in March 2022, is the passing of UN treaty to tackle the full lifecycle of plastics from production to disposal, hence enhancing the global adoption of circular products and lowering the costs of recycling and waste processing. The treaty has been described as the most significant environmental multilateral deal since the Paris accord by the executive director of the UN Environment Programme. Full ratification of the treaty will take place in 2024. In MENA, KSA and the UAE are the regional leaders (and pioneers) in producing circular products (like packaging and insulation materials, and industrial plastics & resins) through SABIC and Borouge. Both companies plan to continue advancement of circular economy products and practices as their countries progress with their industrialization and economic diversification paths. Saudi Arabia plans to also boost technological development in new materials catering to energy transition, opening a vast array for chemical-industrial applications, like carbon fiber, EV and solar energy components. The mammoth Saudi mining program that the kingdom is embarking on will also boost domestic and regional chemicals industry due to the many synergies and linkages between the two sectors.

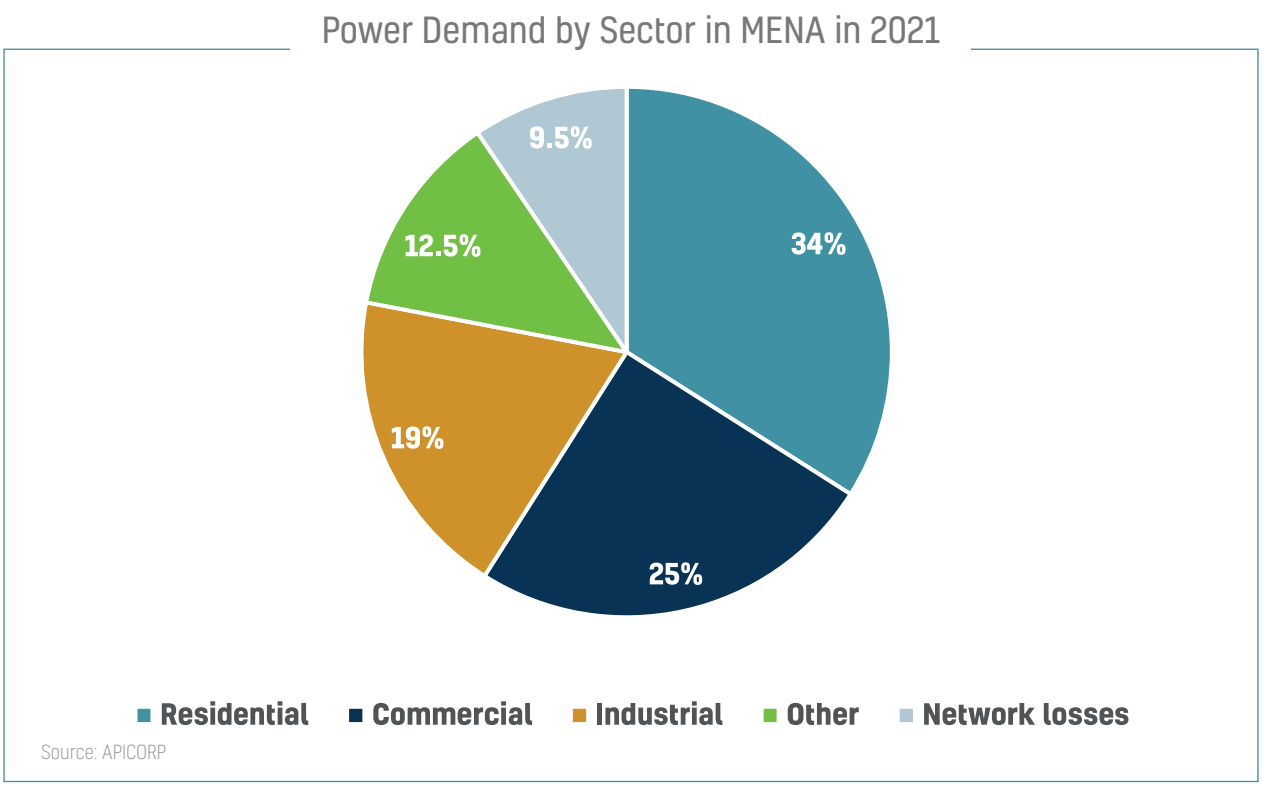
2. Power, Renewables & Hydrogen in MENA

i. Power demand to undergo a steady growth

According to the IEA, global electricity demand dropped by around 2% in 2020 as compared to 2019 due to the COVID-19 pandemic. Following this decline, global electricity demand is estimated to have grown by around 6% in 2021 due to the economic rebound and easing of societal measures that were set to curb the spread of the pandemic.

As for the MENA region, electricity demand increased by over 3% in 2021 after a 3.7% contraction in 2020. Power demand is projected to rise by around 3.6% in 2022 in line with the strengthening economic momentum where it is expected to sustain its growth trajectory at an average rate of around 2% for the upcoming years. This is driven by a steady population growth, rising power demand for air conditioning and seawater desalination, and the expansion of energy-intensive industries, especially in the GCC region.

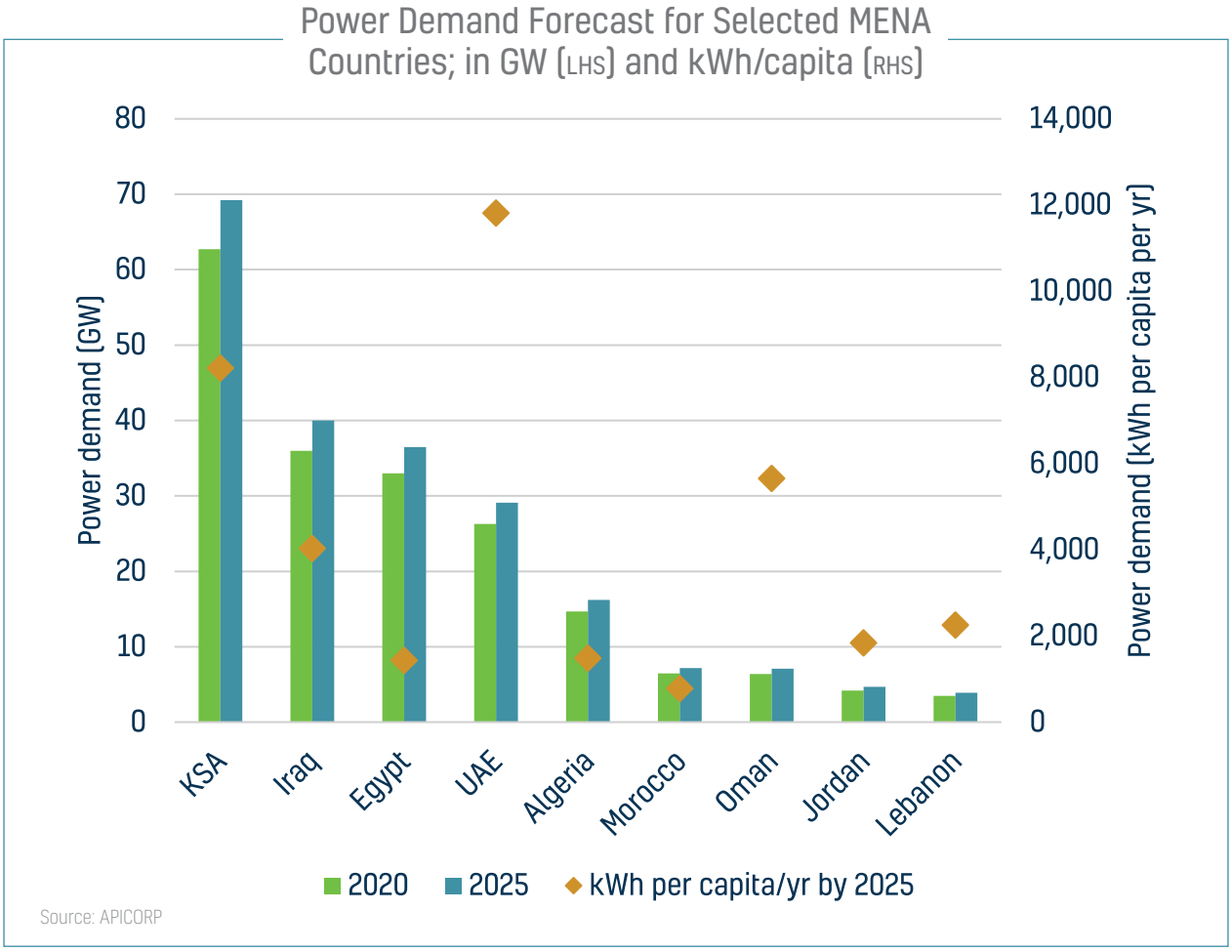
As of 2021, the residential sector represented around 34% of MENA's total power demand, followed by the commercial sector at 25% and the industrial sector at 19%, with the remaining 22% including agriculture, transport, and network losses. The residential, commercial and industrial sectors continue to be the main engines of power demand growth in MENA, accounting for around 78% of total power consumption.



The varying levels of power demand growth among MENA countries are attributed to the disparities in respective power market structures and power consumption patterns. At prima facie, the COVID-19 pandemic may have caused a slew of underlying changes to the power load profiles, a shift that will reverberate for years to come depending on market dynamics and consumer behaviors –particularly in the residential and commercial sectors– as well as the response of system operators.

All energy-intensive sectors in MENA will take time to evolve depending on their energy efficiency levels, use of captive generation, and fuel switching possibilities. Several headwinds facing the rebound in power demand in MENA include the possibility of resurgence of new waves of the pandemic during 2022, how long the volatility in commodity pricing will persist, and the disruptions in global supply chains affecting explicitly the commercial and the industrial power demand.

Compared to other regions, the MENA power sector has come out relatively unscathed from the 2020 pandemic compared to other energy sectors and is expected to play a vital role in driving and accelerating the economic recovery process. Among other variables, the power market structure and regulatory reforms were affected differently within countries. Policy efficiency, decentralization, digitalization and decarbonization weigh in as the most prominent parameters in shaping the future of power demand growth in MENA.



Source: APICORP

ii. Natural gas and renewables will drive the shift in the power supply mix

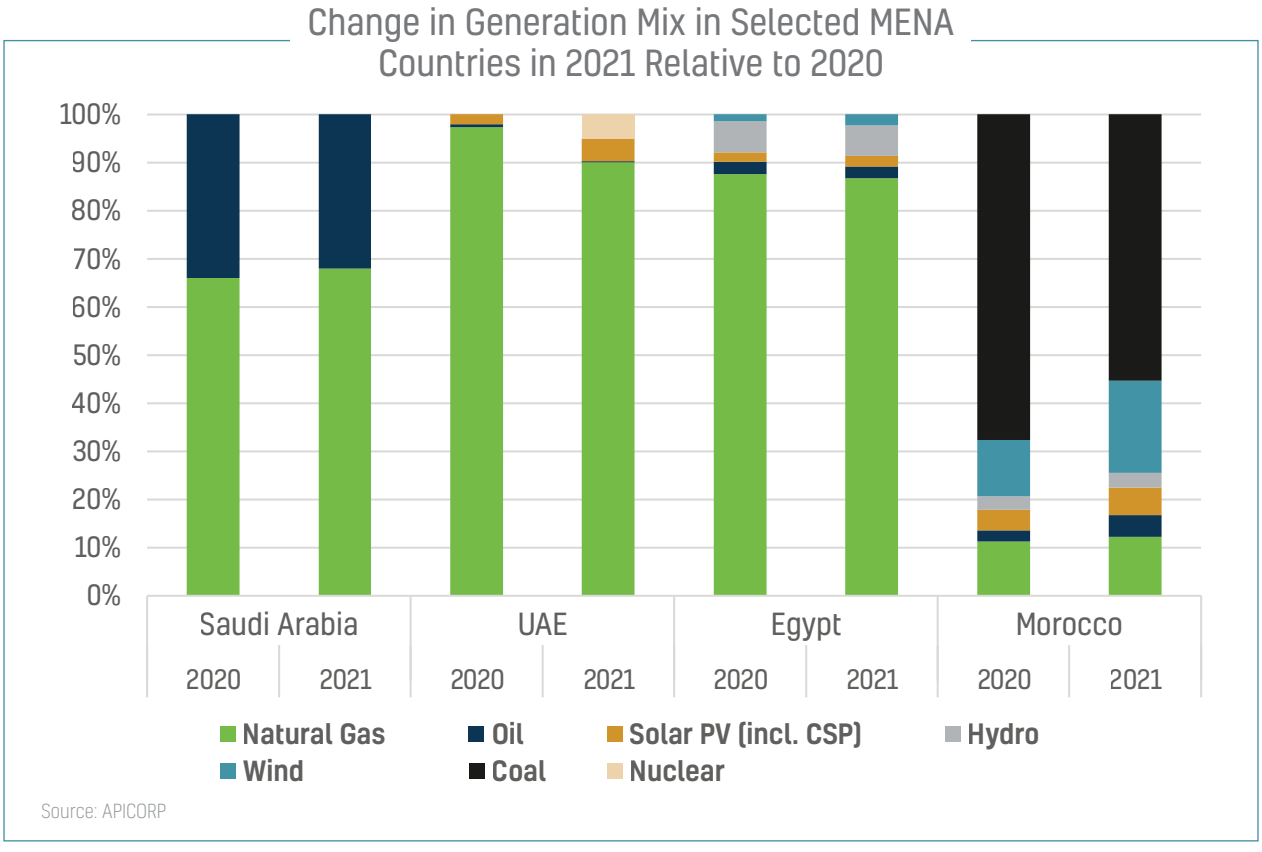
Several MENA countries are integrating renewables in their generation mix as part of a shared policy objective to diversify the power mix with low-cost, low-carbon energy vectors and accentuate the security of power supply. For the hydrocarbon net-importing countries with robust renewables potential, the aim is to reduce dependence on fossil fuel imports and integrate low-cost renewables into domestic grids. As for the hydrocarbon net-exporters, the priority is to free up export volumes of fossil fuels –and maximize revenues at healthy price environments– for socioeconomic development and to support the decarbonization initiatives of their net-zero targets.

Although few MENA countries have already pledged their net-zero targets by 2050 (UAE) and 2060 (KSA, Bahrain), electrification via renewable energy sources will be a key driver to reach those targets. However, due to the intermittency of renewable energy sources and the lack of utility-scale grid storage solutions to date, fossil fuels and nuclear will remain indispensable in the power supply mix in the foreseeable future.

To partly overcome this quandary, existing conventional generators need to become more flexible, capitalizing on their improved ability to provide a faster ramping capacity. This will place them in a better position to react to the increasing volatility of peak load with the increased penetration of renewables. In the longer term, flexibility may also come from leveraging digital tools for enhanced demand management and optimized grid interconnectivity for better supply/demand matching. As for transmission & distribution value chains, components need to be more flexible for better frequency and voltage regulation, and the traditional pattern of predicting the power load will become unmanageable with the increased integration of renewables.

As for the energy vectors constituting the power mix in MENA, natural gas –which is already a dominant fuel for power generation– is expected to grow to maintain a power generation share of around 70% to 75% across MENA by 2024. Another positive sustainability signal is given by the region where oil-fired power is set to drop from 24% of total generation to almost 20% by 2024.

In Saudi Arabia, gas-fired generation is projected to rise in the upcoming five years while oil-fired power output is expected to drop over the same period. The share of oil-fired generation in the electricity mix is projected to drop to less than 30% in 2022 from an estimated 32% in 2021. In the UAE, natural gas constitutes around 90% of the generation mix and is expected to drop to less than 60% in the upcoming five years as the country diversifies its supply mix with nuclear and renewables. As for Qatar, incremental generation will be mainly fueled by gas, supported by the completion of the 2.6 GW 'Facility E' project and the production ramp-up of Qatar's 'Barzan' gas field, which is fully dedicated to the domestic market. As for Egypt, the country currently relies heavily on oil and gas for its electricity generation, with a strong ramp-up of natural gas-fired capacity over recent years (providing up to 87% of total generation in 2021).



Source: APICORP

Power generation from coal will be nearing 1% of total power generation in MENA by 2024 as Morocco reduces its dependence on thermal coal. Around 55% of Morocco's generation mix came from coal in 2021 as compared to 68% in 2020, and 12% from natural gas as compared to 11% in 2020. The reduction in coal's share in MENA's generation mix is underscored by UAE's recent decision to convert the 2.4 GW 'Hassyan' power plant from coal to natural gas.

Nuclear generation more than doubled in MENA during 2021 led by UAE's 5.4 GW 'Barakah' nuclear power plant with two units coming online in April and September of 2021. Nuclear power generation in MENA remains relatively modest at 3% of the total generation mix in 2021, led by the UAE. Egypt's first planned nuclear power plant –the 4.8 GW 'El Dabaa' facility– is expected to start operations in 2026, while Saudi Arabia and Jordan are also planning to add nuclear to their power mix during this decade.

As for non-hydro renewables, generation reached up to 60 TWh —constituting almost 4% of total installed capacity in MENA in 2021. In Saudi Arabia, renewable generation is set to expand considerably and approach 18 TWh by 2026 thanks to a robust project pipeline under REPDO and PIF-led projects. In Qatar, renewables will generate more than 1 TWh by 2026, following the phased ramp-up of the 800 MW 'Al Kharsaah' solar project from late 2021 to mid-2022.

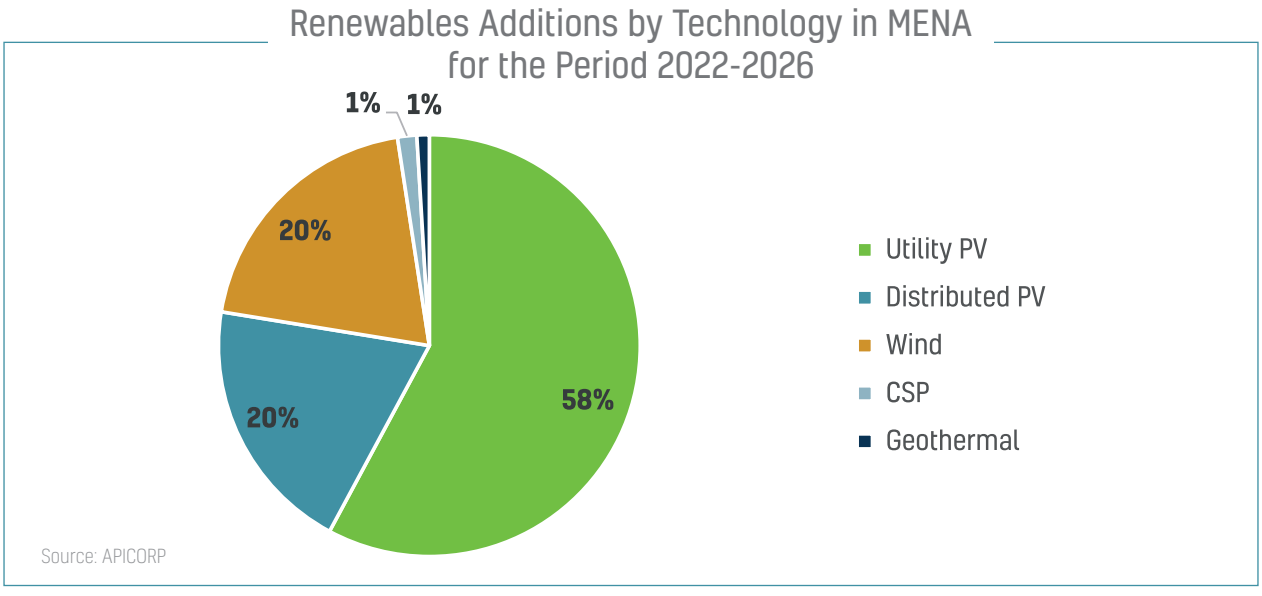
In Algeria, the country's energy transition strategy sets an objective of 16 GW of renewable capacity by 2035, with a medium-term target of 4 GW by 2024. At the end of 2021, the Algerian Ministry of Energy Transition and Renewable Energies selected 11 sites for the installation of 1 GW of solar capacity.

As for Morocco, the country has seen major growth in renewables over the past decade, and the share of renewable energy in the generation mix increased to around 28% in 2021. Morocco has already stated its ambitions to expand the share from renewables by installed capacity to 52% by 2025 with more than 10 GW of planned renewables projects by 2030.

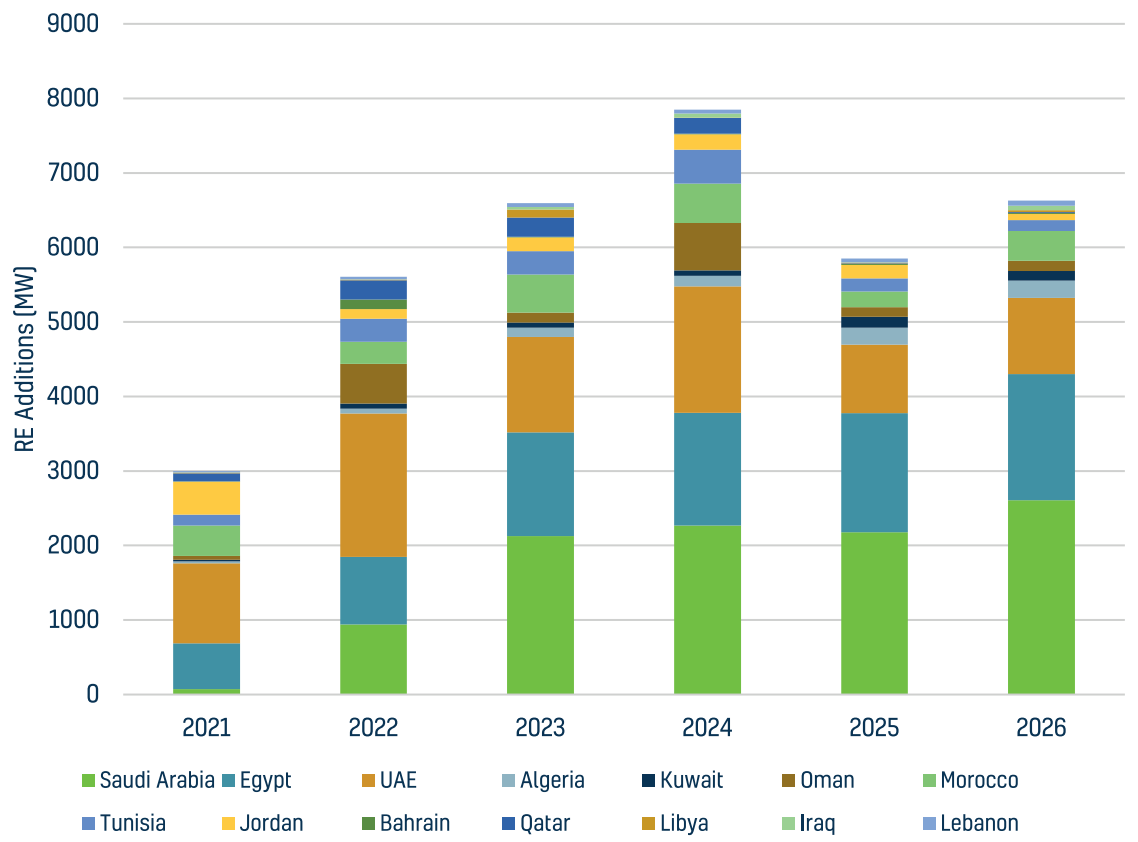
iii. Renewables additions are led by solar PV

Renewable energy systems have been gaining momentum across MENA driven by ambitious national targets and increasing investments towards low-cost and low-carbon technologies. The national renewable energy targets set for 2030 –ranging between 15% and 50% of electricity generation– portray the governments' will to double down efforts and increase the share of renewables in the energy mix. As of 2021, the total renewables additions reached 3 GW across MENA, with almost 5.6 GW to be added in 2022.

The increase in renewables is mainly driven by utility and distributed solar PV, onshore wind power, and other energy sources such as CSP, geothermal and hydropower. The MENA region is expected to add around 33 GW of renewables by 2026 (by installed capacity), with around 26 GW as utility and distributed solar PV.



Renewables Additions by Selected Countries in MENA (MW)



Source: APICORP

To diversify the power mix with low-cost and low-carbon energy sources while enhancing energy security, MENA countries have been focusing on the generation side of the value chain by setting ambitious renewable energy targets for the medium and long terms as shown below:

Renewable Energy Targets in Selected MENA Countries

Country	RE policy targets	Progress '21
Saudi Arabia	10% of generation by 2025, 50% by 2030	< 1% of generation
UAE	44% of generation mix by 2050 (federal)	≈ 5% of generation (federal)
Oman	10% of generation by 2025, 30% by 2030	< 1% of generation
Qatar	20% of generation by 2030	< 1% of generation
Kuwait	15% of generation by 2030	< 1% of generation
Jordan	31% of generation mix by 2030	≈ 20% of generation
Iraq	5% of generation by 2025, 20% by 2030	< 1% of generation
Lebanon	30% of generation mix by 2030	≈ 7% of installed capacity
Egypt	20% of generation by 2022, 42% by 2035	≈ 11% of generation
Morocco	52% of installed capacity by 2025, 70% by 2040	≈ 40% of installed capacity
Algeria	37% of installed capacity by 2030	< 1% of installed capacity

Source: APICORP

Morocco and Jordan are currently at the forefront of renewable energy deployment in MENA, achieving their short-term policy targets. Morocco has reached almost 40% of its installed capacity from renewable energy in 2021, meanwhile Jordan has achieved nearly 20% of generation capacity. Other countries such as Saudi Arabia, UAE, Egypt, and Oman have relatively low renewable energy generation, but the share is expected to witness a significant hike with large capacities planned and committed in the projects' pipeline.

Despite the high potential, the rate of propagation of renewables in MENA will very much depend on the level of state commitment, evolution of the regulatory frameworks, and financing availability from both the private and public sectors. In the near term, the execution of renewable projects will be impacted by the recent volatility in commodity pricing, continued supply chain disruptions, and higher equipment costs affecting solar PV and onshore wind capex. This will result in an uptick in capital costs of renewable electricity until 2023-2024 which will exert more pressure on committed projects (possibility of price renegotiations) and higher bid offers in upcoming bidding rounds.

Beyond the focus on increasing renewable energy on the generation side, meeting the national renewable energy targets requires a thorough integration of variable renewable energy (VRE) systems into the power grids. This necessitates reinforcing the power network, firming capacities and enhancing the grids' stability and flexibility. MENA countries face a technical risk whereby the increasing deployment of intermittent energy sources may jeopardize the power system stability and security of supply if integration challenges are not addressed via numerous grid flexibility measures led by energy storage systems (this topic was addressed in APICORP's whitepaper: *"Leveraging Energy Storage Systems in MENA"* , December 2021).

iv. Blue & green hydrogen are key energy transition pillars in MENA

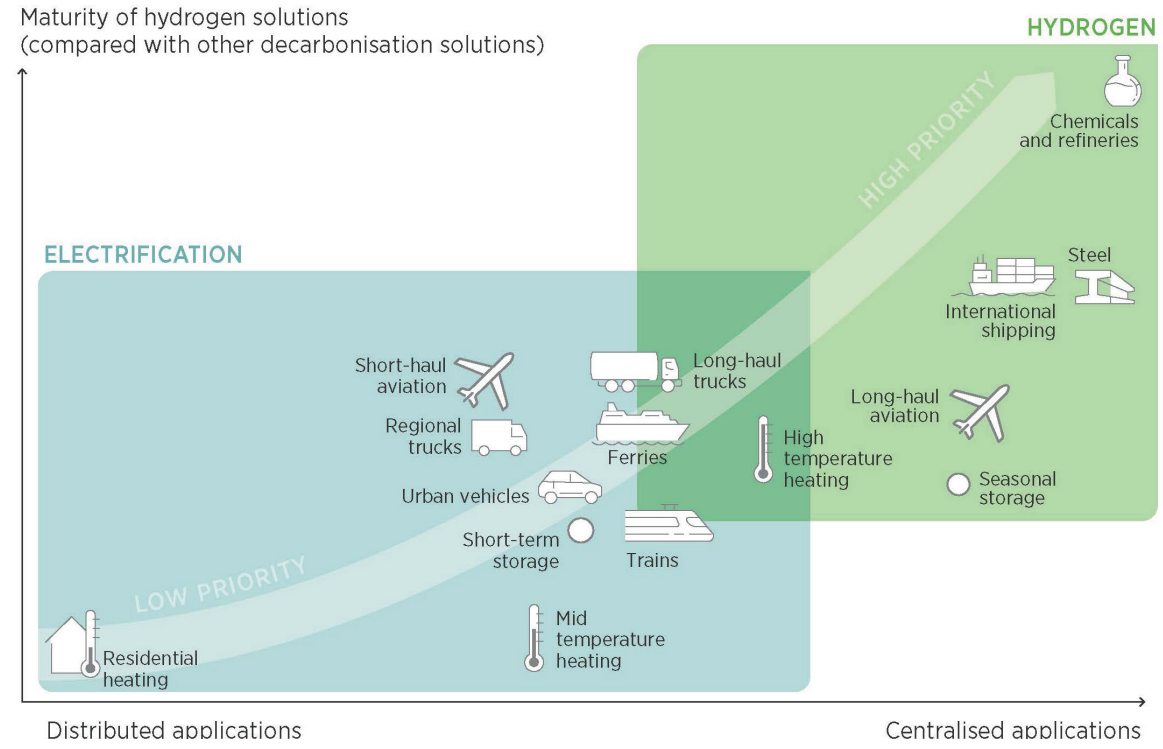
In light of the gradual energy transition towards a low-carbon future, hydrogen will play a central role due to its versatility as a clean energy vector. Hydrogen can be an energy carrier and/or an energy storage medium given its high energy content per mass (every 1 kg of hydrogen carries 33.4 kWh of energy relative to 12 kWh for petroleum and diesel). Hydrogen can also support the MENA countries' energy security by diversifying the energy mix and boosting the resilience of localized energy systems.

Although hydrogen is abundant in nature, it rarely exists as a single molecule buried deep in geological formations. It exists more commonly either bound to oxygen, in the form of water, or to carbon in the form of hydrocarbons. It is worth noting that while burning hydrogen does not emit any CO_2, hydrogen combustion emits primarily water vapor and small volumes of nitrous oxide —a major air pollutant. According to the IEA, hydrogen enables the avoidance of up to 60Gt of CO_2 emissions during 2021-2050 as per its 'Net Zero Emissions 2050' scenario, representing 6% of total cumulative emissions reduction.

According to IRENA's 1.5°C scenario, hydrogen could meet up to 12% of final energy consumption by 2050. Global hydrogen demand is expected to increase from the current 90 MTPA in 2020 to almost 300 MTPA in 2050, according to IRENA. By leveraging its strong potential, the MENA region is well-positioned to supply around 10% to 20% of the global hydrogen market by 2050.

In addition to its prospective role as a large-scale energy storage medium, hydrogen can be optimally utilized to decarbonize the hard-to-abate energy-intensive industries where electrification proves to be challenging. For the MENA region, the most adequate near-term applications are the petrochemicals & refining industries (which currently depend on grey hydrogen and can shift to cleaner hydrogen vectors), steel and aluminum smelters, ammonia and methanol. In the medium to long term, large-scale seasonal energy storage, long-haul transportation and maritime shipping are prospective applications. It is worth noting that due to hydrogen's low volumetric efficiency, conventional fuel may be more efficient in certain applications such as residential heating and short-haul transportation.

Prospective Applications for Low-Carbon Hydrogen



Source: IRENA (2022)

Blue and green hydrogen will dominate the hydrogen rainbow spectrum in MENA.
Almost 95 to 98% of the hydrogen extracted and consumed today is identified as grey and brown hydrogen. Grey hydrogen is extracted from fossil fuels (mostly natural gas) via steam methane reforming (SMR) or Auto-thermal reforming (ATR). Brown hydrogen is extracted from coal via gasification. Both grey and brown hydrogen are notorious for their high CO_2 emissions and GHG footprints.

As for cleaner hydrogen molecules, blue hydrogen is extracted in the very same manner as grey hydrogen molecules except that CO_2 is captured, stored and/or reused via carbon capture and storage technologies (CCUS) with very low fugitive GHG emissions.

As for green hydrogen, the molecule is extracted from water via low-temperature electrolysis —either with Alkaline (ALK) or PEM (proton-exchange membrane) electrolysers with renewable energy as the electricity feedstock powering the process.

Hydrogen can be extracted in several other means, but for the MENA region, blue and green hydrogen will dominate the nascent hydrogen markets in the near term as the region gradually switches from the polluting grey hydrogen to cleaner hydrogen molecules.

A Selected Color-Code Typology of Hydrogen Production

	Hydrogen Color	Process	Feedstock	GHG footprint
Production based on electricity	Green	Electrolysis	Solar, Wind, Hydropower, Geothermal	Very low
	Pink		Nuclear	Very low
	Yellow		Mixed-origin	Medium
Production based on fossil fuels	Blue	Natural gas reforming w/ CCUS Gasification w/CCUS	Natural gas, Coal	Low
	Turquoise	Pyrolysis	Natural gas	Very high (solid carbon)
	Grey	Natural gas reforming		High
	Brown	Gasification	Brown coal (lignite)	Very high
	Black		Black coal	

Source: APICORP

For blue hydrogen, MENA has a competitive advantage in terms of abundant oil and gas resource base with low costs of extraction and low carbon content. At average gas prices of USD 3-4/MMBTU, the levelized cost of blue hydrogen production (LCOH) is estimated to be around USD 1.5-2.5/kgH in the MENA region based on the SMR technology with CCUS. The capacity to use CO_2 as a feedstock in the petrochemical/refining industries or store it in depleted geological oil and gas formations is technically feasible. However, the technology risk resides in scaling up the CCUS facilities as it is still an evolving technology. Further technical improvements are anticipated to make blue hydrogen more cost-competitive in an organic market without direct policy interventions.

In the medium term, blue hydrogen proves to be a more attractive option to the MENA region. Blue hydrogen can be produced at a relatively low cost, and it will slightly disrupt the IOC/NOC's existing business models. This is a central metric in the energy transition journey since hydrocarbon producers will play a key role in decarbonizing the upstream oil and gas sector and help reach net-zero targets by mid-century. Blue hydrogen can yield very low greenhouse gas emissions, only if methane leakage emissions do not exceed 0.2% with close to 100% carbon capture.

For green hydrogen, the two main elements that need to be addressed are low-cost electricity from renewable energy sources and electrolysis. The MENA region has a highly competitive advantage in generating low-cost renewable electricity with high-capacity factors reaching 20% where the levelized cost of renewable electricity in the region has reached world-record levels nearing USD 1.04/kWh (in the 600 MW Al Shuaiba PV IP project in KSA). However, due to the supply chain disruptions resulting from the pandemic over the past two years, the downward trend of renewable electricity costs is expected to invert temporarily before returning to its low levels by 2023-2024. As for electrolysers, the technology risk resides in scaling up to a multi-GW scale that can be operated with intermittent renewable energy sources at high efficiencies. It is expected that the cost curve of green hydrogen will decline with time, and it will be cost-competitive with blue and grey hydrogen by 2030.

The LCOH for producing green hydrogen in MENA is estimated to be between USD 2.5/kgH to USD 3.5/kgH for Alkaline electrolysers and slightly higher for PEM electrolysers.

What is the outlook of MENA hydrogen markets?
The global hydrogen demand reached 88 Mt/y in 2020 with 58% used for producing ammonia and methanol, and the remaining 42% for refining and industrial applications. MENA constituted almost 10% of this hydrogen demand and almost all quantities were used as a feedstock for petrochemicals and refining activities. The current hydrogen market emits close to 900 MTPA CO_2 (IEA).

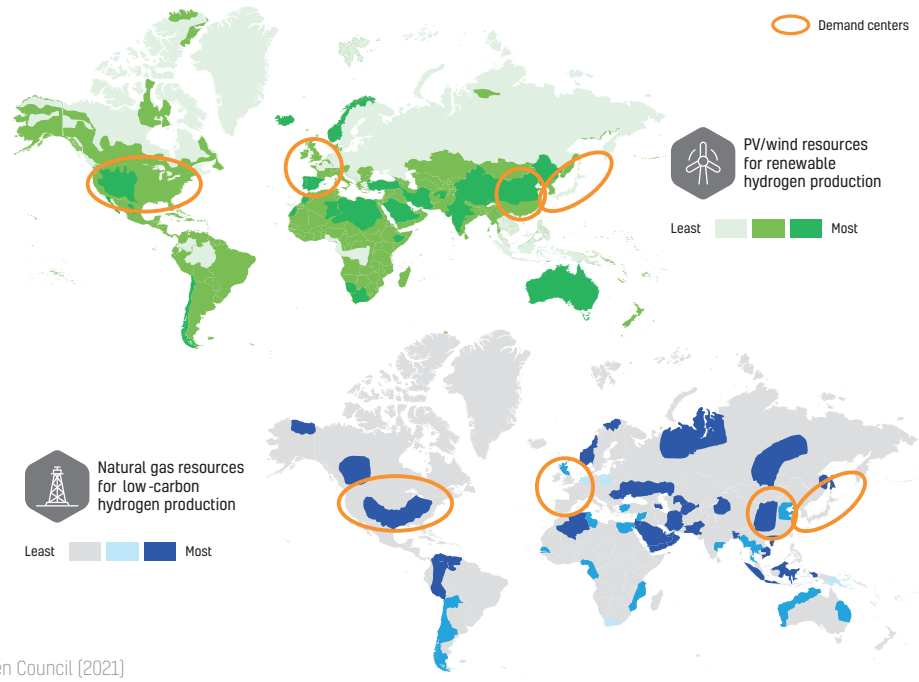
It is expected that the hydrogen markets in MENA will pass through three phases before transforming into a fully established commodity market:

- **2022-2030:** The hydrogen markets will start scaling up as the market foundations are placed. For the MENA region –GCC specifically– the focus will be on blue hydrogen for export markets especially to SE Asia via ammonia shipments. Fossil-fuel producers will continue to leverage their competitive advantage in blue hydrogen as part of their broad-based transition strategies, as long as hydrogen compensates to a certain degree any loss in revenues.

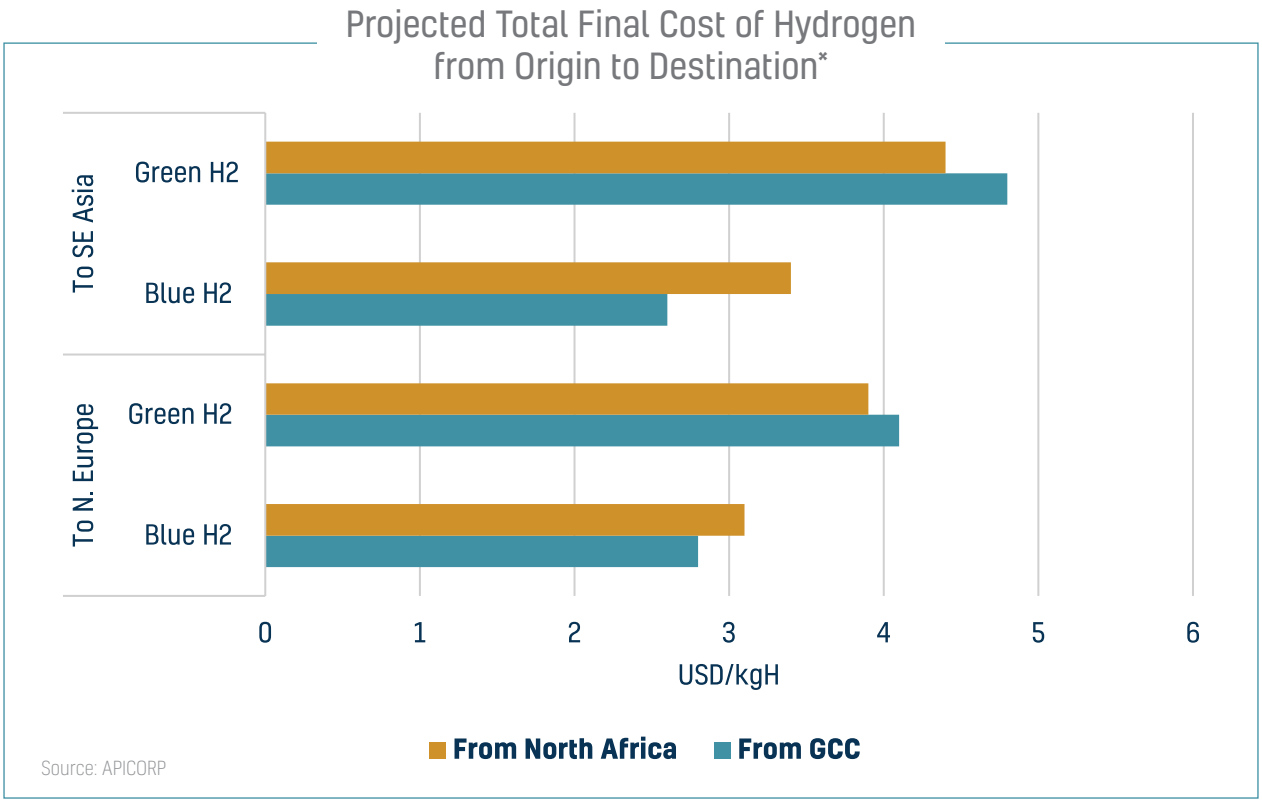
- **2030-2035:** With hydrogen demand scaling up, more supply hubs will emerge as the market starts reaching maturity. Green hydrogen will start making an entrance in niche markets. Projects will be centralized in hydrogen valleys and mostly funded by public investments.

- **2035+:** Widespread adoption of green and blue hydrogen in various applications. Low-carbon hydrogen will be consumed domestically and in export markets. Europe and SE Asia will be the most prominent hydrogen markets for the GCC and North Africa. Export routes will be either via hydrogen pipelines or ammonia shipments. Moreover, as the cost of green hydrogen falls, new participants will enter the market, making hydrogen a more competitive global commodity market.

Distribution of Global Hydrogen Resources and Demand Centers



Source: Hydrogen Council (2021)



* The total final cost includes hydrogen production, conversion at origin, transport, conversion and storage at destination for end-use. Dollar terms are as of 2020. The energetic equivalent natural gas cost is based on a conversion factor of 8.78 kg of hydrogen per MMBTU; a USD 2/kgH is equivalent to USD 17.6/MMBTU.

For hydrogen projects to be financed, several aspects need to be addressed to ensure an attractive investment environment:

1. **Technology:** There is a need to de-risk the electrolyser technology (modularity and scaling up to multi-GW scale) for green hydrogen and the CCUS technology for blue hydrogen. This will directly impact the cost profiles of both types of hydrogen as they near the cost limit of grey hydrogen.

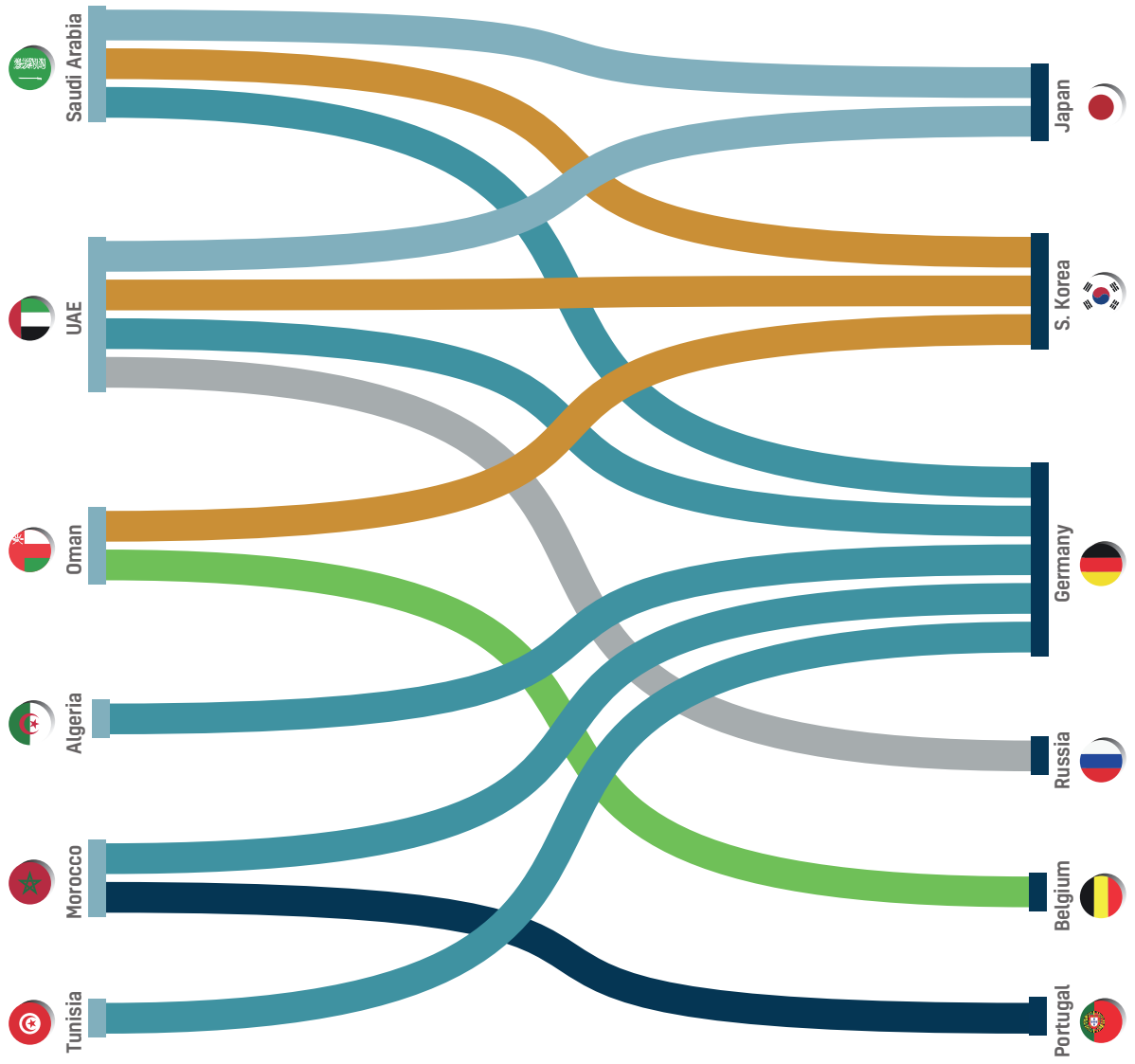
2. **Regulation:** A complete regulatory environment is needed to move from high-level roadmaps and strategies to laws and regulations that mitigate the policy risk for investors. More than 30 countries and regions have hydrogen strategies that include import or export plans, indicating that cross-border hydrogen trade is set to grow considerably. Certification, standardization and providing frameworks for validating guarantees of origin are key. The ability to translate these regulations into contractual clauses between suppliers and off-takers is essential. Divergent standards could hinder progress, disrupt markets, stir regulatory competition, and create trade barriers.

3. **Market fundamentals:** Transforming hydrogen into an established commodity market requires scaling up supply and demand while enhancing clarity on pricing. There is a chicken-and-egg problem in building out the necessary infrastructure for hydrogen. Without demand, investments remain too risky for wide-scale production that could reduce costs, but without economies of scale, the technology remains too costly for small demand.

4. **Infrastructure:** An established infrastructure from production and conversion to transmission and delivery is essential. This will require mobilisations of hefty investments in the medium term to scale-up hydrogen projects.

5. **Governmental support:** Several initiatives are needed to be taken by governments to activate hydrogen markets, among which: providing equity ownership, mandates and blending quotas, policy incentives such as tax credits/holidays, technology-specific subsidies, access to markets, support pilot projects, carbon pricing, etc.

Selected MENA Countries Bilateral Agreements and MOUs for Hydrogen Projects (as of January 2022) *



Source: APICORP

*This includes bilateral agreements/MOUs between public entities only.

V. Appendix

TOP 10 Projects by Country and Value (USD Bn)

Country	Project	Committed	Planned	Total
Algeria	Sonatrach – Bled El-Hadba Phosphate Plant in Tebessa	0.00	6.00	6.00
	Sonelgaz – Renewable Energy Program 22000 MW	0.00	4.46	4.46
	Sonatrach / NNPC – Trans Saharan Gas Pipeline	0.00	4.00	4.00
	Ministry of Energy Transition and Renewable Energy – Solar 1000 MW Project	0.00	3.60	3.60
	Sonatrach – Hassi Messaoud Refinery	3.43	0.00	3.43
	Ministry of Energy and Mining– 1000 MW Solar PV Park 1 at Algiers	0.00	2.00	2.00
	Algeria MEM / Qatar MEI – Oued Keberit Fertiliser Plant	0.00	1.95	1.95
	Sonatrach – Tinrhert Gas Field Development	1.66	0.00	1.66
	Groupement TouatGaz – Touat Natural Gas Field Phase 2	0.00	1.02	1.02
	Ministry of Energy and Mining– 1000 MW Solar PV Park	0.00	1.00	1.00
Bahrain	Bapco: Sitra Oil Refinery Expansion	2.76	0.00	2.76
	NOGA – Oil Shale Development From Khalij Al-Bahrain Reservoir	0.00	1.96	1.96
	Bapco – Modernization Programme	1.47	0.00	1.47
	MoWMU – Askar Waste to Energy Plant	0.00	0.79	0.79
	EWA – Addur 3 Power Plant	0.00	0.67	0.67
	Tatweer Petroleum – Pre-Unayzah Reservoir (LSTK)	0.00	0.59	0.59
	MEW – Addur 4 IPP	0.00	0.54	0.54
	MEW – 220kV & 66kV Transmission Development (2012-2016)	0.51	0.00	0.51
	NOGA – LNG Distribution Centre	0.00	0.46	0.46
	Tatweer Petroleum – Well Head Compression For Non Associated Gas Wells	0.29	0.00	0.29
Egypt	ECHEM – Alamein Petrochemical Complex	0.00	8.50	8.50
	Egypt Ministry of Petroleum – Salamat Field	0.00	7.87	7.87
	MoP/MoPB – Petrochemical Complex in Suez	0.00	7.50	7.50
	AtomStroyExport – El Dabaa Nuclear Power Plant 4800 MW	6.57	0.00	6.57
	MoP – Suez Oil Refining and Petrochemical Complex	4.29	0.00	4.29
	EEHC/EGAS – Green Hydrogen Facility	0.00	3.99	3.99
	RSNRP – Crude Oil Refining and Petrochemical Complex in Ain Sokhna	0.00	3.71	3.71
	EEHC/Terra Sola/Terra Nex – 2000 MW PV Power Plant (FIT Model)	0.00	3.50	3.50
	SCZONE – Waste to Hydrogen Plant (1 GW)	0.00	2.94	2.94
	Atomstroyexport – El Dabaa Nuclear Power Plant 4800 MW: Nuclear Island (Block 2)	2.37	0.00	2.37
Iran	NMDC – Chabahar Petrochemical Complex (Mokran)	10.74	0.00	10.74
	POGC – South Pars Gas Field Development	7.13	0.00	7.13
	NIOC – Kish Gas Field Development	0.00	6.94	6.94
	POGC – North Pars Gas Field Development: Offshore	0.00	5.89	5.89
	ICOFC – Tous Gas Field Development	0.00	5.84	5.84
	NIOC – Golshan Gas & Ferdowsi Oil & Gas Fields Development: Onshore	0.00	4.20	4.20
	Petro Tejarat Shahin Co. – Shahid Soleymani Petro-Refinery (SSPRC)	0.00	3.81	3.81
	POGC – North Pars Gas Field Development: Onshore	0.00	2.97	2.97
	IWPC – Bakhtiyari Hydro-Power Project	2.77	0.00	2.77
	IOOC – Farzad B Gas Field Development: Offshore	0.00	2.69	2.69
Iraq	BGC – South Gas Utilization Project	15.31	0.00	15.31

Country	Project	Committed	Planned	Total
	Ministry of Electricity – Gas-Fired Power Plants Program 11 GW in Iraq	12.77	0.00	12.77
	Eni/Oxy / Kogas / MOC/SOC – Zubair Field Development	11.66	0.00	11.66
	SRC – Basra Refinery Upgrade	10.14	0.00	10.14
	MoO – Iraq Strategic Crude Oil Export Pipeline: Haditha-Aqaba Pipeline	0.00	8.00	8.00
	Ministry of Oil – Al Faw Refinery & Petrochemical Complex	7.39	0.00	7.39
	SCOP – Iraq Strategic Crude Oil Export Pipeline: Najaf-Aqaba Pipeline	0.00	6.00	6.00
	Ministry of Industry & Minerals – Nebras Petrochemical Complex	0.00	5.86	5.86
	MoO – Iraq Strategic Crude Oil Export Pipeline: Basra-Haditha Pipeline	0.00	3.98	3.98
	Petronas/Japex/NOC – Garraf Oil Field Development	3.06	0.00	3.06
Jordan	Private Developer – Maan Crude Oil Refinery	0.00	3.80	3.80
	Jordan Ministry of Energy & Mineral Resources – Isfir-Jafr Oil Shale Development	0.00	2.94	2.94
	Private Developer – Oil Refinery and Petrochemical Complex in Maan	0.00	2.93	2.93
	JPRC – Zarqa Refinery Phase 4	0.00	2.64	2.64
	Karak International Oil – El Lejjun Area Oil Shale Development	0.00	1.31	1.31
	ADC – LNG Terminal Onshore Regasification Unit	0.00	1.00	1.00
	Fortescue Future Industries – Hydrogen Production Plant	0.00	0.50	0.50
	Al Hamdi/Al Khair Group – Chemical Industrial Complex	0.00	0.34	0.34
	MEMR – Jordan Renewable Energy Round 3: 150MW Photovoltaic Solar Plant	0.00	0.25	0.25
	ADC – Aqaba Natural Gas Network	0.00	0.15	0.15
KSA	REPDO – Renewable Energy Program: Round 2	7.94	0.00	7.94
	KA-CARE – Nuclear Power Reactor: Package 1	0.00	5.89	5.89
	SATORP – Amiral Complex: Ethylene & Propylene Plant	0.00	5.00	5.00
	Saudi Power Procurement Company – 3.5GW Gas Fired Power Plant in Al-Qassim (IPP)	0.00	3.93	3.93
	Saudi Power Procurement Company – 3.6GW Gas Fired Power Plant in Taiba (IPP)	0.00	3.90	3.90
	Saudi Aramco – New discoveries development	0.00	3.50	3.50
	Saudi Aramco – Master Gas System Expansion (MGSE)	3.20	0.00	3.20
	REPDO – Renewable Energy Program: Round 5	0.00	2.94	2.94
	REPDO – Renewable Energy Program: Round 1	2.90	0.00	2.90
	Saudi Aramco – Marjan Offshore Oil Field Expansion	2.76	0.00	2.76
Kuwait	KAPP – Al Zour North IWPP	6.82	0.00	6.82
	KIPIC – Al Zour Petrochemical Complex: Package 1	0.00	3.93	3.93
	KIPIC – Al Zour Petrochemical Complex: Package 2	0.00	3.93	3.93
	KAPP – Shagaya Renewable Energy Complex: Phase 3	0.00	2.09	2.09
	KAPP – Al Zour North IWPP: Phase 2 & 3: Power Plant	0.00	2.08	2.08
	KAPP – Doha East Power & Desalination Plant (IWPP)	0.00	1.96	1.96
	KNPC – Mina Al Ahmadi Refinery Gas Fractionation Train 6 & 7	0.00	1.96	1.96
	MEW – Shuaiba South Power and Desalination Plant	0.00	1.75	1.75
	KIPIC – Al Zour Petrochemical Complex: Package 3	0.00	1.47	1.47
	MEW – Nuwaiseeb Power and Water Desalination Plant: Phase 1	0.00	1.01	1.01
Lebanon	Lebanese Center for Energy Conservation – Lebanon Wind Power Program Round 2	0.00	0.92	0.92
	LCEC – Concentrated Solar Power Plant 50 MW in Hermel	0.00	0.30	0.30
	MEW – 300MW Solar photovoltaic Farms (Energy Storage)	0.00	0.30	0.30
	MEW – 500 MW Power Plant in Lebanon	0.00	0.30	0.30

Country	Project	Committed	Planned	Total
	MEW – 500 MW Power Plant in South Lebanon	0.00	0.30	0.30
	MEW – 220kV Marina Dbayeh Substation	0.00	0.15	0.15
	Lebanese Center for Energy Conservation – Sustainable Akkar Wind Farm 90.75MW	0.13	0.00	0.13
	Lebanese Center for Energy Conservation – Lebanon Wind Power 68.30 MW	0.10	0.00	0.10
	MEW – 100 MW Wind Power Project in Akkar	0.00	0.10	0.10
	MEW – 100 MW Wind Power Project in Beqaa	0.00	0.10	0.10
	MEW – 100 MW Wind Power Project in Mount Lebanon	0.00	0.10	0.10
Libya	GECOL – Tripoli IWPP	0.00	1.10	1.10
	MOG – Mellitah Complex & CO_2 Management A&E Structure: Sealine and Subsea System	0.00	1.00	1.00
	GECOL – Benghazi South IWPP	0.00	1.00	1.00
	MOG – Mellitah Complex Expansion & CO_2 Management A&E: Sabratha Platform	0.00	0.97	0.97
	MOG – Mellitah Complex Expansion & CO_2 Management: Onshore Development	0.00	0.97	0.97
	GECOL – 1320 MW New South Tripoli Gas-Fired Power Plant	0.00	0.90	0.90
	GECOL – Zwara Combined Cycle Power Plant	0.00	0.58	0.58
	GECOL – Zueitina IWPP	0.00	0.50	0.50
	WOC – NC-98 Gas Field Development	0.00	0.50	0.50
	WOC – North Gialo Field Development	0.00	0.50	0.50
Morocc	Xlink – Morocco-UK Power Project: 7000 MW Solar Power Plant in Morocco	0.00	16.34	16.34
	Brookstone Partners – Harmattan Wind Farm 900 MW in Dhakla	0.00	2.36	2.36
	MASEN – Moroccan Solar Plan: Foum Al Ouad Solar Power Plant	0.00	2.11	2.11
	MEME – Gas to Power Project: LNG Floating Storage and Regasification Unit (FSRU)	0.00	1.30	1.30
	ONEE – Morocco-Portugal Interconnection Project	0.00	0.87	0.87
	MoEM – Hevo Ammonia Morocco Project	0.00	0.83	0.83
	MEME – Gas to Power Project: Gas Pipelines	0.00	0.70	0.70
	Xlinks – Morocco-UK Power Project: 3500 MW Wind Power Plant in Morocco	0.00	0.64	0.64
	ONEE – Wind Integrated Programme: Phase 2	0.64	0.00	0.64
	MASEN – Moroccan Solar Plan: Noor Midelt IPP 230MW (Phase 2)	0.00	0.50	0.50
Oman	SIS – Sur Refinery And Petrochemicals Complex	0.00	9.87	9.87
	OQ – SalalaH2 Green Ammonia	0.00	5.89	5.89
	PDO – Habhab Field Service Contract (C311790)	0.00	5.00	5.00
	CBH – Low-Sulphur Fuel Oil (LSFO) Refinery in Duqm	0.00	4.20	4.20
	Mingyuan Holdings Group – SEZAD: Methanol to Olefins (MTO) Plant	0.00	2.73	2.73
	Acme Group/ Scatec ASA – Green Ammonia Facility: Phase 2	0.00	2.16	2.16
	RMPIC/YPI – Refinery in Duqm Special Economic Zone	1.86	0.00	1.86
	OQ8 – Duqm Refinery	1.59	0.00	1.59
	OTTCO – Ras Markaz Crude Oil Park	1.56	0.00	1.56
	Acme Group/ Scatec ASA – Green Ammonia Facility: Phase 1	0.00	1.44	1.44
Qatar	Qatargas – LNG Processing Trains (EPC 1)	12.44	0.00	12.44
	Qatargas – North Field East Development: Onshore	8.14	0.00	8.14
	Qatar Energy – Ras Laffan Petrochemical Complex: Ethane Cracker	0.00	2.74	2.74
	KAHRAMAA – Facility E IWPP 2600MW	0.00	2.38	2.38
	Qatargas – Lean LNG Storage and Loading Expansion (EPC-2)	1.95	0.00	1.95
	Qatargas – North Field Production Sustainability: Phase 2: Scope B	0.00	1.84	1.84

Country	Project	Committed	Planned	Total
	Qatargas – North Field Production Sustainability: Phase 1: Offshore	1.65	0.00	1.65
	Qatar Energy – Ras Laffan Petrochemical Complex: Polyethylene Derivative Units	0.00	1.50	1.50
	Qatargas – North Field South Development	1.37	0.00	1.37
	Qatargas – Pipelines and Topsides Facilities	1.00	0.00	1.00
Sudan	SETCO – 500kV Khartoum Ring Project	0.00	0.22	0.22
	STPGC – El Shaheed Thermal Power Plant	0.00	0.20	0.20
	Sudan Ministry of Energy & Mining – 500MW Solar Power Plant	0.00	0.20	0.20
	Sudan Ministry of Energy & Mining – Al Bagir Power Generation Station	0.00	0.20	0.20
	MEM – Red Sea Offshore Refinery	0.00	0.13	0.13
	Sudan Petroleum Corporation – Port Sudan Natural Gas Terminal and Pipeline	0.12	0.00	0.12
	Sudan Ministry of Energy & Mining – Al Foula Power Plant	0.00	0.10	0.10
	Sudan Thermal Generation Company – Garri 3 Power Plant	0.05	0.00	0.05
	USAID – Juba Compound Electrical Upgrade	0.00	0.05	0.05
	Sudanese Thermal Power Generating Company – Port Sudan Power Plant	0.03	0.00	0.03
Tunisia	Terna/STEG – Italy-Tunisia HVDC Power Interconnector	0.00	0.70	0.70
	STEG – Nabeul: 200 MW Wind Power Plant	0.00	0.28	0.28
	STIR – Rehabilitation of LPG Gas Processing Unit in Bizerte Refinery	0.00	0.25	0.25
	STEG – Overhead HV Power Cables Connecting Solar Plants	0.00	0.20	0.20
	STEG – Electricity Transmission Network : AIS Substation	0.17	0.00	0.17
	STEG – Medenine 50MW Solar Power Plant	0.00	0.10	0.10
	TMIESME – 500 MW Solar PV IPP	0.10	0.00	0.10
	TMIESME – Solar PV IPP 500MW: 200MW in Tataouine	0.07	0.00	0.07
	STEG – Beni Mehira Solar Power Plant 50MW	0.00	0.07	0.07
	STEG – Skhira-Kondar-Thyna Transmission Line	0.00	0.07	0.07
UAE	ADNOC LNG – Fujairah LNG Export Terminal	0.00	7.95	7.95
	ADNOC/DUSUP – Jebel Ali Gas Reservoir Project	4.91	0.00	4.91
	ADNOC – Hail and Ghasha Sour Gas Development: Package 4	0.00	3.21	3.21
	ADNOC/TAQA – Sub-Sea Power Transmission Network	2.97	0.00	2.97
	Noor Energy 1 – Mohammed Bin Rashid Al Maktoum Solar Park 950 MW CSP (Phase 4)	2.97	0.00	2.97
	ADNOC Offshore – Lower Zakum Long-Term Development Plan: Phase-1	0.00	2.58	2.58
	Al Dhafra Petroleum – Haliba Oil Field Development	0.00	2.25	2.25
	ADPC/TAQA – 2GW Solar Farm	0.00	1.96	1.96
	ADNOC – Hail and Ghasha Sour Gas Development: Package 1	0.00	1.92	1.92
	Taziz/Fertiglobe – Taziz: Blue Ammonia Production Facility	0.00	1.87	1.87
Yemen	Khalifa Bin Zayed Al Nahyan Foundation – 120MW Power Station in Aden	0.00	0.10	0.10
Grand Total		**171.76**	**284.99**	**456.74**

TOP 10 Oil projects by Country and Value:

Country	Project	Committed	Planned	Total USD Bn
Iraq	Eni/Oxy / Kogas / MOC/SOC – Zubair Field Development	11.7	0.0	11.7
	SRC – Basra Refinery Upgrade	10.1	0.0	10.1
	MoO – Iraq Strategic Crude Oil Export Pipeline: Haditha-Aqaba Pipeline	0.0	8.0	8.0
	Ministry of Oil – Al Faw Refinery & Petrochemical Complex	7.4	0.0	7.4
	SCOP – Iraq Strategic Crude Oil Export Pipeline: Najaf-Aqaba Pipeline	0.0	6.0	6.0
	MoO – Iraq Strategic Crude Oil Export Pipeline: Basra-Haditha Pipeline	0.0	4.0	4.0
	Petronas/Japex/NOC – Garraf Oil Field Development	3.1	0.0	3.1
	MOI – Artawi Oil Field Development	0.0	2.9	2.9
	PetroChina/SOC/Petronas/Total – Halfaya Project Surface Facility(HPSF)	2.7	0.0	2.7
	Lukoil/SOC – West Qurna Oil Field Development	2.2	0.0	2.2
KSA	Saudi Aramco – New discoveries development	0.0	3.5	3.5
	Saudi Aramco – Marjan Offshore Oil Field Expansion	2.8	0.0	2.8
	Saudi Aramco – ZOFD: Onshore: Hydrocarbons Processing Facilities: Package 1	2.5	0.0	2.5
	Saudi Aramco – Berri Field Development Project	2.0	0.0	2.0
	Saudi Aramco – MFD: Offshore GOSP4 Development: Package 1	1.7	0.0	1.7
	Saudi Aramco – MFD: Tanajib Onshore Oil Facilities: Pkg 6	1.3	0.0	1.3
	Saudi Aramco – ZOFD: Offshore: Oil Gathering Centres (CRPO 82)	1.2	0.0	1.2
	Saudi Aramco – Manifa Offshore Field Expansion	0.0	1.0	1.0
	Saudi Aramco – ZOFD: Onshore: Utilities & Water Treatment Facilities: Package 2	1.0	0.0	1.0
	Saudi Aramco – Marjan Field Development (MFD): Phase 3	0.0	1.0	1.0
Oman	PDO – Habhab Field Service Contract (C311790)	0.0	5.0	5.0
	CBH – Low-Sulphur Fuel Oil (LSFO) Refinery in Duqm	0.0	4.2	4.2
	RMPIC/YPI – Refinery in Duqm Special Economic Zone	1.9	0.0	1.9
	OQ8 – Duqm Refinery	1.6	0.0	1.6
	OTTCO – Ras Markaz Crude Oil Park	1.6	0.0	1.6
	Marsa LNG – Marsa LNG Terminal	0.0	1.0	1.0
	OQ8– Duqm Refinery: Process Unit (EPC 1)	0.7	0.0	0.7
	OQ8 – Duqm Refinery: Offsite & Utilities (EPC 2)	0.6	0.0	0.6
	OQ – Bisat Oil Field Development	0.5	0.0	0.5
	Sohar Asphalt LLC – Sohar Refinery: Bitumen Facility	0.4	0.0	0.4
Iran	PEDEC – South Azadegan Field Development : Phase 2	0.0	2.5	2.5
	PEDEC – Azadegan Oil Field Development	2.4	0.0	2.4
	PEDEC – Central Azadegan Oil Field Development	0.0	2.0	2.0
	PEDEC – Changouleh Oilfield Development	0.0	1.7	1.7
	NIOC – South Yaran Oil Field Development	0.0	1.5	1.5
	Iran Ministry of Oil – Dehloran Oil Refinery	0.0	1.5	1.5
	IOOC – Soroush Oilfield Development	0.0	1.2	1.2
	PEDEC/NISOC – Yadavaran Oil Field Development	1.2	0.0	1.2
	IOOC – Mahshahr Oilfield Development	0.0	1.0	1.0
	PEDEC/NISOC – Yadavaran Oil Field: Early Production Facilities: Phase 3	0.0	1.0	1.0
UAE	ADNOC Offshore – Lower Zakum Long-Term Development Plan: Phase-1	0.0	2.6	2.6

Country	Project	Committed	Planned	Total USD Bn
	Al Dhafra Petroleum – Haliba Oil Field Development	0.0	2.3	2.3
	ADNOC Offshore – Umm Shaif Field Long-Term Development Plan: Phase 2	0.0	1.8	1.8
	ADNOC Onshore – 1.8 MMBPD Onshore Oil Field Development Project	1.5	0.0	1.5
	ADNOC Offshore – Abu Dhabi Das Island Crude Oil Tank Farm	0.0	1.0	1.0
	ADNOC Offshore – Umm Shaif Field Long Term Development Plan: Phase 1	0.9	0.0	0.9
	ADNOC Refining – Ruwais Refinery Upgrade: Crude Flexibility Project	0.6	0.0	0.6
	BPGIC – Fujairah Storage Facility: Phase 3	0.0	0.6	0.6
	ADNOC – Al Mandous Underground Cavern Oil Storage Facility in Fujairah	0.6	0.0	0.6
	Al Dhafra Petroleum – Haliba Oil Field Development: Phase 2	0.0	0.5	0.5
Egypt	RSNRP – Crude Oil Refining and Petrochemical Complex in Ain Sokhna	0.0	3.7	3.7
	SOPC – Coking & Diesel Complex in Suez Refinery	0.0	1.7	1.7
	ASORC – Assuit Oil Refinery Upgrade: Hydrocracking Complex	1.7	0.0	1.7
	AMOC – Mazut Refining and Distillation Complex	0.0	1.5	1.5
	ASORC – Assuit Oil Refinery Upgrade	1.0	0.0	1.0
	MIDOR – Alexandria Refinery Expansion 2	0.8	0.0	0.8
	APC – Alexandria Refinery Green Project	0.0	0.6	0.6
	Suez Oil Processing Company – New Lubrication Oil Complex	0.0	0.5	0.5
	Amreya Petroleum Refining Company – Amreya Refinery Modernization	0.0	0.4	0.4
	ASORC – Assuit Oil Refinery Upgrade: Atmospheric Distillation Unit	0.0	0.4	0.4
Jordan	Private Developer – Maan Crude Oil Refinery	0.0	3.8	3.8
	Jordan Ministry of Energy & Mineral Resources – Isfir-Jafr Oil Shale Development	0.0	2.9	2.9
	JPRC – Zarqa Refinery Phase 4	0.0	2.6	2.6
	Karak International Oil – El Lejjun Area Oil Shale Development	0.0	1.3	1.3
	OPPL – Aqaba Storage Terminal	0.0	0.1	0.1
	Private Developer – Maan Petroleum Refinery Complex	0.0	0.0	0.0
Algeria	Sonatrach – Hassi Messaoud Refinery	3.4	0.0	3.4
	Groupement El M Zaid – El M Zaid Oil Field Development	0.0	0.8	0.8
	Sonatrach – Hassi Messaoud Oil Storage Facility	0.0	0.7	0.7
	Sonatrach – Haoud El Hamra to Bejaia II Oil Pipeline	0.0	0.7	0.7
	Sonatrach – Hassi Messaoud Oil Storage Project	0.6	0.0	0.6
	Sonatrach – HTJ Oil Field Development	0.5	0.0	0.5
	Sonatrach – South West Gas Fields Development: 3 Central Processing Facilities	0.5	0.0	0.5
	SONATRACH/PTTEP – Hassi Bir Rekaiz Oilfield Development: Phase I	0.2	0.0	0.2
	Sonatrach – Tinrhert Gas Field Development: Central Processing Plant	0.1	0.0	0.1
	Sonatrach – Renovation of Existing Facilities of South Treatment Center: Lot 1	0.0	0.1	0.1
	Sonatrach/E&P/Touat BV – Touat Gas Surface Installations	0.0	0.1	0.1
Bahrain	Bapco – Modernization Programme: Sitra Oil Refinery Expansion	2.8	0.0	2.8
	NOGA – Oil Shale Development From Khalij Al-Bahrain Reservoir	0.0	2.0	2.0
	Bapco – Modernization Programme	1.5	0.0	1.5
	Tatweer Petroleum – Installation of Two New Well Manifolds	0.0	0.0	0.0
	Tatweer Petroleum – Off Plot Infrastructure Works for ABWTF	0.0	0.0	0.0
Qatar	NOC – Gallaf Batch 3: EPC-06	0.6	0.0	0.6
	Qatar Energy – ISND Phase 5: ISND 5.2	0.0	0.5	0.5

Country	Project	Committed	Planned	Total USD Bn
	NOC – Gallaf Production Project: Batch 3	0.4	0.0	0.4
	Qatar Energy – Idd El Shargi South Dome Expansion	0.0	0.4	0.4
	Qatar Energy – Idd El Shargi North Dome Expansion: Phase 5	0.4	0.0	0.4
	Qatar Energy – Dukhan Crude Storage Tanks, MOL, Sludge Handling Facilities	0.0	0.4	0.4
	NOC – Gallaf Batch 3: EPC-05	0.3	0.0	0.3
	NOC – Al Shaheen Field: Gallaf Production Project	0.2	0.0	0.2
	Qatar Energy – ISND Phase 5: Installation of Topsides and Subsea Pipelines	0.1	0.0	0.1
	Qatar Energy – Construction, Installation and Hook-Up of Well Flowlines	0.1	0.0	0.1
	Qatar Energy – Dukhan Production Facilities Upgrade: Phase 1A	0.1	0.0	0.1
Kuwait	KPC – Kuwait to Indian Ocean Crude Oil Pipeline Project	0.0	0.9	0.9
	KNPC – Local Marketing Depot At Mutlaa	0.0	0.6	0.6
	KOC – 11 Patterns Well Hook-up Installation & Associated Works	0.4	0.0	0.4
	KOC – JPF 4 Off-Plot Works & Production Facilities	0.4	0.0	0.4
	KOC – Gathering Centres 1 & 2 Upgrade at Burgan & Magwa	0.0	0.2	0.2
	KOC – Major Storage Tanks	0.0	0.2	0.2
	KOC – JLO Export Facilities and Upgrade of Existing Export Network (EF/2034)	0.0	0.2	0.2
	KOC – Jurassic Non Associated: Phase 2: West Raudhatain Field Upgrade	0.1	0.0	0.1
	KOC – Construction of Injection Flowline Works in North Kuwait	0.0	0.1	0.1
	KOC – Mega Storage Tanks	0.0	0.1	0.1
	KOC – Installation of Flowlines & Associated Works in S&E Kuwait Areas	0.0	0.1	0.1
	KOC – Flowline Network and Associated Works in Umm Niqa and South Ratqa	0.0	0.1	0.1
Libya	WOC – North Gialo Field Development	0.0	0.5	0.5
	Zallaf – Erawin Field Development: Pipeline Package	0.0	0.3	0.3
	Zallaf – Chadar Field Development	0.0	0.3	0.3
	BPMC – Modernization and Upgrade of Tobruk Oil Terminal	0.0	0.3	0.3
	NOC – Sebha Refinery	0.0	0.3	0.3
	Harouge Oil Operations – Rehabilitation of Farroud Water Injection Station	0.0	0.2	0.2
	Harouge Oil Operations – Rehabilitation of Zenad Station	0.0	0.2	0.2
	AGOCO – Replacement of Crude Oil Pipeline from Nafoora GOSP 06 to Zueitina 103A	0.0	0.1	0.1
	MOO – Early Production Facilities (EPF) at Mabruk Oil Field	0.0	0.1	0.1
	Arabian Gulf Oil Company – Water Disposal and Injection System	0.0	0.1	0.1
Tunisia	STIR – Rehabilitation of LPG Gas Processing Unit in Bizerte Refinery	0.0	0.2	0.2
Sudan	MEM – Red Sea Offshore Refinery	0.0	0.1	0.1
Morocco	Winxo – Jorf Lasfar Import Oil Terminal	0.1	0.0	0.1
Grand Total		**80.3**	**88.3**	**168.6**

TOP 10 Gas projects by Country and Value (USD Bn):

Country	Project	Committed	Planned	Total
Iran	POGC – South Pars Gas Field Development	7.13	0.00	7.13
	NIOC – Kish Gas Field Development	0.00	6.94	6.94
	POGC – North Pars Gas Field Development: Offshore	0.00	5.89	5.89
	ICOFC – Tous Gas Field Development	0.00	5.84	5.84
	NIOC – Golshan Gas & Ferdowsi Oil & Gas Fields Development: Onshore	0.00	4.20	4.20
	POGC – North Pars Gas Field Development: Onshore	0.00	2.97	2.97
	IOOC – Farzad B Gas Field Development: Offshore	0.00	2.69	2.69
	NIOC – Kish Gas Field Development: Phase 3	0.00	2.50	2.50
	NIOC – Kish Gas Field Development: Phase 2	0.00	2.50	2.50
	Fateh Sanat Kimia – Gas To Propylene And Polypropylene Plant (GTPP)	1.95	0.00	1.95
Qatar	Qatargas – LNG Processing Trains (EPC 1)	12.44	0.00	12.44
	Qatargas – North Field East Development: Onshore	8.14	0.00	8.14
	Qatargas – Lean LNG Storage and Loading Expansion (EPC-2)	1.95	0.00	1.95
	Qatargas – North Field Production Sustainability: Phase 2: Scope B	0.00	1.84	1.84
	Qatargas – North Field Production Sustainability: Phase 1: Offshore	1.65	0.00	1.65
	Qatargas – North Field South Development	1.37	0.00	1.37
	Qatargas – Pipelines and Topsides Facilities	1.00	0.00	1.00
	Qatargas – Sulphur Storage and Export Facilities (EPC-4)	0.00	0.98	0.98
	Qatargas/ExxonMobil – Barzan Gas Development	0.97	0.00	0.97
	Qatargas – North Field Production Sustainability: Phase 1: Pipelines	0.97	0.00	0.97
UAE	ADNOC LNG – Fujairah LNG Export Terminal	0.00	7.95	7.95
	ADNOC/DUSUP – Jebel Ali Gas Reservoir Project	4.91	0.00	4.91
	ADNOC – Hail and Ghasha Sour Gas Development: Package 4	0.00	3.21	3.21
	ADNOC – Hail and Ghasha Sour Gas Development: Package 1	0.00	1.92	1.92
	ADNOC/Total/PetroChina/ENI – Umm Shaif Gas Cap Condensate Development: Phase 1	0.00	1.50	1.50
	ADNOC – Hail and Ghasha Sour Gas Development: Package 2	0.00	1.28	1.28
	ADNOC – Hail and Ghasha Sour Gas Development: Package 3	0.00	1.28	1.28
	ADNOC – Hail and Ghasha Sour Gas Development	1.21	0.00	1.21
	Adnoc Gas Processing – Integrated Gas Development (IGD) Expansion	1.03	0.00	1.03
	ADNOC – North West Development: Dalma Field: Package B	0.94	0.00	0.94
Iraq	BGC – South Gas Utilization Project	15.31	0.00	15.31
	MOI – Central Gas Complex in Artawi	0.00	2.00	2.00
	Ministry of Oil – Mansouriya Field Development Project	0.00	1.48	1.48
	Ministry of Oil – Mansouriya Field Development: CPF	0.00	1.00	1.00
	CNOOC Iraq – Buzurgan Terminal (BUT) Upgrade	0.00	0.80	0.80
	PetroChina/SOC/Petronas/Total – HPSF: Phase 3: Gas Processing Plant	0.60	0.00	0.60
	MoO – Nahr Bin Omar Gas Utilisation Project	0.00	0.50	0.50
	BGC – Basra New Gas Processing Plant	0.44	0.00	0.44
	Pearl Petroleum – Kurdistan Khor Mor Gas Field Expansion	0.31	0.00	0.31
	BGC – Gas Compression Stations	0.00	0.30	0.30
KSA	Saudi Aramco – Master Gas System Expansion (MGSE)	3.20	0.00	3.20

Country	Project	Committed	Planned	Total
	Saudi Aramco – Berri Field Development: GOSP	2.47	0.00	2.47
	Saudi Aramco – SUGCP: Shedgum & Uthmaniya Gas Compression Plant: Package 1 & 2	0.00	2.45	2.45
	Saudi Aramco – Tail Gas Treatment Desulphurization Project	0.00	1.60	1.60
	Saudi Aramco – Hawiyah Unayzah Gas Reservoir Storage Project	1.47	0.00	1.47
	Saudi Aramco – COUR: Jafurah: Utilities & Interconnecting Facility (Package-3)	1.34	0.00	1.34
	Saudi Aramco – MFD: TGP: Onshore: Inlet, Storage & Compression: Pkg 9	1.32	0.00	1.32
	Saudi Aramco – MFD: Tanajib Gas Processing Plant	1.29	0.00	1.29
	Saudi Aramco – Commercialisation of Unconventional Resources: Jafurah	1.29	0.00	1.29
	Saudi Aramco – COUR: Jafurah: Processing Plant (Package 2)	1.17	0.00	1.17
Egypt	Egypt Ministry of Petroleum – Salamat Field	0.00	7.87	7.87
	Egypt Ministry of Petroleum – Tanin, Merit, Aten, Tarsa, and Salmon Gas Fields	0.00	1.62	1.62
	BP/Dana Gas – El Matariya Onshore Concession (Block 3)	0.00	0.98	0.98
	EGAS – Egypt-Cyprus Gas Pipeline	0.00	0.98	0.98
	Agiba/EGPC – Natural Gas Processing Plant in Western Desert	0.00	0.70	0.70
	Egypt Ministry of Petroleum – West El-Brulus Offshore	0.00	0.50	0.50
	GASCO – Western Desert Gas Complex: Train D	0.49	0.00	0.49
	EGAS – South Seth and North Tort Gas Fields	0.00	0.37	0.37
	GASCO – EGAS Energy Efficiency Project: Lot 2 & 3	0.00	0.60	0.60
Algeria	Sonatrach / NNPC – Trans Saharan Gas Pipeline	0.00	4.00	4.00
	Sonatrach – Tinrhert Gas Field Development	1.66	0.00	1.66
	Groupement TouatGaz – Touat Natural Gas Field Phase 2	0.00	1.02	1.02
	Groupement TouatGaz – Touat Gas Field Expansion	0.00	0.80	0.80
	PTTEP/Sonatrach/CNOOC – Hassi Bir Rekaiz Field Development	0.78	0.00	0.78
	Sonatrach – Tinrhert Gas Field Development: EPC-II package	0.00	0.70	0.70
	Sonatrach/ENI – Upgrade of CTH BRN Gas Pipeline	0.00	0.50	0.50
	Sonatrach – Hassi R'mel Gas Field Debottlenecking	0.00	0.50	0.50
	Sonatrach/Total/Alnaft – Erg Issouane Gas Field Development	0.00	0.39	0.39
	Sonatrach – Tin Foye Tabankort Gas Field : Additional Works	0.00	0.32	0.32
Libya	MOG – Mellitah Complex & CO_2 Management A&E Structure: Sealine and Subsea System	0.00	1.00	1.00
	MOG – Mellitah Complex Expansion & CO_2 Management A&E: Sabratha Platform	0.00	0.97	0.97
	MOG – Mellitah Complex Expansion & CO_2 Management: Onshore Development	0.00	0.97	0.97
	WOC – NC-98 Gas Field Development	0.00	0.50	0.50
	MOG – Mellitah Complex Expansion & CO_2 Management Integrated Development Project	0.00	0.49	0.49
	MOG – Mellitah Complex Expansion & CO_2 Management: Structure A & E (PPE)	0.00	0.29	0.29
	MOG – Mellitah Complex Expansion & CO_2 Management: Production Platform E	0.00	0.19	0.19
	MOGCO – Bouri Gas Utilization Project	0.00	0.14	0.14
	WOC – NC-98 & North Gialo Fields Development	0.00	0.00	0.00
Kuwait	KNPC – Mina Al Ahmadi Refinery Gas Fractionation Train 6 & 7	0.00	1.96	1.96
	KOC – JPF 5 Off-Plot Works & Production Facilities	0.42	0.00	0.42
	KOC – Upgrade of Gas Booster Station 160 (EF/1992)	0.00	0.27	0.27
	KOC – New Strategic Gas Export Pipeline from North Kuwait to MAA	0.26	0.00	0.26
	KOC – Enhancement of Booster Stations BS-140 & BS-150	0.00	0.24	0.24
	KOC – Jurassic Non Associated Oil & Gas Reserves Expansion: Phase 2	0.22	0.00	0.22

Country	Project	Committed	Planned	Total
	KGOC/Chevron – Divided Zone Gas Sweetening Facility	0.00	0.20	0.20
	KOC – Jurassic Non-Associated Phase 2: JPF 4&5 Off-plot & Production Facilities	0.19	0.00	0.19
	KIPIC – Alternate Feed for HPU (Phase I) for Al-Zour Refinery	0.00	0.15	0.15
	KOC – JPF 4 & 5 Off-plot Works & Production Facilities: North Area Off-plot Work	0.13	0.00	0.13
Morocco	MEME – GTP Project: LNG Floating Storage and Regasification Unit (FSRU) + Pipelines	0.00	2.0	2.0
	ONHYM – Atlantic Ridge Project	0.00	0.40	0.40
	ONEE/Sound Energy – Tendrara-Gazoduc Maghreb Gas Pipeline	0.00	0.18	0.18
	MEME – Floating LNG Import Terminal	0.00	0.10	0.10
	Chariot – Anchois Gas Field Development	0.08	0.00	0.08
	MEME – Gas to Power Project	0.00	0.00	0.00
Oman	Occidental Oman – Central Processing Facility at Muradi Huraimah	0.00	1.00	1.00
	OQ – South Grid Debottlenecking Phase 2	0.39	0.00	0.39
	PetroTel – Tibat and Ash Sham Oil and Gas Field Development	0.00	0.31	0.31
	PDO – Marmul Gas Compression Station	0.24	0.00	0.24
	OQ – Central Rich and Lean Gas Segregation Project	0.17	0.00	0.17
	Petroleum Development Oman – Main Pipeline To Saih Rawl Gas Processing Facility	0.00	0.10	0.10
	OQ – New Methanol Export Line and Installation of Methanol Loading Arms	0.00	0.10	0.10
	Jindal Shadeed – Air Separation Unit at Jindal Shadeed Iron & Steel Facility	0.08	0.00	0.08
	OQ – 210 Km Gas Pipeline	0.08	0.00	0.08
	PDO – Al Burj Early Development Facility (EDF)	0.04	0.00	0.04
Bahrain	Tatweer Petroleum – Pre-Unayzah Reservoir (LSTK)	0.00	0.59	0.59
	NOGA – LNG Distribution Centre	0.00	0.46	0.46
	Tatweer Petroleum – Well Head Compression For Non Associated Gas Wells	0.29	0.00	0.29
	Tatweer Petroleum – Installation of Remote Gas Dehydration Units	0.27	0.00	0.27
	Tatweer Petroleum – Non-Associated Gas Compression Station in Bahrain	0.21	0.00	0.21
	Tatweer Petroleum – Onshore Drilling Rig Works	0.11	0.00	0.11
	Tatweer Petroleum – Pre-Unayzah Gas Well Hook-Ups	0.09	0.00	0.09
	Tatweer Petroleum – De-Bottleneck Gas Distribution Network Phase 1	0.07	0.00	0.07
Jordan	ADC – LNG Terminal Onshore Regasification Unit	0.00	1.00	1.00
	ADC – Aqaba Natural Gas Network	0.00	0.15	0.15
Tunisia	ETAP – Tataouine Gas Project	0.04	0.00	0.04
	STEG – LOT 1: Ain Turkia Gas Compression Station	0.00	0.03	0.03
	ETAP – Tataouine Gas Project: Gas Processing and LPG Bottling Unit	0.03	0.00	0.03
	STEG – LOT 2: Reinforcement of M'saken Gas Compression Station	0.00	0.03	0.03
ETAP – Tataouine Gas Project: Nawara to Tataouine Pipeline		0.01	0.00	0.01
	STIR – Underground LPG Storage Tanks Farm at Bizerte Refinery	0.01	0.00	0.01
	STEG – Tunis-Mabtouh-Bizerte Pipeline	0.01	0.00	0.01
Sudan	Sudan Petroleum Corporation – Port Sudan Natural Gas Terminal and Pipeline	0.12	0.00	0.12
Grand Total		**82.39**	**99.29**	**181.68**

TOP 10 Petchems projects by Country and Value (USD Bn):

Country	Project	Committed	Planned	Total
Egypt	ECHEM – Alamein Petrochemical Complex	0.00	8.50	8.50
	MoP – Petrochemical Complex in Suez	0.00	7.50	7.50
	MoP – Suez Oil Refining and Petrochemical Complex	4.29	0.00	4.29
	EEHC/EGAS – Green Hydrogen Facility	0.00	3.99	3.99
	SCZONE – Waste to Hydrogen Plant (1 GW)	0.00	2.94	2.94
	ECHEM – Suez Aromatics Complex	0.00	1.84	1.84
	SIDPEC – Alexandria Polypropylene Plant	0.00	1.69	1.69
	SCZONE – Methanol Complex in Ain Sukhna: Phase 1	0.00	1.60	1.60
	Misr Methanol & Petrochemicals Company – Methanol Plant: Phase 1	0.00	1.57	1.57
	Egyphos – Phosphate and Potassium Plant	0.00	1.21	1.21
Oman	SIS – Sur Refinery And Petrochemicals Complex	0.00	9.87	9.87
	OQ – SalalaH2 Green Ammonia	0.00	5.89	5.89
	Mingyuan Holdings Group – SEZAD: Methanol to Olefins (MTO) Plant	0.00	2.73	2.73
	Acme Group/ Scatec ASA – Green Ammonia Facility: Phase 2	0.00	2.16	2.16
	Acme Group/ Scatec ASA – Green Ammonia Facility: Phase 1	0.00	1.44	1.44
	OQ8 – Duqm Petrochemical Complex: Offsite & Utilities (Package 2)	0.00	1.12	1.12
	Acwa Power/OQ/Air Products – Green Hydrogen and Green Ammonia in Dhofar	0.00	1.04	1.04
	Government of Oman/BP Global – Petrochemical Project: Acetic Acid Plant	0.00	1.00	1.00
	Oman Ministry of Oil and Gas – Hyport Duqm	0.00	0.98	0.98
	Sumitomo Corp/ARA Petroleum – Hydrogen Production Facility	0.00	0.64	0.64
Iran	NMDC – Chabahar Petrochemical Complex (Mokran)	10.74	0.00	10.74
	Petro Tejarat Shahin Co. – Shahid Soleymani Petro-Refinery (SSPRC)	0.00	3.81	3.81
	Fanavaran Petrochemical Company – Petro Olefin Plant	0.00	1.50	1.50
	PGPI – Petrochemical Mahshahr Polyethylene Plant 2	0.00	0.95	0.95
	APC – Bandar Imam PVC Plant III	0.00	0.93	0.93
	PGPC – Mahshahr Ethylene Plant	0.92	0.00	0.92
	ZPC – Mehran Petrochemical Complex	0.00	0.60	0.60
	Petro MahTaab Seimareh – Seimareh Petrochemical Complex	0.00	0.60	0.60
	Mahtab Parsian Petrochemical Co – GTX Complex	0.00	0.50	0.50
	Mahtab Parsian Petrochemical – Bandar Abbas Polypropylene Plant	0.48	0.00	0.48
KSA	SATORP – Amiral Complex: Ethylene & Propylene Plant	0.00	5.00	5.00
	SATORP – Amiral Complex	0.00	1.74	1.74
	Pan-Asia Saudi – Petrochemical & Chemical Fiber Integrated Project: Phase-2	0.00	1.20	1.20
	SATROP/INEOS – Jubail 2 Complex: Acrylonitrile Plant	0.00	0.80	0.80
	Pan-Asia Saudi – Petrochemical & Chemical Fiber Integrated Project: Phase-3	0.00	0.80	0.80
	Saudi Aramco/Total – New Polyisobutylene Plant in Jubail	0.00	0.80	0.80
	APC – Propane Dehydrogenation (PDH) & Polypropylene (PP) Complex	0.64	0.00	0.64
	APC – Propane Dehydrogenation (PDH) & Utilities & Offsites package	0.63	0.00	0.63
	SATORP/INEOS – Jubail 2 Complex: LinearAlphaOlefin Plant	0.00	0.60	0.60
	SATORP/INEOS – Jubail 2 Complex: Poly Alpha Olefin Plant	0.00	0.60	0.60
UAE	Taziz/Fertiglobe – Taziz: Blue Ammonia Production Facility	0.00	1.87	1.87

Country	Project	Committed	Planned	Total
	Borouge – Borouge 4 Petrochemical Complex	6.13	0.00	6.13
	Taziz/RIL – Taziz: Chlor-Alkali, EDC and PVC Production Facility	0.00	1.33	1.33
	Helios Industry – Green Hydrogen and Green Ammonia Plant at Kizad	0.00	0.98	0.98
	Atles Industries – Biofuel Refinery at Kizad	0.72	0.00	0.72
	ADPC/TAQA – Green Hydrogen Plant	0.00	0.59	0.59
	ADNOC/RIL – Ethylene Dichloride (EDC) Facility in Ruwais	0.00	0.50	0.50
Kuwait	KIPIC – Al Zour Petrochemical Complex: Upgrades	0.00	9.73	9.73
	KIPIC – Olefins Complex in Kuwait	0.00	0.37	0.37
	EQUATE Petrochemicals/Green Carbon Company – Green Carbon Project	0.00	0.00	0.00
Algeria	Sonatrach – Bled El-Hadba Phosphate Plant in Tebessa	0.00	6.00	6.00
	Algeria MEM / Qatar MEI – Oued Keberit Fertiliser Plant	0.00	1.95	1.95
	STEP – Propane Dehydrogenation Polypropylene (PHD/PP) Plant	0.00	0.40	0.40
	Fertial SpA – Ammonia Plant Revamp	0.00	0.30	0.30
	Sonatrach – New MTBE Facility	0.00	0.20	0.20
	Sonatrach – Revamp of Skikda Ethylene Plant	0.00	0.15	0.15
	Sonatrach – Propane & Butane Production Unit in Hassi Messaoud	0.00	0.15	0.15
	Sonatrach/ENI – Debottelenecking Gas Project: Train 3 ROD	0.08	0.00	0.08
Iraq	Ministry of Industry & Minerals – Nebras Petrochemical Complex	0.00	5.86	5.86
	SCPI – Chlorine Plant in Khor Al Zubair	0.00	0.00	0.00
Qatar	Qatar Energy – Ras Laffan Petrochemical Complex: Ethane Cracker	0.00	2.74	2.74
	Qatar Energy – Ras Laffan Petrochemical Complex: Polyethylene Derivative Units	0.00	1.50	1.50
	QAFCO – QAFCO VII Expansion	0.00	0.50	0.50
	QAPCO – Poly Vinyl Chloride (PVC) Plant	0.00	0.50	0.50
	QChem – 6th Furnace in Mesaieed Complex	0.04	0.00	0.04
	QAFAC – MTBE Plant Regeneration Gas Scrubber Project (RGS)	0.03	0.00	0.03
	Qatar Energy – Ras Laffan Petrochemical Complex	0.00	0.00	0.00
Jordan	Private Developer – Oil Refinery and Petrochemical Complex in Maan	0.00	2.93	2.93
	Fortescue Future Industries – Hydrogen Production Plant	0.00	0.50	0.50
	Al Hamdi/Al Khair Group – Chemical Industrial Complex	0.00	0.34	0.34
	JPMC – Phosphate Washing Plant	0.00	0.09	0.09
	KEMAPCO – Ammonia Storage Tanks in Aqaba	0.00	0.03	0.03
	JPMC – Eshidiya Aluminum Fluoride Plant	0.02	0.00	0.02
Morocco	MoEM – Hevo Ammonia Morocco Project	0.00	0.83	0.83
	Masen – 100MW Green Hydrogen Facility	0.00	0.20	0.20
	OCP – Sulphuric Acid Plants in Jorf Lasfar	0.15	0.00	0.15
	ADNOC/OCP – Jorf Lasfar Sulphur Production Plant Expansion	0.00	0.08	0.08
	OCP – Sulphuric Acid Plant For Fertilizers in Jorf Lasfar	0.04	0.00	0.04
	SCE – Chlor Alkali Plant in Jorf Lasfar Industrial Park	0.03	0.00	0.03
Grand Total		**25.34**	**118.34**	**143.68**

Top 10 Power projects by Country and Value (USD Bn):

Country	Project	Committed	Planned	Total
KSA	REPDO – Renewable Energy Program: Round 2	7.94	0.00	7.94
	KA-CARE – Nuclear Power Reactor: Package 1	0.00	5.89	5.89
	Saudi Power Procurement Company – 3.5GW Gas Fired Power Plant in Al-Qassim (IPP)	0.00	3.93	3.93
	Saudi Power Procurement Company – 3.6GW Gas Fired Power Plant in Taiba (IPP)	0.00	3.90	3.90
	REPDO – Renewable Energy Program: Round 5	0.00	2.94	2.94
	REPDO – Renewable Energy Program: Round 1	2.90	0.00	2.90
	SEC – Shuqaiq Power Plant Expansion: Phase 1	0.00	2.50	2.50
	REPDO – Renewable Energy Program	2.48	0.00	2.48
	KA-CARE – Nuclear Power Reactor	0.00	2.23	2.23
	REPDO – Renewable Energy Program: Round 4	0.00	1.38	1.38
Morocco	Xlink – Morocco-UK Power Project: 7000 MW Solar Power Plant in Morocco	0.00	16.34	16.34
	Brookstone Partners – Harmattan Wind Farm 900 MW in Dhakla	0.00	2.36	2.36
	MASEN – Moroccan Solar Plan: Foum Al Ouad Solar Power Plant	0.00	2.11	2.11
	ONEE – Morocco-Portugal Interconnection Project	0.00	0.87	0.87
	Xlinks – Morocco-UK Power Project: 3500 MW Wind Power Plant in Morocco	0.00	0.64	0.64
	ONEE – Wind Integrated Programme: Phase 2	0.64	0.00	0.64
	MASEN – Moroccan Solar Plan: Noor Midelt IPP 230MW (Phase 2)	0.00	0.50	0.50
	MASEN – Moroccan Solar Plant: Noor Midelt IPP 800 MW: Phase 1	0.47	0.00	0.47
	MASEN – Moroccan Solar Plan: Noor Tata	0.00	0.38	0.38
	MASEN – Moroccan Solar Plan: Noor Midelt IPP (Noor M1)	0.35	0.00	0.35
	MASEN – Moroccan Solar Plan: Noor Midelt IPP (Noor M2)	0.35	0.00	0.35
Iraq	Ministry of Electricity – Gas-Fired Power Plants Program 11 GW in Iraq	12.77	0.00	12.77
	Harlow International – Al Khairat Thermal Power Plant: Phase 2 (1600MW)	0.00	1.65	1.65
	Harlow International – Al Khairat Thermal Power Plant: Phase 1 (1600MW)	1.41	0.00	1.41
	NIC – 2000 MW Solar Photovoltaic Power Plant in Iraq	0.00	1.17	1.17
	MOE – Artawi 1 GW Solar PV Plant	0.00	0.99	0.99
	Iraq Ministry of Electricity – 1000 MW Solar Power Plant in Najaf	0.00	0.99	0.99
	MOE – 2000 MW Iraq Solar Power Plant	0.00	0.88	0.88
	MoE – 1000MW Baghdad South Combined Cycle Power Plant	0.78	0.00	0.78
	MOE – Overhead Transmission Line & Substation	0.68	0.00	0.68
	MOE – Al Khairat 615 MW Combined Cycle Gas Power Plant	0.00	0.51	0.51
Egypt	AtomStroyExport – El Dabaa Nuclear Power Plant 4800 MW	6.57	0.00	6.57
	EEHC/Terra Sola/Terra Nex – 2000 MW PV Power Plant (FIT Model)	0.00	3.50	3.50
	Atomstroyexport – El Dabaa Nuclear Power Plant 4800 MW: Nuclear Island (Block 2)	2.37	0.00	2.37
	EuroAfrica – Euro Africa Power Interconnection	1.55	0.00	1.55
	MHUUD – Solid Waste To Energy Facilities	0.00	1.45	1.45
	MoEE – 2400MW Hydropower Power Plant in Attaqa	1.42	0.00	1.42
	EETC – 1.1 GW Wind Independent Power Project (IPP)	0.00	1.00	1.00
	EuroAfrica – Euro Africa Power Interconnection: HVDC Cable System	0.00	0.71	0.71
	EETC/SEC – Saudi Egypt HDVC Power Interconnection	0.67	0.00	0.67
	Italgen – Gabal Al Zeit Wind Farm (Merchant IPP Model)	0.00	0.53	0.53

Country	Project	Committed	Planned	Total
Kuwait	KAPP – Al Zour North IWPP	6.82	0.00	6.82
	KAPP – Shagaya Renewable Energy Complex: Phase 3	0.00	2.09	2.09
	KAPP – Al Zour North IWPP: Phase 2 & 3: Power Plant	0.00	2.08	2.08
	KAPP – Doha East Power & Desalination Plant (IWPP)	0.00	1.96	1.96
	MEW – Shuaiba South Power and Desalination Plant	0.00	1.75	1.75
	MEW – Nuwaiseeb Power and Water Desalination Plant: Phase 1	0.00	1.01	1.01
	KAPP – Al Zour North IWPP: Phase 4: Power Plant	0.00	0.77	0.77
	KAPP – Al Zour North IWPP: Phase 5: Power Plant	0.00	0.77	0.77
	MEW – Nuwaiseeb Power and Water Desalination Plant: Phase 2 3600 MW	0.00	0.72	0.72
	KAPP – Al Khiran IWPP: Phase I: Power Plant	0.00	0.38	0.38
Algeria	Sonelgaz – Renewable Energy Program 22000 MW	0.00	4.46	4.46
	Ministry of Energy Transition and Renewable Energy – Solar 1000 MW Project	0.00	3.60	3.60
	Ministry of Energy and Mining– 1000 MW Solar PV Park 1 at Algiers	0.00	2.00	2.00
	Ministry of Energy and Mining– 1000 MW Solar PV Park	0.00	1.00	1.00
	Ministry of Energy and Mining– 1000 MW Solar PV Park 3	0.00	1.00	1.00
	Sonatrach/Sonelgaz/AME – Tafouk 1 Solar Project 800MW: Phase 3	0.00	0.72	0.72
	Sonatrach/Sonelgaz/AME – Tafouk 1 Solar Project 800MW: Phase 4	0.00	0.72	0.72
	Sonatrach/Sonelgaz/AME – Tafouk 1 Solar Project 800MW: Phase 5	0.00	0.72	0.72
	Sonatrach/Sonelgaz/AME – Tafouk 1 Solar Project 800MW: Phase 1	0.00	0.72	0.72
	Sonatrach/Sonelgaz/AME – Tafouk 1 Solar Project 800MW: Phase 2	0.00	0.72	0.72
UAE	ADNOC/TAQA – Sub-Sea Power Transmission Network	2.97	0.00	2.97
	Noor Energy 1 – Mohammed Bin Rashid Al Maktoum Solar Park 950 MW CSP (Phase 4)	2.97	0.00	2.97
	ADPC/TAQA – 2GW Solar Farm	0.00	1.96	1.96
	DEWA – Mohammad Bin Rashid Al Maktoum Solar Park	1.77	0.00	1.77
	EWEC – Abu Dhabi Third Solar IPP	0.00	1.09	1.09
	SHIPCO – Hamriyah IPP	0.72	0.00	0.72
	Dubai Municipality – Al Warsan Waste to Energy Plant	0.62	0.00	0.62
	Hassyan Energy – Hassyan Gas Power Plant IPP (Phase 1 & 2)	0.62	0.00	0.62
	EWEC – Al Dhafra Second Solar IPP	0.61	0.00	0.61
	EWEC/TADWEER – Al Dhafra Waste-To-Energy Project	0.00	0.60	0.60
Iran	IWPC – Bakhtiyari Hydro-Power Project	2.77	0.00	2.77
	AEOI – Bushehr Nuclear Plant Unit 3	2.62	0.00	2.62
	AEOI – Bushehr Nuclear Plant Unit 2	2.12	0.00	2.12
	Mobarakeh Steel Company – Thermal Power Plant Expansion	0.00	1.20	1.20
	Thermal Power Plants Holding Company – Sirik Power Plant (1,400 MW)	1.01	0.00	1.01
	Iran Ministry of Energy/KEPCO – Chabahar Power Plant	0.00	1.00	1.00
	PGSEZ – Persian Gulf Special Zone Power Plant	0.00	1.00	1.00
	South Aluminium Co – South Aluminum Power Plant	0.00	0.78	0.78
	Sirjan Gohar Energy Company – Gol Gohar Power Plant Expansion	0.00	0.71	0.71
	Ministry of Energy – Tabriz Combined Cycle Power Plant	0.00	0.70	0.70
Libya	GECOL – Tripoli IWPP	0.00	1.10	1.10
	GECOL – Benghazi South IWPP	0.00	1.00	1.00
	GECOL – 1320 MW New South Tripoli Gas-Fired Power Plant	0.00	0.90	0.90

Country	Project	Committed	Planned	Total
	GECOL – Zwara Combined Cycle Power Plant	0.00	0.58	0.58
	GECOL – Zueitina IWPP	0.00	0.50	0.50
	MOE – Mabruk Solar Power Plant in Libya	0.00	0.49	0.49
	GECOL – 240MW Al Maqrun Wind Farm	0.00	0.30	0.30
	GECOL – 740MW Tobruk Simple Cycle Power Plant	0.19	0.00	0.19
	GECOL – 200MW Solar Power Plant in Ghadames	0.16	0.00	0.16
	GECOL – Gas Fired Power Plant 164 MW	0.00	0.13	0.13
Qatar	KAHRAMAA – Facility E IWPP 2600MW	0.00	2.38	2.38
	Qatar Energy – 800 MW Solar PV Plant in Qatar	0.00	0.32	0.32
	KAHRAMAA – Facility E: Power Evacuation and IWPP	0.00	0.22	0.22
	KAHRAMAA – Qatar Transmission Phase 13: Cables (GTC/736/2015)	0.09	0.00	0.09
	KAHRAMAA – Facility E IWPP: 400kV Substation	0.00	0.09	0.09
	KAHRAMAA – Facility E IWPP: Supply & Installation of 220kV & 132kV Cables	0.00	0.08	0.08
	KAHRAMAA – 400kV Current Limiting Reactors at Abu Nakhlah Substation	0.08	0.00	0.08
	KAHRAMAA – Qatar Transmission Phase 13: Substation Package S8,9,12,13,14,15 & 16	0.07	0.00	0.07
	KAHRAMAA – 400kV Substation in Qatar	0.07	0.00	0.07
	KAHRAMAA – Facility E IWPP: Supply & Installation of 400kV Cables for Facility E	0.00	0.06	0.06
Bahrain	MoWMU – Askar Waste to Energy Plant	0.00	0.79	0.79
	EWA – Addur 3 Power Plant	0.00	0.67	0.67
	MEW – Addur 4 IPP	0.00	0.54	0.54
	MEW – 220kV & 66kV Transmission Development (2012-2016)	0.51	0.00	0.51
	Aluminium Bahrain – Alba Power Station 5: Block 4	0.28	0.00	0.28
	EWA – 100 MW IPP Solar PV Plant in Askar	0.13	0.00	0.13
	MMUAP – Integrated Waste Energy Plant	0.00	0.10	0.10
	EWA – 220kV OHTL from UAH to SITRA BSP Substations	0.00	0.10	0.10
	USACE – P-974 Electrical System Upgrade	0.00	0.10	0.10
	EWA – 220kV Hidd, Riffa & Manama Substation (DRPC)	0.09	0.00	0.09
Oman	Oman Environmental Services Holding Co – Waste To Energy To Water Plant in Oman	0.00	0.75	0.75
	OPWP – Manah Solar 2 IPP	0.00	0.50	0.50
	OPWP – Manah Solar 1 IPP	0.00	0.50	0.50
	Hebei Electric / Ningxia Electric JV – SEZAD – 300MW Coal Power Plant	0.00	0.41	0.41
	OETC – 400kV North South Interconnection	0.27	0.00	0.27
	OPWP – 200MW Dhofar III Wind Power Plant (IPP)	0.00	0.20	0.20
	OPWP – 200 MW Duqm Wind IPP	0.00	0.20	0.20
	Tanweer – 146MW Hybrid Solar-Diesel IPP	0.00	0.18	0.18
	OPWP – 150MW Dhofar II Wind Power Plant (IPP)	0.00	0.15	0.15
	SSDC – Biomethane And Solar PV Power Generation Plant	0.00	0.13	0.13
Lebanon	Lebanese Center for Energy Conservation – Lebanon Wind Power Program Round 2	0.00	0.92	0.92
	LCEC – Concentrated Solar Power Plant 50 MW in Hermel	0.00	0.30	0.30
	MEW – 300MW Solar photovoltaic Farms (Energy Storage)	0.00	0.30	0.30
	MEW – 500 MW Power Plant in Lebanon	0.00	0.30	0.30
	MEW – 500 MW Power Plant in South Lebanon	0.00	0.30	0.30
	MEW – 220kV Marina Dbayeh Substation	0.00	0.15	0.15

Country	Project	Committed	Planned	Total
	Lebanese Center for Energy Conservation – Sustainable Akkar Wind Farm 90.75MW	0.13	0.00	0.13
	Lebanese Center for Energy Conservation – Lebanon Wind Power 68.30 MW	0.10	0.00	0.10
	MEW – 100 MW Wind Power Project in Akkar	0.00	0.10	0.10
	MEW – 100 MW Wind Power Project in Beqaa	0.00	0.10	0.10
	MEW – 100 MW Wind Power Project in Mount Lebanon	0.00	0.10	0.10
Tunisia	Terna/STEG – Italy-Tunisia HVDC Power Interconnector	0.00	0.70	0.70
	STEG – Nabeul: 200 MW Wind Power Plant	0.00	0.28	0.28
	STEG – Overhead HV Power Cables Connecting Solar Plants	0.00	0.20	0.20
	STEG – Electricity Transmission Network : AIS Substation	0.17	0.00	0.17
	STEG – Medenine 50MW Solar Power Plant	0.00	0.10	0.10
	TMIESME – 500 MW Solar PV IPP	0.10	0.00	0.10
	TMIESME – Solar PV IPP 500MW: 200MW in Tataouine	0.07	0.00	0.07
	STEG – Beni Mehira Solar Power Plant 50MW	0.00	0.07	0.07
	STEG – Skhira-Kondar-Thyna Transmission Line	0.00	0.07	0.07
	STEG – Kasserine: 50MW Solar Power Plant	0.00	0.07	0.07
Sudan	SETCO – 500kV Khartoum Ring Project	0.00	0.22	0.22
	STPGC – El Shaheed Thermal Power Plant	0.00	0.20	0.20
	Sudan Ministry of Energy & Mining – 500MW Solar Power Plant	0.00	0.20	0.20
	Sudan Ministry of Energy & Mining – Al Bagir Power Generation Station	0.00	0.20	0.20
	Sudan Ministry of Energy & Mining – Al Foula Power Plant	0.00	0.10	0.10
	Sudan Thermal Generation Company – Garri 3 Power Plant	0.05	0.00	0.05
	USAID – Juba Compound Electrical Upgrade	0.00	0.05	0.05
	Sudanese Thermal Power Generating Company – Port Sudan Power Plant	0.03	0.00	0.03
Jordan	MEMR – Jordan Renewable Energy Round 3: 150MW Photovoltaic Solar Plant	0.00	0.25	0.25
	NEPCO – Resha Substation Transformers & Ancillary Equipment	0.00	0.09	0.09
	NEPCO – New Substations and Expansion of Substations 132/33 KV	0.00	0.08	0.08
	Attarat Power Company – Oil Shale Fired Power Station at Attarat Um Ghudran	0.08	0.00	0.08
	WAJ – 24MW Solar PV Power Plant At Disi	0.05	0.00	0.05
	GE/ Mass Energy – Tafilha Wind Power Plant 100 MW	0.04	0.00	0.04
	APC – APC Thermal Power Plant 40MW	0.00	0.04	0.04
	APC –Thermal Power Plant 40 MW	0.02	0.00	0.02
	NEPCO – Resha Substation Switchgear & Ancillary Equipment	0.00	0.02	0.02
	Majid Al Futtaim – 17MW Solar Power Park For Carrefour Stores in Amman	0.00	0.02	0.02
Yemen	Khalifa Bin Zayed Al Nahyan Foundation – 120MW Power Station in Aden	0.00	0.10	0.10
Grand Total		**71.72592**	**114.655**	**186.3809**

Top Hydrogen projects by Country and Value (USD Bn)

Country	Project	Total
Egypt	EEHC/EGAS – Green Hydrogen Facility	3.99
	SCZONE – Waste to Hydrogen Plant (1 GW)	2.94
	TAQA Arabia – Green Hydrogen Project in Egypt	0.49
	MoEE – Green Hydrogen Plant	0.20
	Scatec/SCZone – Green Hydrogen Plant in Ain Sokhna	0.20
	Scatec Solar/Fertiglobe/TSFE – 100MW Green Hydrogen Facility	0.16
Jordan	Fortescue Future Industries – Hydrogen Production Plant	0.50
KSA	NEOM Green Hydrogen Co – Helios Green Fuels Project: Ammonia & Hydrogen Plants	0.59
	ACWA Power/NEOM/Air Products – Helios Green Fuels Project	0.52
	SWCC/Cummins – Hydrogen Gas Production Plant	0.50
	SA/MIG/IE – Green Hydrogen and Ammonia Plant	0.50
	PIF – Green Hydrogen Production Plant	0.49
	ACWA Power/NEOM/Air Products – Helios Green Fuels Project: Electrolysis Plant	0.40
	ACWA Power/NEOM/Air Products – Helios Green Fuels Project: Green Ammonia Plant	0.30
Morocco	MoEM – Hevo Ammonia Morocco Project	0.83
	Masen – 100MW Green Hydrogen Facility	0.20
Oman	OQ – SalalaH2 Green Ammonia	5.89
	Acwa Power/OQ/Air Products – Green Hydrogen and Green Ammonia in Dhofar	1.04
	Oman Ministry of Oil and Gas – Hyport Duqm	0.98
	Sumitomo Corp/ARA Petroleum – Hydrogen Production Facility	0.64
	SEZAD/ACME – Green Hydrogen & Ammonia Facility	0.59
	SEZAD/ACME – Green Hydrogen & Ammonia Facility: Phase 1	0.31
	Acme Group/ Scatec ASA – Green Ammonia Facility	0.00
UAE	Taziz/Fertiglobe – Taziz: Blue Ammonia Production Facility	1.87
	Helios Industry – Green Hydrogen and Green Ammonia Plant at Kizad	0.98
	ADPC/TAQA – Green Hydrogen Plant	0.59
	Beeah – Waste to Hydrogen Plant in Sharjah	0.18
	Borouge – EU3 Hydrogen Extraction Unit for B3 Project	0.15
	ADPC/TAQA – Green Hydrogen To Ammonia Export Project	0.15
	Abu Dhabi Future Energy Company – Masdar City: Green Hydrogen Demonstrator Plant	0.05
Grand Total		**26.2**

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