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# DRIVING ECONOMIC IMPACT FROM THE FUTURE ENERGY EVOLUTION

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# INTRODUCTION

The energy industry and associated technologies are continually evolving as demand, supply and consumer preferences change, supported and spurred by economic development and advances in technology.

In the past, the trend has been toward adopting sources with high energy content, moving from coal to oil and finally, natural gas. At the beginning of the 20th century, the power generation sector predominantly relied on coal but gradually shifted toward oil and petroleum products, more so in the latter part of the 20th century. As technologies evolved, natural gas and nuclear fission emerged as promising sources of energy, while renewable sources of energy such as hydroelectric, wind and solar were slowly starting to be tapped but had a limited contribution to the overall energy mix—restrained primarily by costs.

In the 21st century, the global energy industry is rapidly shifting toward low-carbon energy sources, with hydrocarbon resources like coal and oil gradually losing penetration. While non-hydro renewables like wind, solar, geothermal and biomass are expected to grow substantially, it is expected that the majority of the global electricity demand will still be met by coal and natural gas through to 2040, with commercial factors playing a defining role in the evolution of the industry.

This energy evolution/transition is now one of the most prolific and impactive global mega trends , as cleaner energy contributes to the world's aspirations for net-zero.

Renewable energy and energy efficiency are two of the most critical pathways for energy evolution, providing solutions for reducing carbon emissions at the necessary speed and scale required to restrict and contain global temperature increases. They can provide 90% of the energy-related emissions reductions through technologies that are both well-established and cost-competitive.[i]

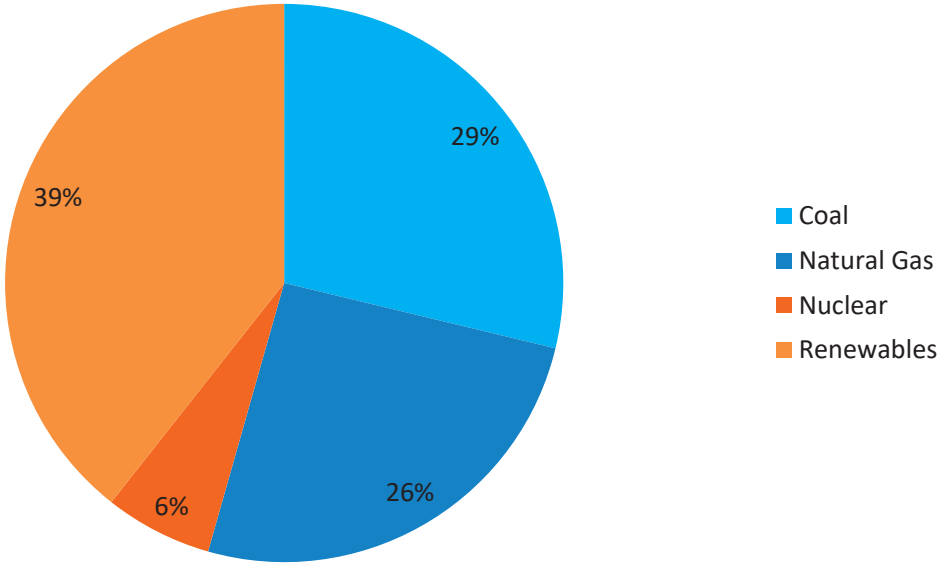
## As we move forward, we can expect to see decentralisation, decarbonisation and digitalisation as the main pillars that will shape the next wave of energy evolution.

- **Decentralisation :** Decentralisation (and distributed generation) refers to reducing electricity reliance on a limited number of large and centralised electricity-generating stations and moving toward dispersed generation characterised by a number of smaller plants. This enables end users/customers to play a more dynamic role in the electricity value chain, where they can supply electricity to the grid and select and buy cheaper electricity based on availability. Examples include combined heat and power units (CHP), rooftop solar photovoltaic (PV), small wind turbines, and hybrid systems (diesel/gas and solar) with battery storage.
- **Decarbonisation :** Decarbonisation as a trend involves the targeted reduction and elimination of hydrocarbon-based fuels from the value chain. Multiple modalities are being adopted to decarbonise the value chain, including renewable-based electricity generation, energy efficiency improvements across industrial, residential and commercial end users, as well as the shift toward cleaner mobility like electric and hydrogen/fuel cell vehicles.
- **Digitalisation :** Decentralisation and decarbonisation are bringing increasing dynamism into the energy market, resulting in increased complexity. Effective management and monitoring of these changing dynamics have become critical across the generation, transmission and distribution segments of the electricity value chain. In addition, electricity systems will have to consider smart transport systems and services that would require precise, real-time monitoring and control. This will be achievable through state-of-the-art digital technology that would be implemented across all aspects of the electricity value chain. Digitalisation is a key solution to this challenge/need, providing technology upgrades in the existing infrastructure that can improve the operational efficiencies of assets to adequately respond to growing challenges in electricity generation and consumption.

## GOVERNMENTS GLOBALLY HAVE PLACED A MAJOR RESPONSIBILITY ON THE ENERGY SECTOR TO MITIGATE CLIMATE CHANGE, WHICH WILL DRIVE INVESTMENTS IN ALTERNATIVE CLEAN ENERGY.

Globally, electricity generation has been dominated by traditional hydrocarbon sources like coal and natural gas, cumulatively accounting for over 54% of the total installed capacity globally, with the remaining capacity accounted for by hydroelectric power, renewables and nuclear.[ii] While hydropower has remained the most dominant source of renewable energy, recent acceleration in investments in wind and solar power has resulted in their installed capacity exceeding that of hydropower. [iii, iv, v]

### FIGURE 1: GLOBAL INSTALLED POWER GENERATION CAPACITY, BY FUEL TYPE, 2020




Source: US EIA, IEA, Carbon Brief, IRENA, Frost & Sullivan Analysis

Global installed power generation capacity increased from an estimated 6,213GW in 2015 to 7,108GW in 2020. The total installed power generation capacity globally increased at 3.1% CAGR between 2015 and 2020. However, the highest growth in installed capacity has been recorded by renewable energy, while fossil fuel-based power generation has witnessed a decline, primarily due to the shutdown of coal-fired power stations in Europe.

While renewable energy recorded strong growth in capacity addition, this has been predominantly driven by large-scale investments in wind and solar power generation. Off-grid/distributed generation capacity has also increased, with global capacity additions reaching 10.6GW in 2020.[vi]

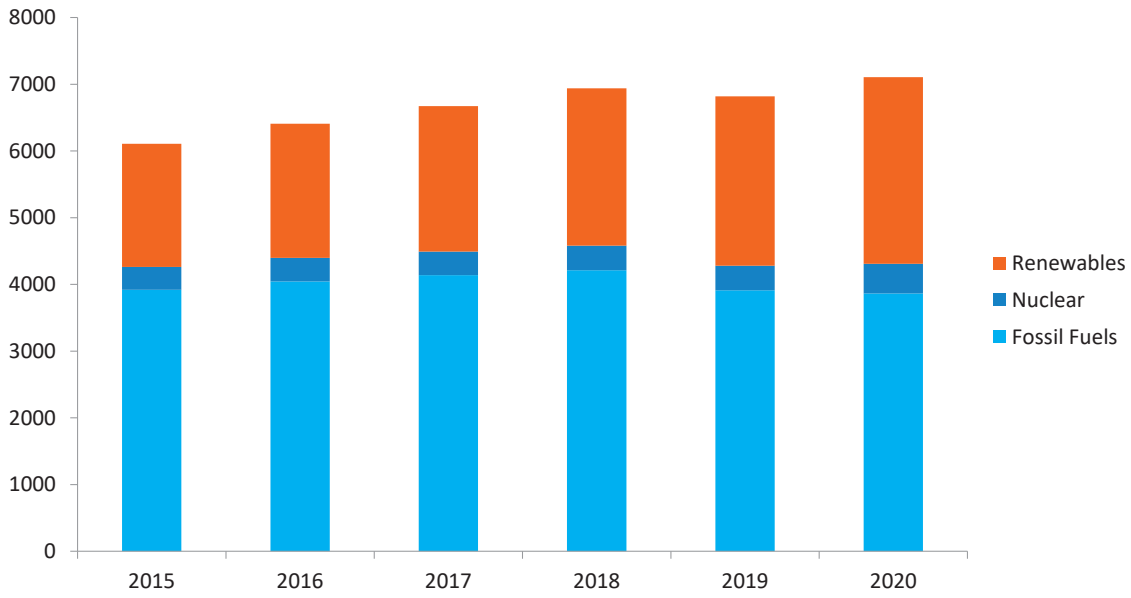
Despite the COVID-19 pandemic, over 260GW of renewable capacity addition was recorded in 2020, exceeding the recorded capacity addition in 2019 by 50%. Over 80% of all new electricity capacity addition in 2020 was renewables-based, with solar and wind accounting for 91% of new renewables addition.

## TABLE 1: GROWTH IN INSTALLED GENERATION CAPACITY, GLOBAL, 2015 TO 2020 [vii, viii, ix]

| Technology | Installed Capacity Growth (% CAGR) |
|---|---|
| Total Installed Power Generation (all technologies) | 3.1% |
| Renewable Energy | 8.7% |
| Fossil Fuel-based Power Generation | -0.3% |
| Solar Power Generation | 26.3% |
| Wind Power Generation | 12.0% |

Source: US EIA, IRENA, Frost & Sullivan Analysis

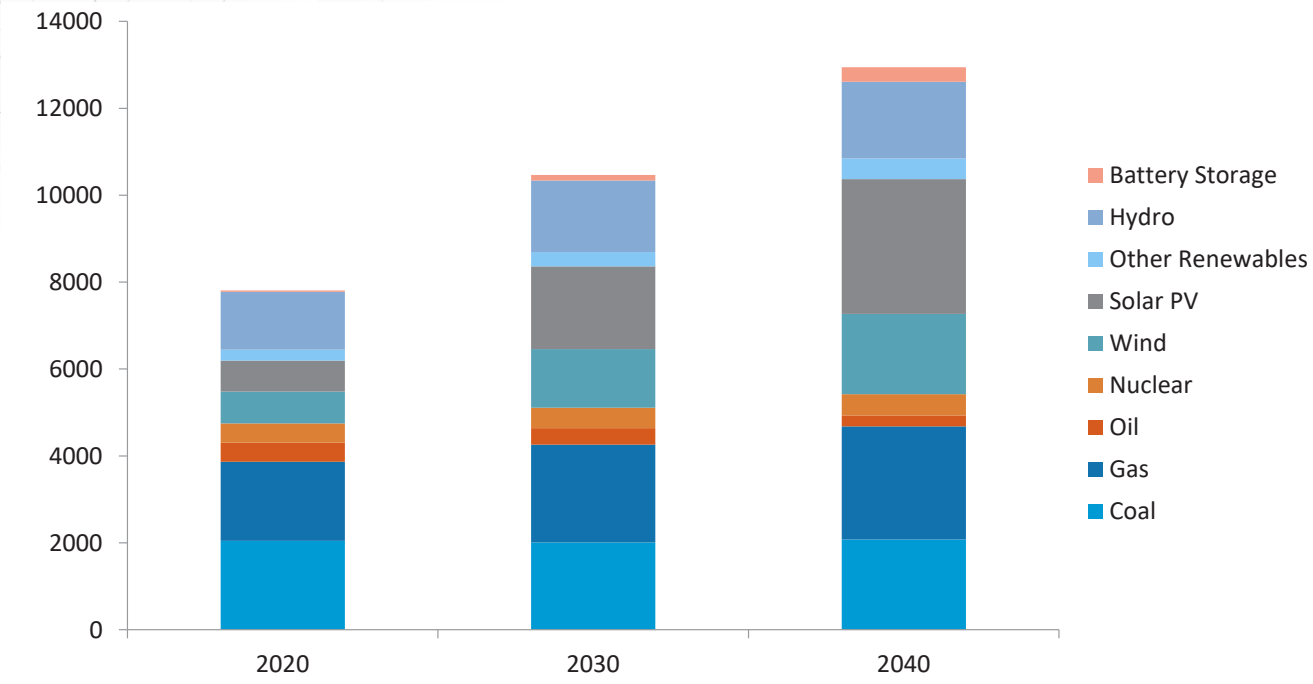
## FIGURE 2: EVOLUTION OF GLOBAL INSTALLED POWER GENERATION MIX (IN GW), 2015 TO 2020




Source: US EIA, IRENA, Carbon Brief, IEA, Frost & Sullivan Analysis

Renewable energy growth witnessed over the past decade will continue over the next two decades, with increasing investments in solar PV and wind power capacity. Solar PV capacity is expected to grow more than 4X to over 3,100 GW, and wind capacity approximately 2.5X to 1,850 GW by 2040, according to the International Energy Agency's (IEA) reference Stated Policies Scenario.[x] Gas-based power generation is expected to play a crucial role in supporting/complementing renewable generation and will witness growth over the next couple of decades. However, investment across coal power generation is anticipated to remain almost stagnant while oil-based power generation will witness a continuous decline.

## FIGURE 3: INSTALLED POWER GENERATION CAPACITY (IN GW) BY FUEL, GLOBAL, 2020 TO 2040




Source: IEA, Frost & Sullivan Analysis

Between 2020 and 2040, installed generation capacity for solar PV, wind and battery storage is anticipated to grow at 7.6%, 4.7% and 12.8%, respectively, in CAGR terms.[xi]

While growing concerns about climate change and its impact on human civilisation have been a key driver for decarbonisation and clean energy adoption, the environmental aspect is not solely responsible for the rapid rise in renewable capacity globally. Strong public policy and regulations supporting renewables, increasing corporate commitments, and rising costs of carbon-based fuels like coal and natural gas have cumulatively contributed to the rise of renewable energy. However, one of the biggest contributing factors to the renewable growth story has been the declining cost of technology, typically solar PV, wind and battery storage. Since 2010, costs of solar PV-based electricity have fallen by over 85%, while costs for onshore and offshore wind power have reduced by about half. [xii, xiii] These renewable sources are now cost-competitive with traditional fossil fuels. The more these technologies are deployed, the cheaper they will become due to economies of scale and more competitive supply chains.

Over the past decade (between 2010 and 2019), an estimated US$ 2.6 trillion has been invested in renewable capacity addition (excluding large hydro projects). While solar is estimated to have attracted US$ 1.3 trillion, wind and biomass/waste to energy have secured an estimated US$ 1.0 trillion and US$ 115 billion respectively during the same period. [xiv] The world committed a record US$ 501.3 billion to decarbonisation in 2020, beating the previous year's investment by 9% despite the economic disruption caused by the COVID-19 pandemic. [xv]

The International Renewable Energy Agency (IRENA) estimates an average annual investment of 2.0% of global GDP needs to be committed until 2050 toward decarbonisation solutions, including renewable energy, energy efficiency and other technologies.[xvi] US$ 131 trillion will need to flow into an energy system over the period to 2050 that prioritises technology avenues compatible with a 1.5°C Pathway.[xvii]

It is important to note here that all investments highlighted above indicate the value that has been dedicated to developing projects that would play a vital role in countries meeting their decarbonisation and NDC mandates. However, the economic impact of these projects is not limited to the projects-based investments alone but has a wide-ranging, socio-economic impact that needs to be considered to ascertain the overall impact that energy transition has on the economy of a country and the world at large. Steps taken toward decarbonising the economy will positively affect economic activity, jobs and welfare, provided an appropriate and holistic framework is implemented.

Renewable energy jobs have witnessed an upswing, increasing from 7.3 million in 2012 to 11.5 million in 2019. Of the total estimated 58 million jobs in the energy sector in 2019, roughly 20% of these jobs were in the renewable sector. Growth in jobs linked to the energy sector is anticipated in the future, with estimates indicating that a "transformed energy sector" would have 122 million jobs in 2050. Jobs related to renewable energy are expected to increase to 43 million in 2050.[xviii] Construction, installation and manufacturing will boost renewable energy jobs, with Operation & Maintenance (O&M) job opportunities gaining traction as energy transition advances in the coming decades.

In its 2016 analysis, "Renewable Energy Benefits: Measuring the Economics," IRENA noted that doubling the share of renewables by 2030 could increase the global GDP by up to 1.1% or US$ 1.3 trillion, support over 24 million jobs in the sector and improve welfare by up to 3.7%.[xix] With appropriate policies in place, renewable energy and energy efficiency will have a consistently positive impact on global GDP until 2050, with GDP gains varying between 1.0% and 1.5%. The main macroeconomic drivers include investment, trade, tax changes, and indirect and induced effects.[xx] In the short to medium term, the positive impact on global GDP will be driven by investment stimulus and carbon tax revenues. Indirect and induced effects are expected to play a more significant role in the longer term (post-2035) of the transition period. Reduced energy expenditure and reallocation of this to other spheres of the economy, larger supply chains and increased wages are some of the anticipated indirect and induced benefits to the GDP that renewable energy and energy efficiency are expected to offer.

A key aspect shaping the energy transition's socio-economic impact is the manufacturing, trading, installation and maintenance of equipment and facilities that are expected to support the growth in renewable energy installations. Similar activities are also expected to drive the socio-economic impact for other decarbonisation modalities, such as energy efficiency, energy flexibility and system integration. Countries and regions that demonstrate the strongest capacity (in terms of regulations, policy, infrastructure, manufacturing capability, manpower skillsets and training) to produce and export these systems and services will be strategically positioned to reap greater benefits from the expected energy transitions.

For example, for a typical 50MW onshore wind turbine project, an estimated 23,000 tons of concrete is needed for the construction of the site's foundations. Nearly 6,000 tons of steel and iron are needed for the turbines and foundations. [xxi] Additionally, a project of this capacity would entail 14,000 person-days. Manufacturing the main components of a wind turbine and developing the foundations also requires specialised equipment. Welding, lifting and painting machines are some of the key activities of wind turbine manufacturing that also find applications across sectors like construction and aeronautics. Wind turbine foundations also require the use of specialised equipment, including rolling, drilling and welding machinery along with specialised vessels, cranes and other transportation equipment that is required to move big structures.

A recent study undertaken by the United Nations Environment Program (UNEP) highlighted the impact of the energy transition on the environment and human health, but also for improving economic status and the creation of employment opportunities. As a key driver of the COVID-19 economic recovery in Panama, the energy transition has demonstrated how an increase in climate ambition is directly proportional to the economic benefits received over time. In the study, UNEP found the economic profits to double the original investment, and in most ambitious scenarios, the economic benefits accrued can even triple that of the original investment. The contribution to Panama's economy has been estimated at US$ 160.65 billion, which effectively translates into a 2.35% additional increase in GDP and the creation of over 10,000 direct jobs.[xxii]

Turkey is another example that can be cited as benefiting from the socio-economic impact of renewable energy implementation. Turkey has rapidly developed into a leading market for wind energy, and the country has recently achieved a cumulative wind energy capacity of 10,000MW, accounting for 10% of the country's electricity mix, and further aims to add 20,000MW of wind energy by 2030.[xxiii] Over the past decade, Turkey has developed a strong wind energy supply chain, which has also expanded continuously. Many global companies have set up their production facilities in Turkey, with over 3,580 companies currently active in the Turkish wind energy market and 25,000 people directly or indirectly employed by the sector.[xxiv] Further, wind power generation has been estimated to replace $1 billion worth of natural gas imports.[xxv] Turkey was also the fifth-largest wind turbine equipment manufacturer in Europe in 2020. To date, there are 77 wind turbine equipment producers with production facilities in Turkey, which export equipment into 45 countries across six continents, all contributing to the economic growth prospects of the country.

It is clear that energy evolution, either through diversified resources or through energy optimisation directly or indirectly, has a positive impact on the economy. This impact has been evident across projects and investments that have been made over the previous decade and will continue through envisaged future investments in energy diversification. Economies able to adapt to this transition while supporting the development of local capabilities and capacity will witness an increase in economic activity through business activities that are directly or indirectly linked to the evolution of the energy value chain.

This phenomenon is not restricted to global economies alone, and the effects of energy evolution and its socio-economic impact on regions and geographies have started to manifest across the GCC and wider MENA region. Developed and developing economies are reducing dependencies on fossil fuels and striving for a cleaner and sustainable energy future—one which is predominantly driven by green energy. Reduced global demand for oil and natural gas directly impacts GCC countries, which rely heavily on these resources for economic growth and budgetary allocations. This is pushing GCC economies toward economic diversification. Reduced domestic fossil fuel usage implies a greater export-oriented opportunity for GCC countries while also boosting capacities for downstream production of value-added chemicals and products. This, together with a strong solar and wind resource profile, is driving the evolution of the energy sector in the GCC and MENA region.

**THE GCC IS EXPERIENCING AN ENERGY TRANSITION THAT HAS NEVER BEEN WITNESSED BEFORE—THIS WILL SHAPE THE FUTURE OF ECONOMIC ACTIVITY AND INVESTMENTS IN THE REGION.**

GCC countries have amongst the highest global per capita electricity consumption rates and also feature amongst the top 10 countries in terms of per capita GHG emissions. Qatar's per capita emissions rate in 2017 has been estimated at 8x the global average. Exacerbating this issue, electricity and energy demand have steadily risen across the GCC. Electricity consumption has increased at 3.15% annually, which is higher than the global average of 2.2%. Increasing demand for electricity necessitates the need for additional investments in generation capacities while also ensuring that steps are taken toward the long-term sustainability of available resources and mitigating the negative impacts of climate change that have global and regional ramifications.

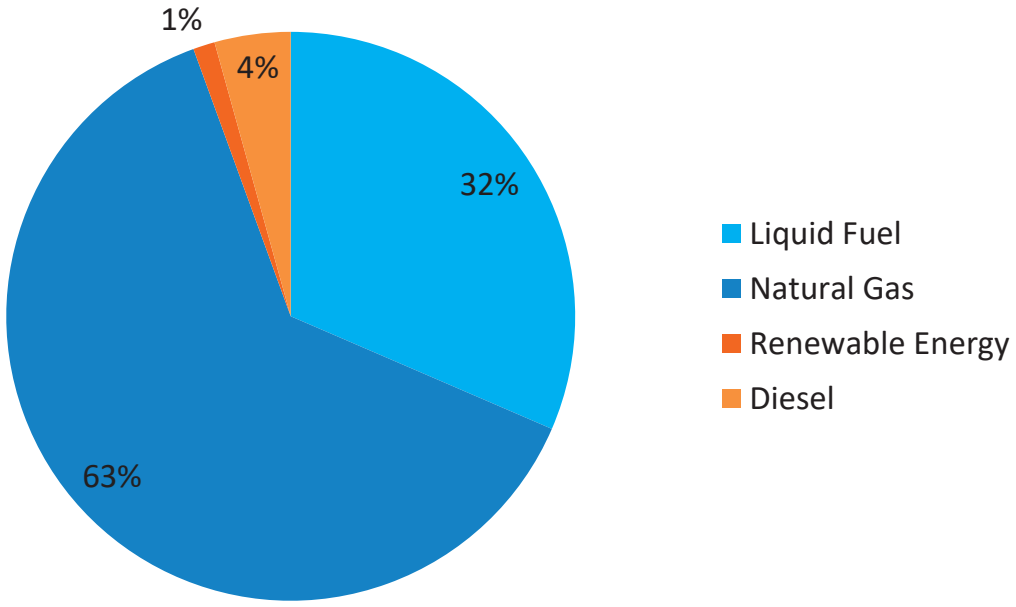
## TABLE 2: ELECTRICITY GENERATION CAPACITY AND PEAK DEMAND, GCC, 2019/2020 [xxvi]

| Technology | Installed Capacity (GW) | Peak Demand (GW) |
|---|---|---|
| Bahrain | 3.90 | 3.40 |
| Kuwait | 19.67 | 14.40 |
| Oman | 11.09 | 6.99 |
| Qatar | 10.50 | 7.90 |
| Saudi Arabia | 85.20 | 63.20 |
| United Arab Emirates | 32.61 | 26.10 |

Source: Respective Power Utility & Regulatory Authority Publications, Frost & Sullivan Analysis

The abundance of crude oil and natural gas reserves has resulted in the GCC region relying heavily on these reserves to meet the demand for electricity from its residential, commercial and industrial sectors. Thermal power through liquid fuel and gas-fired power stations accounts for approximately 98.7% of the region's installed power generation capacity.

## FIGURE 4: GCC INSTALLED POWER GENERATION CAPACITY, BY FUEL TYPE, 2020



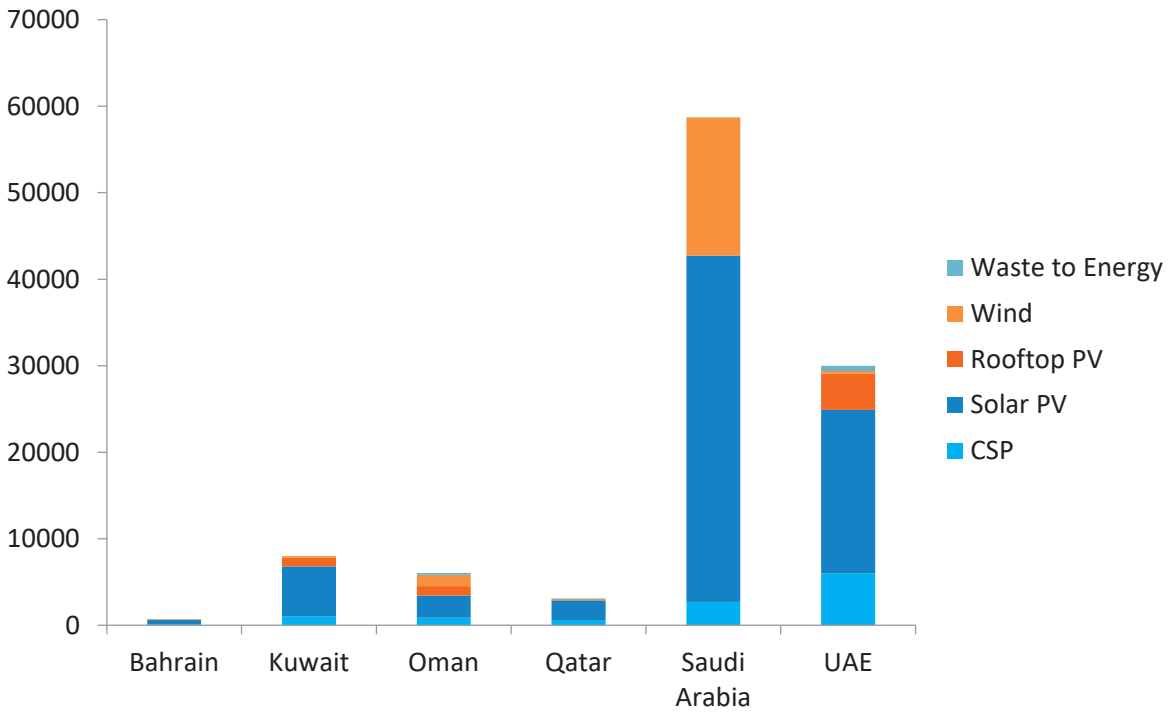

Source: Respective Power Utility, Regulatory Authority and Ministry Publications, Frost & Sullivan Analysis

As previously mentioned, electricity consumption/demand has been rising across the GCC, which is reflected in increased installed generation capacity from an estimated 138-140GW in 2016 to 162GW in 2019.[xxvii] A growing population, diversification of economic activities and increasing industrial output are expected to impact future electricity demand, where peak electricity demand across the region is anticipated to increase from the current 122GW to over 250GW in 2030.[xxviii] This increase in electricity demand necessitates additional investments in generation capacities while also ensuring that steps are taken to optimise energy usage across different sectors.

Realising the impact of climate change on human civilisation and the economy, each of the GCC member countries has ratified the Paris Agreement to transform their developmental agendas such that they set the world on a course for sustainable development while limiting warming to 1.5 to 2 degrees Celsius above pre-industrial levels. Nationally determined contributions (NDC) form the backbone of the Paris Agreement and represent efforts by each country to reduce national emissions while adapting to climate change impacts. Each of the GCC member countries declared its own NDCs and the modalities for achieving them. GCC countries currently seek to achieve energy sustainability through a combination of renewable energy integration and energy-efficiency implementations of electricity consumption, which will also drive the evolution of the energy sector in the region.

GCC countries are seeking to transform the region's power sector, and renewable energy has been identified as a key pillar of this transformation. The region has fast emerged as a hotspot for renewable energy, investments in which can make the region a world leader in renewable energy markets. Renewable energy across the GCC has grown at a staggering 69% CAGR since 2015, increasing from 175MW in 2015 to 2,446MW in 2020. The UAE has emerged as the front-runner in the adoption of renewable energy across its value chain. All GCC countries have outlined their vision for energy diversification. Based on these vision documents, it is estimated that the GCC would witness a cumulative installed renewable generation capacity of over 105GW by 2030. [xxix]

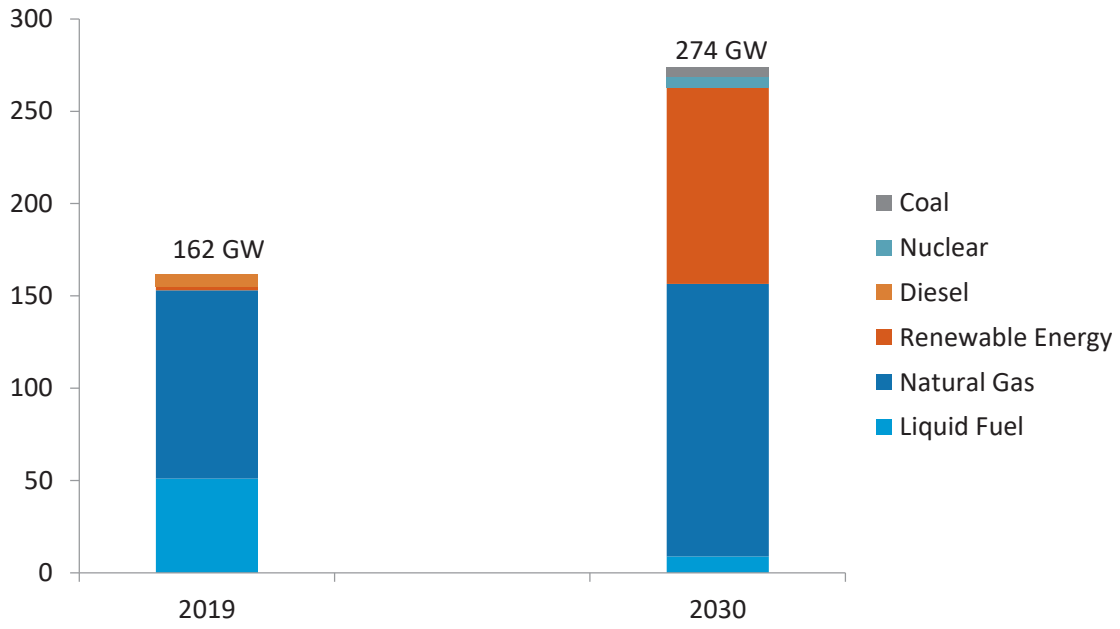
## FIGURE 5: RENEWABLE ENERGY TARGETS (IN MW), GCC, 2030




Source: Respective Power Utility, Regulatory Authority and Ministry Publications, Frost & Sullivan Analysis

If commitments by the GCC government are realised during the current decade, renewable energy contribution to the overall generation mix is expected to increase from slightly over 1% in 2019 to over 38% in 2030. [xxx]

## FIGURE 6: EVOLUTION OF POWER GENERATION MIX, GCC, 2019 VS. 2030




Source: Respective Power Utility, Regulatory Authority and Ministry Publications, NDC Commitments, Frost & Sullivan Analysis

Over the past 15 years, the UAE has invested an estimated US$ 40 billion in clean energy and plans to invest an additional US$ 163 billion in renewable energy toward achieving its plan of net-zero emissions by 2050.[xxxi] With the climate change commitments and sustainable development goals of countries in the region, the deployment of renewables will be accelerated, with estimated investments between 2020 and 2025 expected to be US$ 182.3 billion, growing to US$ 341.1 billion by 2030.[xxxii]

While grid-scale renewable energy has gathered pace in the region, countries like UAE and Oman have also been working toward developing the distributed energy space in the country by establishing frameworks for on-site energy generation through rooftop and ground-mounted solar PV as well as hybrid technologies. Distributed energy technologies like rooftop solar PV, PV diesel hybrid systems, and diesel and gas gensets will present a US$ 3.5 billion cumulative opportunity by 2025.[xxxiii] The Shams Initiative in Dubai and the Sahim Initiative in Oman are examples of regulations and policies that will positively impact the market for distributed energy in the region.[xxxiv]

In addition to renewable energy integration, energy efficiency has been identified as a key modality in the evolution of the energy sector in GCC. Countries like UAE and KSA have set targets of achieving 40% and 20% improvements in energy consumption efficiency, respectively, which would be driven by energy efficiency implementations and technologies across the buildings and industrial sector predominantly. In the UAE alone, Frost & Sullivan estimates the total energy-saving potential across buildings (excluding residential and infrastructure) to be in excess of 4,500GWh while the same for KSA has been estimated to be over 5,400GWh. [34]

Hydrogen has gained increasing recognition as a key contributor to the evolution of the global energy sector and is expected to play a key role in decarbonising the economy across end-use sectors. GCC countries, especially UAE and KSA, are working on national strategies aimed at developing the hydrogen market in the region and positioning themselves as future hydrogen exporters. GCC countries currently use large quantities of natural gas-based "grey hydrogen," and the availability of low-cost natural gas coupled with ease of Carbon, Capture, Utilisation and Storage (CCUS) allows for cost-competitive production of "blue hydrogen." The GCC's ample low-cost land, availability of low-cost capital, and extensive solar and wind resources have made the region one of the highest-ranked regions for low-cost, large-scale renewable energy projects. Its geographical proximity to growth markets in the Asia-Pacific region put it in a strategic position to become a significant "green hydrogen" producer and exporter. Estimates indicate that the global market for green hydrogen may eventually reach 500 m MT by 2050, whereas hydrogen production annual revenues in GCC could grow to US$ 70-200 billion.[xxxv]

While climate change, emission reductions and declining technology costs have been key drivers of the energy transition, several other global trends have also impacted the evolution of the energy sector in the GCC region. Decarbonisation mandates in Europe have been pushing for reduced utilisation of hydrocarbon-based fossil fuels across end-use sectors, which have prompted the development of hydrogen as an alternative carrier. Developing Asian economies are considering cleaner alternatives to coal and liquid fuel (oil), which has resulted in the emergence of natural gas as an important resource in the region's energy mix. Considering these major energy import markets, GCC countries have been strategically working toward expanding their natural gas production and export capabilities while also laying the ground for the future supply of clean hydrogen.

**Several factors are accelerating the adoption of renewable energy technologies; the most prominent include:**

- Suitability of the region for grid-scale projects.
- Rapidly declining technology costs.
- Increase in average size/installed capacity of grid-scale projects coupled with lower technology costs that have reduced the overall levelised cost of electricity (LCOE).
- Policy decisions, government strategies and regulatory frameworks encouraging large-scale renewable energy deployment.

Despite the myriad potential benefits offered by energy evolution in the GCC, challenges remain to realise the true potential of this transition. Foremost amongst these is the highly subsidised electricity and energy available in the region. Lower energy and electricity costs hamper the competitiveness of new technologies (distributed solar, energy efficiency, etc.) and negatively impact their adoption. Similarly, the integration of large quantities of renewable energy in the grid has the potential to create stability issues, which will require modernisation of the transmission and distribution infrastructure while also integrating digital technologies to effectively monitor and manage the multiple sources of energy feeding into the grid. Grid modernisation, however, provides an opportunity for the participation of local and global companies through technology provisions as well as solutions and service offerings. Smart metering, energy modeling and forecasting, distributed energy (DER) aggregation, and the development of virtual power plants (VPPs) are all part of grid expansion, efficiency and reliability enhancements. Overall, with the proposed renewable energy capacity addition, the market opportunity for digital grids and associated solutions is anticipated to be between US$ 35 billion and US$ 45 billion, which would be realised over the next 10 to 15 years across the GCC.

Countries in the GCC have made a concerted effort toward evolving their energy mix, which is being driven by investments and policy decisions aligned with increased uptake of renewable energy, energy efficiency and hydrogen. The realisation of these energy evolution initiatives is bound to have a positive impact on the socio-economic status of countries in the region.

The GCC region has been predominantly fossil fuel-driven, with a huge dependency on oil and natural gas for meeting local energy and electricity requirements. However, as part of the overall initiatives underway for economic diversification and development, GCC countries have outlined policy initiatives to increase the share of renewable energy in the overall energy/electricity mix with varying degrees of progress in introducing localisation programmes—aimed at ensuring local availability of critical functionalities, attracting and establishing domestic energy-related industries capable of competing at the global level, and contributing to human capital development.

KSA, UAE, Oman and Kuwait have already put in place local content requirement targets for organisations bidding to develop renewable energy-based projects in the region; 30% to 60% of the technology demand, equipment, service and manpower, depending on the countries, could be impacted by the ongoing localisation initiatives. For example, REPDO in KSA plans to increase its local content requirement to 60% for renewable energy projects beyond 2020, which is currently at 17%. Kuwait's auction for 1,500 MW solar PV had a 30% local content requirement for equipment and services.

Economic diversification coupled with energy diversification will help GCC economies reduce their dependency on oil reserves; the global demand is expected to reduce in the medium to long term. Diversification away from oil allows GCC economies to develop new avenues for revenue generation and employment creation. Energy diversification away from oil (through renewable energy and energy efficiency) reduces local demand for these hydrocarbon resources, which can be exported/downstream processed to derive additional revenue for the country's economy. This additional revenue generated either through conservation of a resource or export can be directed toward investment in other sectors of economic interest, compounding the effect of an evolved/mature energy sector on economic diversification.

Economic diversification has been a key pillar for GCC economies in achieving economic sustainability and has gathered renewed focus recently due to the COVID-19-induced economic slowdown that resulted in crude oil prices reducing from US$ 64 per barrel at the start of 2020 to US$23 per barrel by April 2020.[xxxvi] Lower oil prices result in substantial budget deficits and prove a challenge for economies that rely heavily on oil and gas-linked government revenues for investment in different sectors of the economy.

Renewable energy development thus provides GCC countries an effective pathway to achieve energy sustainability and support economic diversification efforts through the development of a new industry, expansion of supply chains and provision of employment that will directly or indirectly support economic expansion and growth. This, coupled with expanding localisation mandates across the energy value chain, will further boost the socio-economic impact of renewable energy across multiple spheres of the GCC economy.

Growing investment in renewable energy is expected to further enhance various sectors of the economy like construction, services, and research and development. An important aspect of an evolving energy landscape is the entry and participation of global companies in the local GCC value chain. These companies will be instrumental in bringing in the latest technological advances while also providing training and building the capacity of the local workforce.

If the region's renewable energy plans are realised, it could result in cumulative savings of 2.5 to 3 billion barrels of oil equivalent in fossil fuel consumption, effectively translating into savings of US$ 200 billion to US$ 215 billion,[xxxvii] depending on oil and gas prices (considered at US$ 85 per barrel as of Oct. 24, 2021). The cumulative savings achieved through reduced usage of fossil fuels could alone spur investment in new projects in the renewable energy sector or other aspects of the economy like construction, tourism and manufacturing, which have been strategic focus areas for GCC economies to strengthen their global economic position.

In light of the ongoing population growth across GCC economies and rising concerns about employment opportunities, creating jobs is a key priority for GCC countries. Provided GCC countries can achieve their renewable energy implementation targets, the sector could create over 320,000 jobs in the region, with the majority of these jobs concentrated across the UAE and KSA, due to their significant deployment plans. The largest portion of these jobs (65% to 70%)[xxxviii] would be in construction and installation. However, as markets mature and local manufacturing gathers pace, the share of jobs in the manufacturing and services segment will increase.

The development of a local market for renewable energy projects and a local value chain for technology, products and services are complementary. As demand gathers pace and a sizeable market for technology is created regionally, benefits would be realised for manufacturers and value chain participants. The strategic location of GCC countries relative to demand centres in Asia, Africa and Europe, well-established seaports and airports, as well as low energy prices that reduce production costs, are all factors that will encourage technology and component manufacturers to set up manufacturing facilities in the region. However, to maximise the socio-economic benefit of value chain localisation, it is important to accurately identify and anticipate the labour, materials, technology and equipment needed for each segment of the evolving energy landscape.

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