



**Iranian Energy Experts Club**



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## **IRANIAN ENERGY EXPERTS CLUB NEWSLETTER**

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# What does COP28 need to do to keep 1.5 °C within reach? These are the IEA's five criteria for success <sup>(1)</sup>

The COP28 climate change conference is bringing together world leaders in Dubai at a critical moment for the clean energy transition and international efforts to tackle climate change.

Under the Presidency of the United Arab Emirates, this COP is particularly significant because leaders will discuss the Global Stocktake of the Paris Agreement – the first official review of progress since the agreement was reached at COP21 in 2015.

IEA analysis shows that while the rapid deployment of clean energy technologies in recent years has made a major difference to the climate outlook – shaving about 1 °C off projected global warming, based on today's policy settings by governments – a huge amount remains to be done. That 1 °C reduction has moved the projected temperature rise in 2100 from a truly catastrophic 3.5 °C to an only slightly less severe 2.4 °C. Good news, but not nearly good enough. We are not on track to meet the Paris Agreement goal of keeping global warming well below 2 °C – let alone below the threshold of 1.5 °C that science has shown is crucial to avoid the worst effects of climate change.

The door to 1.5 °C is closing rapidly, but COP28 can keep it open. Encouragingly, agreement appears to be emerging around a commitment to triple the world's renewable power capacity by 2030. I commend the countries rallying around this target, which the IEA has been highlighting from an early stage. This includes the European Commission and the COP28 Presidency's efforts to push for a global pledge; India's work via its G20 Presidency; and the support for the target in the recent US-China statement on climate.

## Success means tripling renewables, doubling efficiency – but more as well

Committing to triple renewables is a good first step in the right direction. Unfortunately, this measure alone – assuming countries actually deliver on the commitment – would not reduce emissions enough to put the world on a path towards the 1.5 °C goal.

As the IEA's recent World Energy Outlook 2023 shows, keeping the door open to 1.5 °C requires agreement and action on five interdependent measures – including tripling renewables. Those central pillars for action between now and 2030 are:

- Triple global renewable power capacity
- Double the rate of energy efficiency improvements
- Commitments by the fossil fuel industry, and oil and gas companies in particular, to align activities with the Paris Agreement, starting by cutting methane emissions from operations by 75%
- Establish large-scale financing mechanisms to triple clean energy investment in emerging and developing economies
- Commit to measures that ensure an orderly decline in the use of fossil fuels, including an end to new approvals of unabated coal-fired power plants

Building consensus quickly around all of these pillars is going to be essential. None of the five pillars work without the others. And achieving them will also require a host of accompanying measures, such as expanding electricity grids, scaling up low-emissions fuels, and building more nuclear plants. It also requires ensuring energy access for all by 2030. This is a central tenet of our 1.5 °C scenario and the IEA will be hosting in Paris a major International Summit on Clean Cooking in Africa in spring 2024.

Tripling renewable power capacity by 2030 would deliver about a third of the emissions reductions needed this decade to move the world to a pathway aligned with 1.5 °C. But without commitments and concrete action to mobilise and channel far more financing for emerging and developing economies, the world is likely to fall short of achieving the goal.

Make no mistake: tripling renewables by 2030 is both necessary and doable. But on its own, tripling renewables by 2030 would still leave the world on track to dangerous levels of global warming, well above 2 °C.

## As world targets net zero, Masdar accelerates its journey to 100GW by 2030 <sup>(2)</sup>

How much can the world achieve in the next seven years?

This question lies at the heart of the UN's climate change conference COP28, about to begin in the United Arab Emirates (UAE) in November 2023. World leaders will negotiate how to almost halve carbon emissions by 2030 to meet the Paris Agreement goals of limiting global warming to 1.5 degrees Celsius. With increasingly frequent

wildfires, floods and other climate disasters claiming lives and costing the planet USD16 million an hour in damages, the need for urgent, course-correcting action is clear.

COP28 President, Dr Sultan Al Jaber, has repeatedly called for the tripling of global renewable energy capacity and the doubling of energy efficiency by 2030 to accelerate the green transition and meet the Paris Agreement goals. Harnessing the power of the sun, wind, water and geothermal can reduce emissions while keeping homes lit and the wheels of industry turning.

"We must rapidly scale up all viable clean energies, while decarbonising the energies we use today," said Dr Sultan Al Jaber, who is also the founding CEO and Chairman of the UAE's clean energy powerhouse Masdar. When Masdar was set up 17 years ago, renewable energy was at a very early stage. It took vision, commitment and investment in innovation and partnerships to build it into one of the world's leading renewable energy companies. Active in over 40 countries and with a global renewable energy capacity of over 20GW, Masdar's 2030 ambitions reflect global climate goals.

Masdar aims to grow its renewable energy portfolio to 100GW by 2030, enough to power over 26 million homes and advance the global energy transition. Securing a fourfold capacity increase won't come easy, but the company's track record shows it has the expertise and determination to realise its goal. In the UAE alone, Masdar has gone from switching on the country's first solar project at 10MW in 2009, to last week launching a plant that is 200 times bigger – the 2GW Al Dhafra Solar PV. Inaugurated in November 2023, Al Dhafra is the world's largest single-site solar power plant and powers almost 200,000 homes.

In less than 15 years, the UAE has become a global solar energy leader, as it is home to four of the world's largest solar power plants.







Masdar's trajectory follows the exponential rise of renewable energy in general. After years of investment in technology and increasing economies of scale, renewables are now the cheapest form of energy. With more than 80 percent of all power capacity added last year being produced by renewables, the sector is set to boom. Masdar intends to capitalise on this by leaning into its “first-mover” approach, which involves forming relationships with nations at the early stage of their renewable energy journey. Instead of planning to develop one or two plants in a country, Masdar aims to develop a pipeline of projects to maximise trade and make a significant contribution to net-zero goals.

Central Asia is a case in point. In 2019 the company began working in Uzbekistan to develop the 100MW Nur Navoi Solar Power project, which was the country's first successfully financed independent power producer solar project. Masdar went on to develop the 500MW Zarafshan facility, the region's largest wind farm and is working on a plethora of other landmark clean energy projects in Central Asia.

This first-mover mentality gives Masdar a competitive edge which it will deploy in other key markets including Europe, the United States, Southeast Asia and Africa. Despite being home to 20 percent of the world's population, Africa attracted only 2 percent of global energy investments this year, according to the International Energy Agency. Masdar became the largest renewables operator in Africa after its Africa platform, Infinity Power, acquired Lekela Power in March. So far, Masdar has invested USD2 billion in

2GW of renewable energy assets in Egypt, Morocco, Senegal, Mauritania and South Africa. By 2030, Masdar plans to mobilise a further USD10 billion to deliver 10GW of projects in the continent.



As well as investing in emerging economies, Masdar is expanding its repertoire of renewable energy sources. Geothermal was added to Masdar's portfolio when it made a strategic investment with Indonesia's Pertamina Geothermal Energy earlier this year. The company will also explore hydropower, the world's largest source of renewable energy, in countries such as landlocked and water-rich Tajikistan.

Masdar and its partners have also used cutting-edge technology to develop Southeast Asia's largest floating solar power plant to boost clean energy while reducing land use. Closer to home, technological advances enabled the launch of the UAE's first wind program which harnessed the country's low wind speeds to generate utility-scale electricity for the first time.

Making bold investments, nurturing innovation and building strong alliances have been the hallmark of Masdar's success for nearly two decades. Now as the world strives to rapidly cut emissions in the next seven years, Masdar remains committed to this crucial goal as it takes great strides towards achieving 100GW by 2030.

## Led by solar PV, renewable power growth is surging—driven by the global energy crisis and policy momentum <sup>(3)</sup>

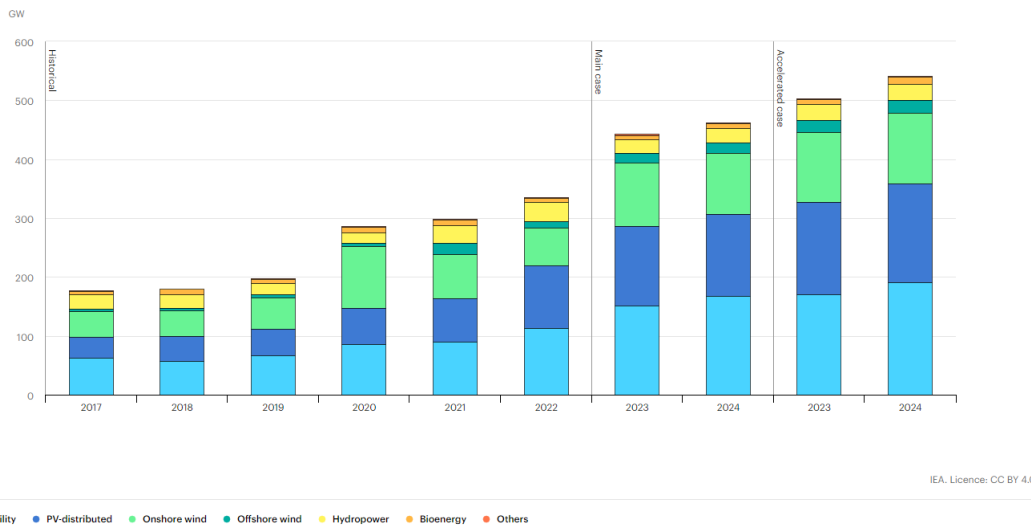
Global renewable capacity additions are set to soar by 107 gigawatts (GW), the largest absolute increase ever, to more than 440 GW in 2023. This is equivalent of more than the entire installed power capacity of Germany and Spain combined. This unprecedented growth is being driven by expanding policy support, growing energy security concerns and improving competitiveness against fossil fuel alternatives. These factors are outweighing rising interest rates, higher investment costs and persistent supply chain challenges.

Solar PV capacity, including both large utility-scale and small distributed systems, accounts for two-thirds of this year's projected increase in global renewable capacity. In response to higher electricity prices caused by the global energy



crisis, policy makers in many countries, particularly in Europe, have actively sought alternatives to imported fossil fuels that can improve energy security. This shifting focus created a favourable environment for solar PV, especially for residential and commercial systems that can be rapidly installed to meet growing demand for renewable energy. These smaller distributed PV applications are on track to account for half of this year's overall deployment of solar PV – larger than the total deployment of onshore wind over the same period.

Following two consecutive years of decline, onshore wind capacity additions are on course to rebound by 70% in 2023 to 107 GW, an all-time record amount. This is mainly due to the commissioning of delayed projects in China following last year's Covid-19 restrictions. Faster expansion is also expected in Europe and the United States as a result of supply chain challenges pushing project commissioning from 2022 into 2023. On the other hand, offshore wind growth is not expected to match the record expansion it achieved two years ago due to the low volume of projects under construction outside of China.



**Net renewable electricity capacity additions by technology, 2017-2024**

Solar PV additions will continue to increase in 2024 while challenges remain for wind expansion. Declining module prices, greater uptake of distributed solar PV systems and a policy push for large-scale deployment are driving higher annual solar additions in all major markets – including China, the European Union, the United States and India. In contrast, without rapid policy implementation, global onshore wind additions in 2024 are expected to fall by



around 5% from 2023 levels. While China's wind energy additions will continue to increase in 2024, they are set to be more than offset by undersubscription of auctions and pending permitting delays in Europe. The situation in Europe is expected to improve once new legislation is implemented. Overall, cumulative world renewable capacity is forecast to reach over 4 500 GW at the end of 2024, equal to the total power capacity of China and the United States combined.

Global renewable capacity additions could reach 550 GW in 2024 in our accelerated case, almost 20% higher than in the main forecast. This is mainly due to a more rapid deployment of residential and commercial PV installations, assuming a faster implementation of recent policies and incentives. The upside for utility- scale onshore wind and solar PV projects mostly depends on the pace of permitting, construction and timely grid connection of projects under development.

### **Renewables are at the forefront of Europe's response to the energy crisis**

The crisis triggered by Russia's invasion of Ukraine has accelerated renewable energy deployment in the European Union, driving the bloc to urgently reduce its dependence on Russian natural gas imports. Policy actions in many European countries has led us to revise our forecast for renewable capacity additions in the EU in 2023 and 2024 upwards by 40% compared with before the war. Rapid growth in distributed solar PV is the main reason for the more positive outlook, accounting for almost three-quarters of the EU forecast revisions. This is driven by high electricity prices that make solar PV more financially attractive and by increasing policy support in key EU markets, especially in Germany, Italy and the Netherlands.

European countries introduced more policy and regulatory changes to ease permitting in the last 18 months than over the entire previous decade. While permitting has become a key policy focus in Europe to accelerate the deployment of large-scale wind and solar PV and early benefits are starting to be visible, the proposed policy changes are expected to have limited impact on the deployment of renewables in 2023 and 2024 compared with other drivers, such as installations of small-scale residential and commercial solar PV.

EU electricity consumers are set to save an estimated EUR 100 billion during the 2021-2023 period thanks to newly installed solar PV and wind capacity. Accelerating renewable energy deployment in Europe since 2021 has mitigated the economic impact of the energy crisis. Low-cost wind and solar PV are on course to displace an estimated 230 terawatt-hours (TWh) of





expensive fossil fuel generation over the 2021-2023 period, helping to reduce wholesale electricity prices in all European markets. Without these capacity additions, the average wholesale price of electricity in the EU in 2022 would have been 8% higher, hurting consumers, businesses and government budgets.

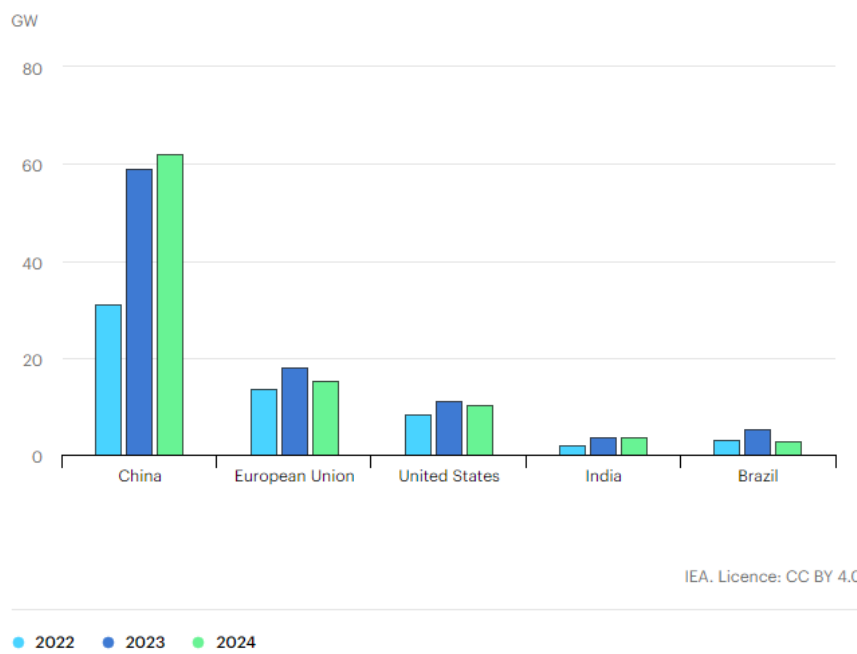
Renewables could help Europe displace more natural gas for heating buildings next winter. Last year was the second warmest winter on record in Europe, which helped the EU use less gas for heating buildings. Projected growth of renewable energy such as clean electricity, bioenergy boilers, heat pumps, and solar thermal and geothermal technologies could displace almost 8 bcm of EU buildings-related gas consumption annually in 2023 and more than 17 bcm in 2024. This would represent a significant contribution to cover increasing gas demand, should harsher winters and hotter summers occur over the course of 2023-2024.



### **China is poised to outpace the rest of the world in renewable capacity installations in 2023 and 2024**

China's contribution to global renewable capacity additions is expected to increase in 2023 and 2024, consolidating its position as the undisputed leader in global deployment. In 2022, China accounted for almost half of all new renewable power capacity worldwide. By 2024, the country's share is set to have expanded to a record 55% of global annual renewable capacity deployment. By 2024, China will deliver almost 70% of all new offshore wind projects globally, as well as over 60% of onshore wind and 50% of solar PV projects.





## Net onshore wind electricity capacity additions by country or region, 2022-2024

the United States, capacity additions will rebound this year after a difficult 2022. The US markets for wind and solar PV contracted last year due to restrictive trade measures and supply chain constraints, but annual additions for both technologies are set to increase by around 40% in 2023, with solar PV setting a new record. The current forecast is underpinned by existing tax incentives, while the Inflation Reduction Act will show its full effect after 2024, providing unprecedented certainty for renewable energy projects until 2032.

India's renewable capacity additions are expected to increase again in 2023 and 2024, owing to faster onshore wind, hydropower and distributed solar PV deployment. However, utility-scale solar PV projects, India's largest renewable electricity growth segment, are expected to slow briefly this year due to supply chain challenges, lower auction volumes and trade policies. While large-scale PV manufacturing is emerging in India, import tariffs are causing short-term demand and supply mismatches.

## Competitiveness of wind and solar PV has improved, but policies need to adapt to changing market conditions

Electricity generation costs from new onshore wind and solar PV plants are projected to decline by 2024 but will likely remain 10-15% above their pre-Covid levels in most markets outside China. Regardless, solar PV and onshore wind remain the lowest cost options for new electricity generation in most countries. Future power



contracts for the end of 2023 and into 2024 in the European Union, the United States, Japan, Australia and India indicate wholesale power prices two to three times above 2020 averages. Today, wind and solar PV plants can provide electricity at prices 30-50% lower than those of future power contracts in most key markets, increasing renewables' attractiveness for investors.

Policy uncertainties and volatile prices left one-sixth of renewable energy auction volumes unallocated in 2022. Competitive renewable energy auctions resulted in the awarding of a record-breaking 100 GW of capacity. However, 20 GW remained unallocated, the highest ever level with Europe accounting for two-thirds of it. Government auction designs need to consider recent inflation, interest rate rises and turbulence in commodity prices – and to envisage dynamic indexation methods to attract investments.

Market-driven procurement is expected to contribute to approximately one-fifth of solar PV and wind capacity expansion in 2023 and 2024, driven by corporate power purchase agreements. The United States leads expansion in corporate power purchasing agreements, followed by Brazil, Australia, Spain and Sweden. These agreements are motivated by the economic attractiveness of renewables, by the opportunity to hedge against rising and volatile power prices, and by sustainability goals.

The financial health of renewable energy value chains is critical for the industry's sustainable growth. Despite challenges from volatile commodity prices, higher interest rates, supply chain constraints and trade measures, the renewable energy industry has shown financial resilience overall. However, there is significant variation across sectors and countries. The solar PV manufacturing sector has a positive outlook with increasing capacity additions, but potential supply gluts and declining prices may reduce company profit margins. Western wind manufacturers face challenges from high commodity prices, as well as permitting and auction designs that do not reflect changing financing environments. While the energy crisis has also hurt the profitability of some specific electricity utilities, these companies overall are maintaining their role as large investors in renewables.

Global manufacturing capacity of solar PV is projected to reach nearly 1 000 GW in 2024, sufficient to meet annual demand in the IEA's Net Zero Emissions by 2050 Scenario. In contrast, wind equipment manufacturing is expanding more slowly and may struggle to keep up with demand growth through 2030. While China will continue to dominate global manufacturing capacity for solar PV, announcements of solar PV manufacturing projects in the United States and



India have doubled since December, indicating that supply chains are diversifying in the medium term.

The rapid expansion of wind and solar PV needs to be accompanied by policies and market rules supporting grid infrastructure and flexibility investments. An increasing amount of electricity generation from wind and solar PV is being curtailed in many markets, particularly where grid infrastructure and system planning lag behind deployment of these variable renewables. However, curtailed generation remains relatively low, ranging from 1.5% to 4% in most large renewable energy markets. Multiple countries in Europe – including Spain, Germany and Ireland – will see their annual share of wind and solar PV reach over 40% by 2024, which will require effective grid management to hold back rising curtailment rates.



### **Biofuels have supported energy security during the recent crisis but are facing challenges of their own**

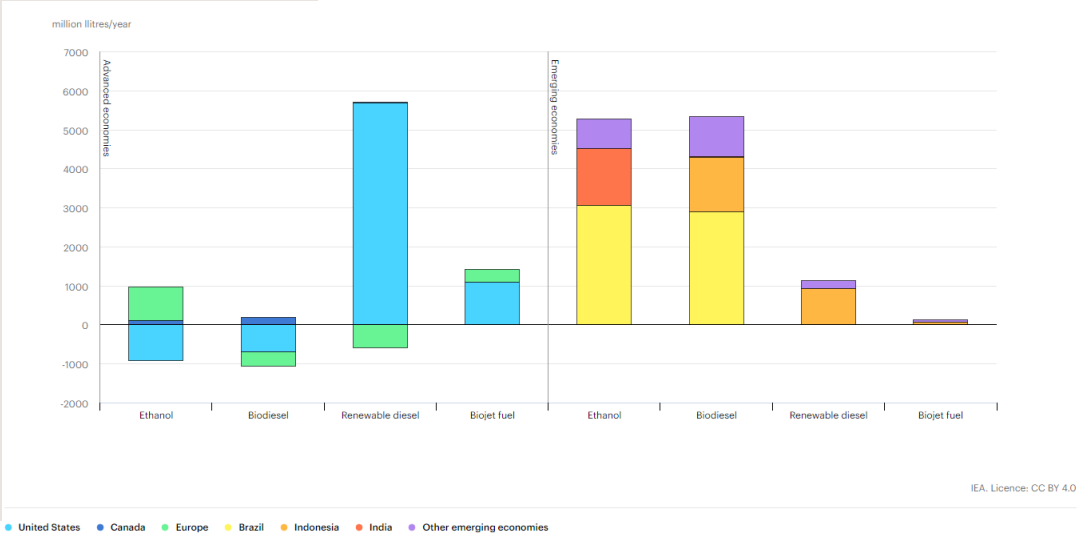
Biofuels avoided the consumption of 2 million barrels of oil equivalent per day (mboe/d) in 2022, equivalent to 4% of global transport sector oil demand. Argentina, India and Indonesia all accelerated biofuel use in 2022. However, while biofuels offered energy security benefits, their prices climbed more quickly than those of gasoline and diesel in many countries. To mitigate increases in transport fuel costs, Brazil, Sweden and Finland delayed planned increases to biofuel blending obligations in 2022.

Biofuel prices are set to decline in 2023 and 2024 while remaining well above pre-Ukraine war levels. Biofuel prices have declined in all major markets from their peaks in 2022. In the first four months of 2023, ethanol prices declined 7%-16% from their 2022 average and biodiesel prices dropped 15%-28% across different markets. While below 2022 peaks, prices for major biofuel feedstocks such as corn, sugar and vegetable oils are expected to remain above pre-war price levels, keeping biofuel prices at historically high levels through 2024.

Biofuel demand is to expand by 11% by 2024, supported by existing policies targeting energy security objectives. Only Indonesia and Brazil are accelerating deployment by 2024. In advanced economies, new policies are not likely to influence production until after 2024 as high prices, feedstock concerns and technical constraints limit additional growth potential.







**Biofuel demand growth by fuel and region, 2022-2024**



## Hydrogen is an increasingly important piece of the net zero emissions by 2050 puzzle <sup>(4)</sup>

The key pillars of decarbonising the global energy system is energy efficiency, behavioural change, electrification, renewables, hydrogen and hydrogen-based fuels, and CCUS. The importance of hydrogen in the Net zero Emissions Scenario is reflected in its increasing share in cumulative emission reductions. Strong hydrogen demand growth and the adoption of cleaner technologies for its production thus enable hydrogen and hydrogen-based fuels to play a significant contribution in the Net Zero Emissions Scenario to decarbonise sectors where emissions are hard to abate, such as heavy industry and long-distance transport.

Hydrogen and hydrogen-based fuels can play an important role in the decarbonisation of sectors where emissions are hard to abate and alternative solutions are either unavailable or difficult to implement, such as heavy industry and long-distance transport.

The announcements for new projects for the production of low-emission hydrogen keep growing, but only 5% have taken firm investment decisions due to uncertainties around the future evolution of demand, the lack of clarity about certification and regulation and the lack of infrastructure available to deliver hydrogen to end users. On the demand side, hydrogen demand keeps growing, but remains concentrated in traditional applications. Novel applications in heavy industry and long-distance transport account for less than 0.1% of hydrogen demand, whereas they account for one-third of global hydrogen demand by 2030 in the Net Zero Emissions by 2050 (NZE) Scenario. A growing number of countries are releasing national strategies and adopting concrete policies to support first movers. But the delays in the implementation of these policies and the lack of policies for demand creation are preventing the scale-up of low-emission hydrogen production and use.

To get on track with the NZE Scenario, accelerated policy action is required on creating demand for low-emission hydrogen and unlocking investment that can accelerate production scale-up and deployment of infrastructure.

Hydrogen demand stood at 90 Mt in 2020, practically all for refining and industrial applications and produced almost exclusively from fossil fuels, resulting in close to 900 Mt of CO<sub>2</sub> emissions. But there are encouraging signs of progress. Global capacity of electrolysers, which are needed to produce hydrogen from electricity, doubled over the last five years to

reach just over 300 MW by mid-2021. Around 350 projects currently under development could bring global capacity up to 54 GW by 2030. Another 40 projects accounting for more than 35 GW of capacity are in early stages of development. If all those projects are realised, global hydrogen supply from electrolyzers could reach more than 8 Mt by 2030. While significant, this is still well below the 80 Mt required by that year in the pathway to net zero CO<sub>2</sub> emissions by 2050 set out in the IEA Roadmap for the Global Energy Sector.

Europe is leading electrolyser capacity deployment, with 40% of global installed capacity, and is set to remain the largest market in the near term on the back of the ambitious hydrogen strategies of the European Union and the United Kingdom. Australia's plans suggest it could catch up with Europe in a few years; Latin America and the Middle East are expected to deploy large amounts of capacity as well, in particular for export. The People's Republic of China ("China") made a slow start, but its number of project announcements is growing fast, and the United States is stepping up ambitions with its recently announced Hydrogen Earthshot.

Sixteen projects for producing hydrogen from fossil fuels with carbon capture, utilisation and storage (CCUS) are operational today, producing 0.7 Mt of hydrogen annually. Another 50 projects are under development and, if realised, could increase the annual hydrogen production to more than 9 Mt by 2030. Canada and the United States lead in the production of hydrogen from fossil fuels with CCUS, with more than 80% of global capacity production, although the United Kingdom and the Netherlands are pushing to become leaders in the field and account for a major part of the projects under development.





## References

1. <https://www.iea.org>
2. <https://www.rechargenews.com/sponsor-content/as-world-targets-net-zero-masdar-accelerates-its-journey-to-100gw-by-2030/2-1-1554706><https://www.iea.org/commentaries/why-ai-and-energy-are-the-new-power-couple>
3. <https://www.iea.org/reports/renewable-energy-market-update-june-2023/executive-summary>
4. <https://www.iea.org/reports/global-hydrogen-review-2021/executive-summary>



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