

Report · November 2023

Middle East embraces solar energy revolution

Key points:

- Renewable energy capacity in the Middle East jumped by 11.2% in 2022 from 2021, the second largest percentage gain of any region that year. The region can build on this growth momentum to move away from a reliance on fossil fuels.
- Solar is the dominant renewable energy technology in the Middle East, and the region has some of the lowest solar photovoltaic (PV) costs globally. In 2022, the UAE's average total installed costs were 48% below the global average.
- Gulf sovereign wealth funds, largely made up of excess revenues from oil and gas exports, are being used to finance renewable energy projects.
- Oman is set to lead the Middle East's projected renewable capacity, having introduced more renewable capacity in 2022 than in [the previous decade](#).
- Globally, Jordan is among the top eight countries with the highest growth rates for the share of renewables in their energy mix.

We are at a pivotal moment in our response to climate change. We are off track, but meaningful action is happening, often faster than we think, and momentum is building towards an exponential shift in our energy systems. Some countries are getting ahead of the curve by taking significant steps towards decarbonisation, while at the same time building new industries, creating jobs, reducing dependence on energy imports and insulating consumers from volatile fossil fuel prices. This briefing presents evidence of where and how this is happening.

The Middle East's energy shift begins

Countries at the heart of the fossil fuel industry and traditionally reliant on oil and gas are deploying renewables and readily embracing a shift to cleaner energy. The [Middle East](#) is recognised globally as a fossil fuel heavyweight. The region is responsible for [46% of global oil exports](#), 36% of oil production, 30% of liquified natural gas (LNG) exports and 22% of natural gas output.¹ However, many Gulf states have recently ramped up efforts to reduce their reliance on fossil fuels and achieve the Arab League's collective goal of developing [80 gigawatts \(GW\) of renewable energy by 2030](#).

- **The United Arab Emirates (UAE)** was the [first country in the Middle East to commit to achieving net zero emissions by 2050](#), and plans to invest up to [USD 54 billion](#) on renewables over the next seven years to achieve this.

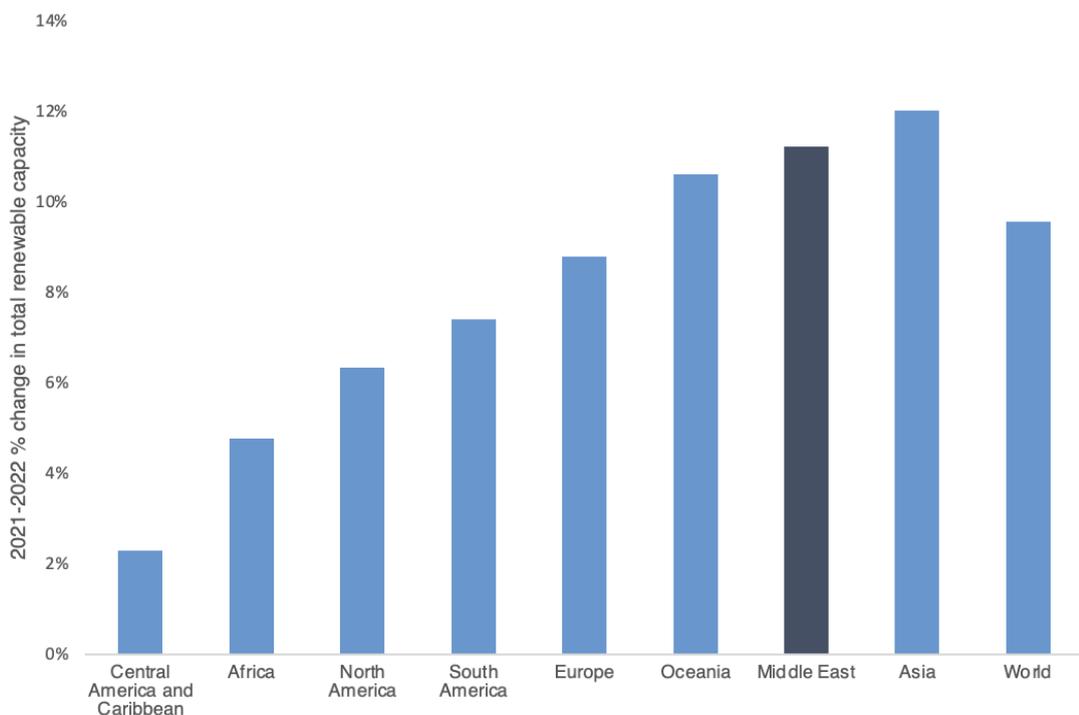
¹ Data covers the International Energy Agency (IEA) Middle East grouping: Bahrain, Iraq, Islamic Republic of Iran, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates, Yemen.

- **Saudi Arabia** wants renewables to account for [50% of its electricity generation](#) by 2030. Along with the UAE, it has one of the [world's lowest average total installed costs](#) for utility-scale solar PV², at USD 653 per kilowatt (KW) in 2022.
- **In Jordan**, renewables accounted for [27% of the country's energy mix in 2022](#), one of the highest shares in the Middle East.
- **Qatar's** utility-scale solar capacity grew from [zero to 800 megawatts \(MW\)](#) in 2022, after the Al Qatar-Kharsaah solar project began operating.
- **Oman** [aims for 20% of its electricity to be generated from renewable sources](#) by 2030, equivalent to 10 terawatt-hours (TWh). Achieving this will require just 36% of its prospective solar and wind capacity to come online.

Current renewable capacity

The Middle East was the second highest region in terms of [percentage growth](#) of renewable capacity in 2022, rising by 11.2% (Figure 1).

Fig. 1: Percentage change in total renewable capacity between 2021-2022 by region



Source: Based on data from the [International Renewable Energy Agency \(IRENA\)](#), Renewable Capacity Statistics 2023

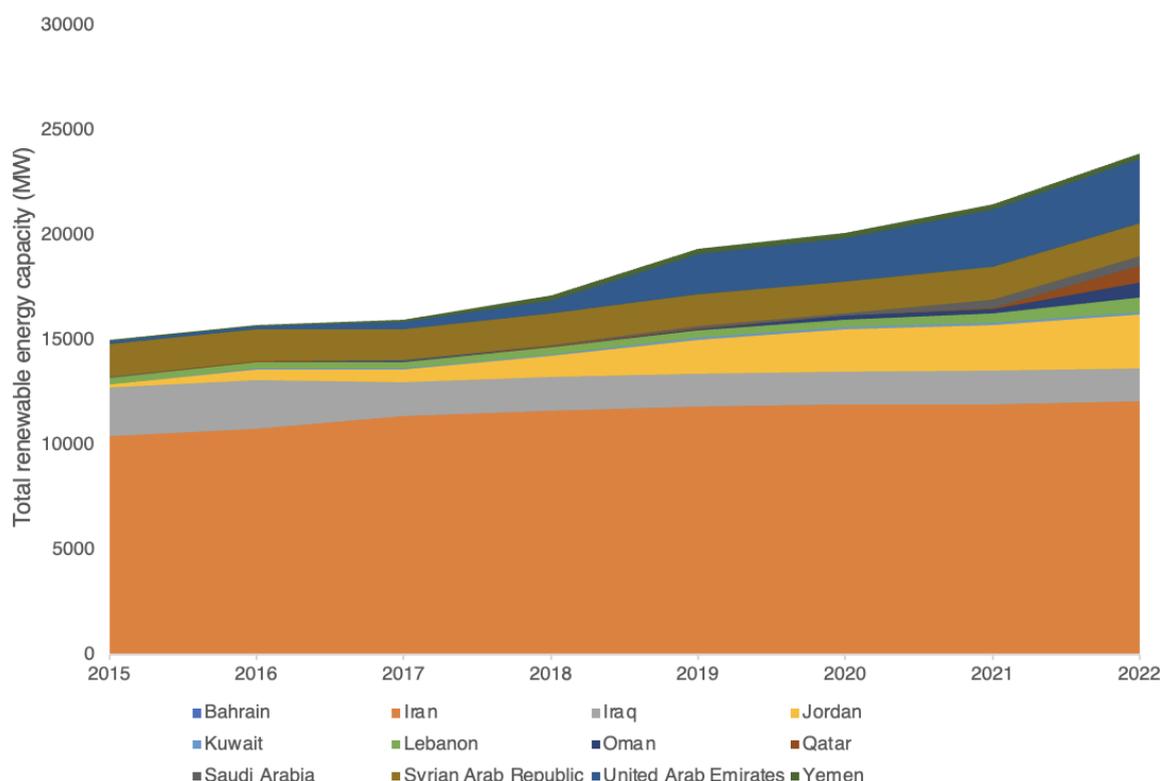
Figure 2 shows that Iran, the UAE and Jordan are leading in renewable energy capacity in the Middle East. While a substantial portion of Iran's renewable energy portfolio comes from large-scale, older [hydroelectric projects](#), that capacity has remained relatively stable over time and has not played a significant role in the recent growth of renewable energy,

² This is the process of converting sunlight into electrical energy. More specifically, solar panels consisting of layers of cells made from semi-conducting materials - usually silicon- create a flow of electricity when light shines upon them. Direct sunlight is not required - indeed solar panels can work on cloudy days - but the stronger the sunlight, the more electricity is created.

driven largely by solar energy. Oman, Qatar and Lebanon each introduced [more renewable capacity in 2022](#) than they had installed over the previous decade.

By building on this momentum, the Middle East could emerge as a key player in the energy transition. The region has [already saved around USD 7 billion in electricity costs](#) in 2022 through renewable power generation deployed since 2000. Fuel savings can help protect against volatile fossil fuel prices, making renewable power essential to enhancing the Middle East's energy security and diversifying its electricity mix, which is currently dominated by oil and gas.

Fig. 2: Middle East total renewable energy capacity in MW, 2015-2022



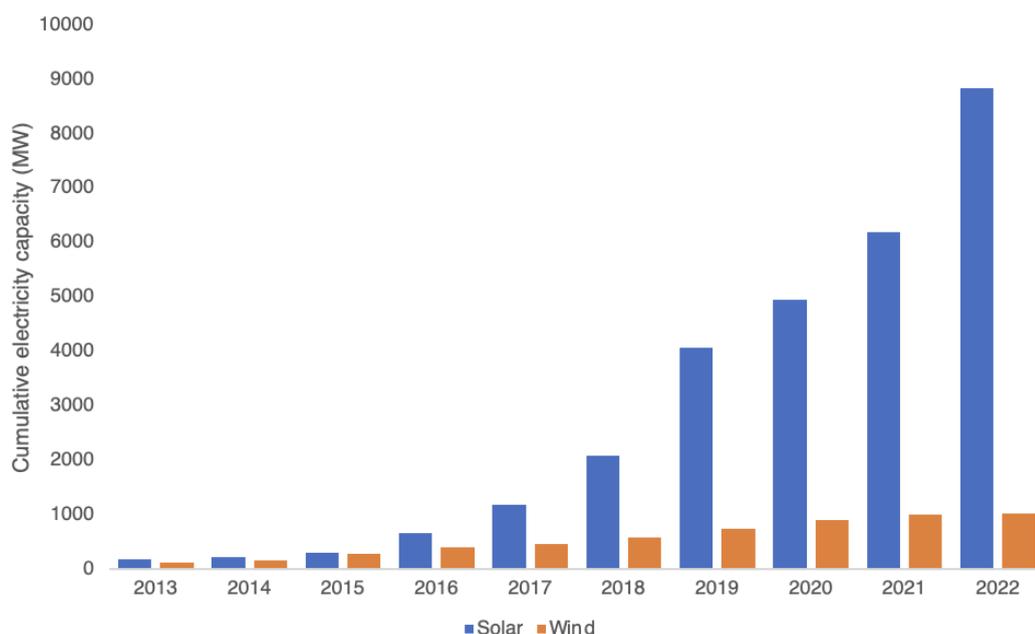
Source: Based on data from [IRENA](#), Renewable Capacity Statistics 2023

Solar dominates renewable capacity and generation growth

The Middle East and North Africa (MENA) added 6.9 GW of utility-scale solar and wind capacity from May 2022 to the end of the year, a [57% increase](#). Solar PV is the dominant technology behind the exponential growth of the MENA region's renewables, representing 92.7% of total installed renewable capacity in 2022.

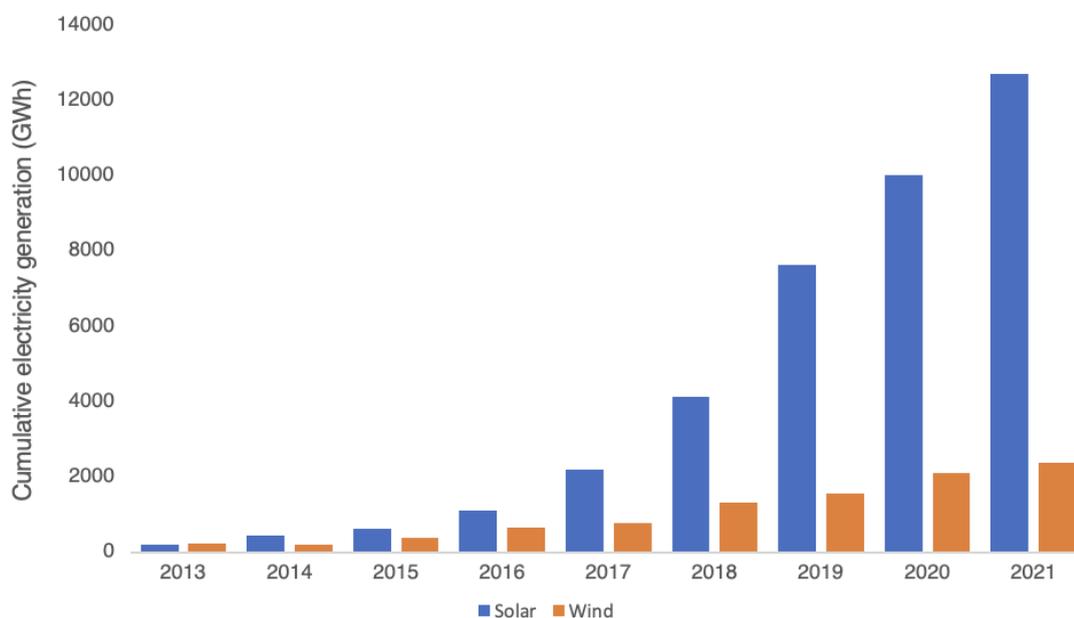
Between 2015 and 2022, [cumulative installed solar capacity increased 30 times](#) in the Middle East, as shown in Figure 3, [compared to just 4.6 times globally](#). Over the same period, wind capacity saw a more modest increase of just over threefold. Solar leads in growth rates as well as absolute values, and this trend also extends to renewable generation. Figure 4 shows how cumulative solar generation has increased in the Middle East, doubling every 1.5 years since 2013. From 2020 to 2021, it grew 27% to 12,710 gigawatt hours (GWh), while cumulative wind generation increased by 12% to 2,374 GWh.

Fig. 3: Middle East cumulative solar and wind electricity capacity



Source: Based on data from [IRENA](#), Trends in Renewable Energy by Region, 2023. Countries included: Islamic Republic of Iran, Saudi Arabia, United Arab Emirates, Iraq, Qatar, Kuwait, Oman, Bahrain, Syrian Arab Republic, Jordan, Lebanon, Yemen.

Fig. 4: Middle East cumulative solar and wind electricity generation



Source: Based on data from [IRENA](#), Trends in Renewable Energy by Region, 2023. Countries included: Islamic Republic of Iran, Saudi Arabia, United Arab Emirates, Iraq, Qatar, Kuwait, Oman, Bahrain, Syrian Arab Republic, Jordan, Lebanon, Yemen.

The Middle East's solar PV growth has been driven by low costs. In 2022, the UAE and Saudi Arabia saw the steepest falls in solar PV installation costs among the top 20 global solar PV markets, dropping by 62% and 35% respectively. As a result, both countries' utility-scale solar installation costs are amongst the [cheapest worldwide](#). In 2022, the UAE's weighted average for total installed costs came to USD 578 per kW, 48% lower than

the global average. Low solar PV installation costs in the UAE and Saudi Arabia have been driven by the [falling costs of solar panels](#), low labour costs³ and low taxes. The UAE and Saudi Arabia also had the greatest reductions in the levelised cost of electricity in 2022, falling 63% and 30% respectively year-on-year.⁴

The impact of lower solar PV costs is magnified by the Middle East's abundant solar resources. Of the top 10 countries for practical PV power potential, four are in the Middle East, with [Jordan ranking third in the world](#). A crucial factor to this is the region's steady year-round solar PV output, meaning it is able to meet a significant share of the Middle East's future energy demand. In the [International Energy Agency's](#) (IEA) Stated Policies Scenario, solar power generation in the Middle East rises ninefold by 2030 and its share of generation rises from 1% today to nearly 10%.⁵

Gulf sovereign wealth funds

The [Gulf sovereign wealth funds](#) (SWF), which are government-owned investment funds, collectively oversee USD 3.7 trillion in assets, a figure surpassing the United Kingdom's annual GDP. Among the estimated 20 SWFs in the Arabian Gulf, primarily funded through excess revenues from oil and gas exports, the top seven alone command about [40% of the world's SWF assets](#).

The Gulf SWFs have recently turned their focus to renewables. In 2022, the second largest investment by a Gulf-based SWF was [the acquisition of a 50% stake in the world's largest private offshore wind energy developer](#), Germany-based Skybourne Renewables, for USD 2.5 billion. The investment was made by Mubadala Investment Co, which is owned by the UAE. Another standout deal was the USD 2.4 billion purchase of a 14% stake in Climate Technologies by the UAE-owned Abu Dhabi Investment Authority. These investments signal the region's strategic shift towards a [new phase of dealmaking](#).

Two companies owned by UAE and Saudi Arabian SWFs, Masdar and ACWA Power, have jointly put around 5 GW of large-scale solar and wind projects into operation. They act as developers, operators or owners in over [46 GW of prospective utility-scale solar and wind projects across 21 countries in the Global South](#), in addition to 14 GW of projects in their own countries.

Oman takes the lead in projected renewable capacity

The MENA region is expected to triple its renewable capacity additions from 2022 to 2027, compared to the previous five years. Oman is leading this expansion in the Middle East by shifting investments away from fossil fuels. The country has [over 18 GW of prospective solar projects](#) announced, in development or in construction (Figure 5), dwarfing the [0.3](#)

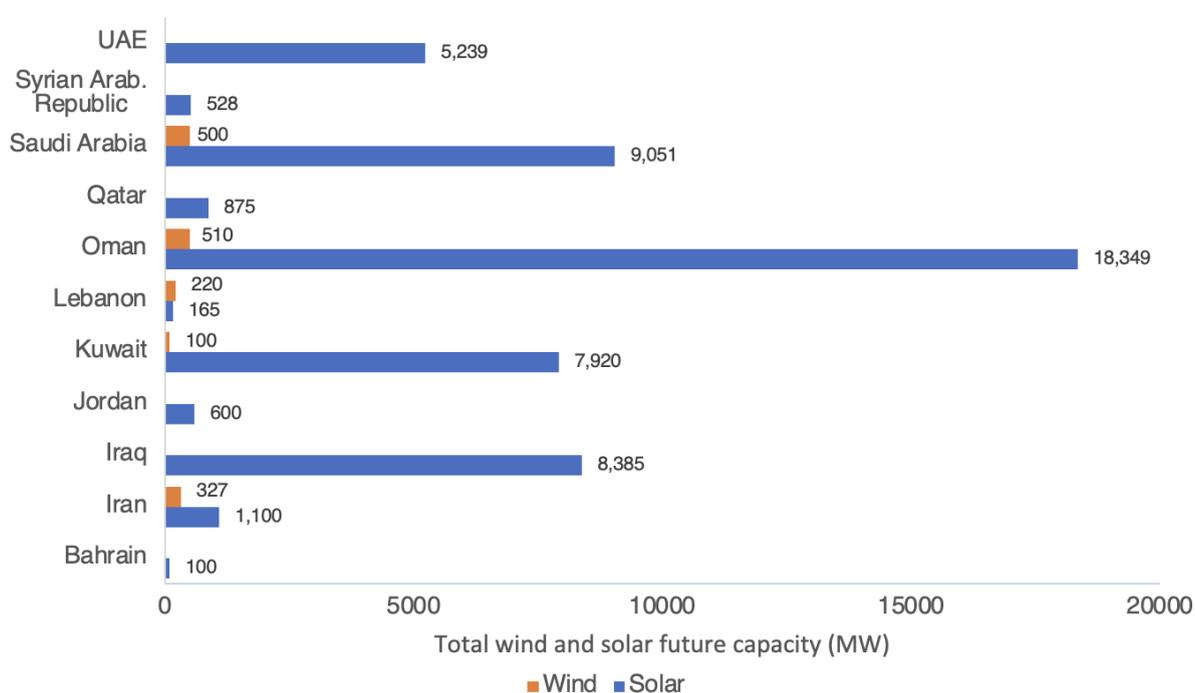
³ The implications of low labour costs is a sensitive topic as it has links to forced labour and modern slavery. Please see <https://www.walkfree.org/news/2023/new-report-links-compounding-global-crises-to-modern-slavery/> for more information.

⁴ The levelised cost of electricity (LCOE) is the cost of electricity generation over the lifetime of a power plant, based on a calculation of the current value of the costs of building and operating a power plant. It allows a comparison of the costs of different technologies even if they have different fuel costs, life spans, capacities and financial profiles.

⁵ The Stated Policies Scenario (STEPS) is "a scenario which reflects current policy settings based on a sector-by-sector and country by country assessment of the specific policies that are in place, as well as those that have been announced by governments around the world." STEPS does not include Nationally Determined Contributions (NDCs) – country action plans to cut emissions and adapt to climate impacts.

[GW of prospective oil and gas plants](#). In 2022, Oman achieved a record year in renewable capacity installations, [surpassing its total for the previous decade](#).

Fig. 5: Middle East total future solar and wind capacity in MW



Source: Based on data from Global Energy Monitor: [Global Solar Power Tracker](#) and [Global Wind Power Tracker](#)⁶. Total future solar and wind capacity includes farms that have been announced, in pre-construction and construction.

Oman is set to boost its renewable electricity capacity by [4.8 GW from 2022 to 2027](#), mainly through solar PV. It is a regional leader in development by independent power producers (IPPs), with competitive IPP auctions being a key growth catalyst. State utility the Oman Power and Water Procurement Company (OPWP) [plans to add at least 2.2 GW of renewable-based IPP capacity](#) by 2027. In 2022, OPWP launched the region's [first wholesale electricity spot market](#), where generators can sell their surplus capacity. This has boosted the appeal of investments in projects with large renewable electricity generation facilities.

Among these investments are projects developing green hydrogen for export, which make up over half of total renewable capacity additions. As a nascent technology, there is a lack of evidence that green hydrogen will work at scale and investments carry considerable risks. Proven and readily deployable technologies such as solar and wind generation should take priority in the transition to replace fossil fuels within domestic electricity grids.

Jordan's share of renewable electricity surges

Jordan is one of eight countries which have scaled up renewable energy at an [average growth rate higher than that needed globally](#) to stay on track for net zero. Between 2015-2020, Jordan grew the share of wind and solar in its electricity mix from 1% to 21%. This

⁶ Data includes solar and wind farms 10 MW or greater. Data updated in January 2023.

exponential growth trajectory is considerably higher than the G20 average (Table 1), and if the country sustains these growth rates, it could result in real [systems change](#).⁷

Table 1: Fastest five-year periods of growth in solar and wind share of electricity mix

	Fastest five-year period of growth	Increase over five-year period (percentage)	Average annual growth (percentage points)	Country rank for average annual growth
Jordan	2015–2020	1 to 21	4	6
Global (what is needed)	2022–2030	12 to 41	3.6	
Global (historical)	2017–2022	7 to 12	1.1	
G20 countries	2017–2022	7 to 13	1.2	

Source: Based on data from the [World Resource Institute](#), [These 8 Countries are Scaling Up Renewable Energy the Fastest, 2023](#)⁸

Renewables growth in Jordan has been driven by its energy security needs, effective policies and lower costs through subsidies. Jordan was an [early adopter of renewable energy policies](#) due to its dependence on energy imports. The government passed a law in 2012 after attacks on the Arab Gas Pipeline led to [disruptions of gas imports from Egypt](#), exempting equipment used in the construction of renewable energy power plants from sales tax and custom duties. A [subsidy is also available for renewable project manufacturers](#) sourcing local equipment.

Currently, 21% of Jordan’s electricity grid is powered by solar and wind, and the country aims to reach 31% by 2030. Jordan also releases the lowest levels of carbon dioxide emissions per capita in the Middle East, at 2.35 tons in 2021. The government [removed a 1 MW limit imposed on all clean energy projects](#) as of mid-2022, creating strong opportunities for renewables growth in the medium to long term.

⁷ The reconfiguration of a system, including its component parts and the interactions between these parts, such that it leads to the formation of a new system that behaves in a qualitatively different way.
⁸ Includes countries with populations over 2.5 million people. Numbers are rounded.