



# Wind targets are achievable but fall short of a tripling

Tripling global renewables is the single biggest action the world can take for the climate in this decade. To meet the tripling renewables goal, wind capacity should at least triple. An analysis of 2030 national wind targets shows that governments are already planning for a doubling, but fall short of a tripling.

---

Published date: 8 August 2024

Lead author: Dr Katye Altieri

Other authors: Dave Jones, Kostantsa Rangelova

---

# Contents

[Executive Summary](#)[Chapter 1 Global wind target outlook](#)[Wind targets aim for a doubling, fall short of tripling](#)[Forecasts suggest China will overachieve its target, and the rest of the world will lag](#)[Chapter 2 National wind target outlook](#)[Ambition must increase to meet wind targets and a tripling](#)[Current offshore wind targets aim for an almost tripling by 2030](#)[Conclusion](#)[Supporting Materials](#)[Acknowledgements](#)

## About

This report analyses national 2030 wind targets for the power sector, evaluating them against what is required to meet the global goal to triple renewables capacity by 2030. The report analyses 2030 wind capacity targets of 70 countries and the EU as a bloc. These countries collectively represent 99% of the current global wind capacity. National targets are sourced from national strategy or plans, executive orders, official projections, or credible third-party studies and can be found in Ember's [2030 Global Renewable Target Tracker](#).

---

# Highlights

0.9 TW

2.4x

3x

---

2022 global wind capacity

Factor of increase in global wind capacity by 2030 based on current national targets

Factor of increase in global wind capacity needed by 2030 to meet the tripling goal

## Executive summary

# Doubling wind capacity already planned by governments, but more needed for tripling

National wind targets aim for a collective doubling of capacity by 2030, and global forecasts suggest this is achievable.

Tripling renewables is the single largest action to cut emissions this decade and keep the 1.5C goal within reach. At the UN's COP28 climate change conference in December 2023, world leaders reached a historic agreement to triple global renewables capacity by 2030. The International Energy Agency (IEA) and International Renewable Energy Agency (IRENA) both show that a global tripling of renewables to at least 11,000 GW by 2030 is the [optimal pathway](#) to keep 1.5C within reach. Over 90% of the renewable capacity growth is expected to be from solar and wind, with wind capacity itself also tripling from 901 GW in 2022 to 2,742 GW in 2030. This would mean wind generates almost a fifth (19%) of global electricity supply by 2030. This report analyses national wind targets to see how current plans align with a tripling of wind capacity by 2030.

## 01 National targets already exceed a doubling of wind capacity

National targets add up to a more than doubling of global wind capacity by 2030, but fall short of a tripling. The sum of 2030 national wind targets from 70 countries and one region is 2,157 GW. This is a 2.4x increase from 901 GW in 2022, leaving a gap of 585 GW to achieve a global tripling of wind (2,742 GW).

## 02 Forecasts suggest sum of national wind targets is achievable due to China

Forecasts for 2030 indicate a doubling of global wind capacity, suggesting that the sum of national wind targets can be met on a global scale.

Forecasts from the IEA, BNEF, and GWEC all agree that global wind capacity in 2030 will reach around 2,100 GW, a value similar to the sum of national targets. However, this is primarily achievable due to large wind additions forecast in China. Although it only accounts for 37% of global wind targets, China is forecast to install over 50% of global wind additions between 2024 and 2030. China is overachieving on its target and is forecast to almost triple wind capacity from 2022 to 2030.

## 03 Other countries must increase ambition

Of the 70 countries with wind targets (including more subjective “implicit” targets), almost two-thirds are projected to fall short of their national 2030 targets based on the [IEA's main forecast](#) updated in January 2024.

Furthermore, these countries are collectively aiming well-below the tripling of wind capacity that is needed.

Wind has a critical role to play in the clean energy transition. It provides almost as much generation as solar in 2030 in the [IEA Net Zero Roadmap](#) despite having less than half the capacity. The IEA has already shifted expectations of more growth from wind to solar in the [Net Zero Roadmap update](#). That means solar already has an ambitious target, and is unlikely to be in a position to make up for a shortfall in wind generation.

**“This latest report from Ember shows commendable growth of wind energy around the world. Unfortunately, we are facing a climate emergency, and the world needs transformational action that delivers on the tripling promise set out at COP28. Action must be taken on permitting, finance, and supply chains - areas where action will deliver multiple benefits that close the gap between action and delivery. There is no time for empty promises, this is the time for action.”**

**Ben Backwell**

CEO, Global Wind Energy Council



**“Governments are lacking ambition on wind, and especially onshore wind. Amidst the hype of solar, wind is not getting enough attention, even though it provides cheap electricity and complements solar. The path to a cleaner energy future could be shaped by prioritising improved policies, regulatory frameworks and financial support.”**

**Katye Altieri**

Global Electricity Analyst, Ember



## Chapter 1 Global wind target outlook

# Wind targets aim for a doubling, fall short of tripling

The current wind capacity targets, outlined in national strategy and policy documents, set the world on track for a more than doubling of wind by 2030.

The International Renewable Energy Agency (IRENA), the International Energy Agency (IEA) and the global agreement by [133 countries at COP28](#) are all aligned that [tripling renewables capacity to 11,000 GW by 2030 is required for a 1.5C pathway](#). A tripling of global renewables capacity by 2030 means a tripling of wind capacity. In the IEA Net Zero Roadmap, wind triples from 901 GW in 2022 to 2,742 GW in 2030. Solar, by comparison, rises five-fold. However, while wind capacity by 2030 is less than half of solar capacity, its generation is only slightly lower, because wind runs more hours per year than solar. Solar and wind are expected to provide over 90% of the growth in renewables capacity from 2022 to 2030.

### **Current 2030 wind targets deliver more than a doubling, but fall short of a tripling**

This report finds that national wind targets set the world on course for 2,157 GW of wind capacity in 2030, which represents more than a doubling (2.4x) compared to 2022. This leaves a gap of 585 GW between current national targets and a global tripling of wind to 2,742 GW.

The wind targets analysed here come from the [Ember 2030 Global Renewable Target Tracker](#), which currently tracks 82 countries and one region representing over 90% of global power demand. 70 of those countries and the EU as a bloc have wind capacity targets for 2030, while the 11 countries with no wind target were excluded from this analysis. The sum of 2030 wind capacity targets includes the EU as a bloc and excludes individual EU countries. The 70 countries and the EU account for 99% of current global wind capacity.

---

Our analysis reveals that only 20 countries specify onshore or offshore wind targets, while the remaining 51 have unspecified targets. National targets are categorised into three different types depending on how the targets are identified. The EU region and 56 countries have explicit targets, identified clearly in national strategy or plans, executive orders, legal texts, and policy proposals nearing approval. There are 12 countries with implicit targets sourced from official projections or credible third-party studies based on current renewable support policies and net zero targets. Although implicit targets are not legislative or legal targets, they act as a proxy for current ambition for renewables in the absence of an explicit target. There are two countries with derived targets that are estimates for 2030 based on explicit targets for other years. [Ember's 2030 Renewable Target Tracker](#) provides detailed information on targets, sources and confidence level by country, allowing for comparison of countries by region and economic groups.

### **Forecasts suggest the sum of national targets is achievable**

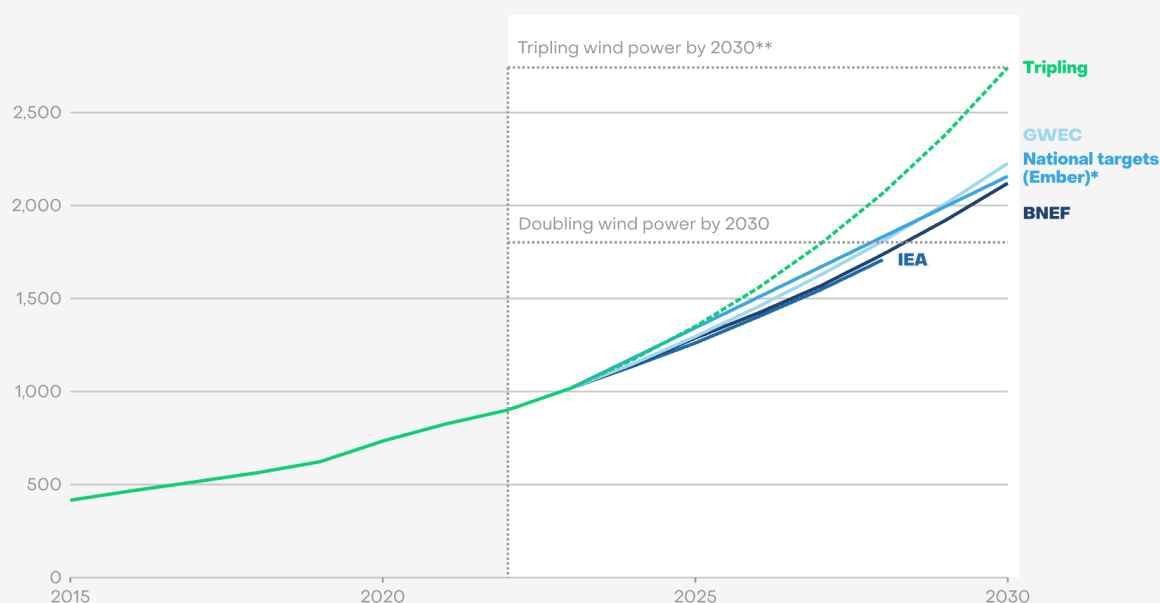
Forecasts from [IEA](#), BNEF, and [GWEC](#) all agree that wind additions will increase such that the sum of the 2030 national targets can be met on a global scale. Ember's assessment of national targets for 2030 suggests that 163 GW of wind capacity needs to be added each year from 2024 to 2030; this is substantially higher than the 116 GW added in 2023. The [IEA main forecast](#) is that wind additions will rise from 119 GW in 2024 to 162 GW in 2028, reaching global cumulative wind capacity of 1,697 GW in 2028. The recent BNEF Global Wind Market Outlook 1H 2024 forecasts wind additions rising from 124 GW in 2024 to 200 GW in 2030, reaching 2,100 GW in 2030. This is an upward revision from the 1,900 GW BNEF forecast from six months ago. The [2024 Global Wind Report](#) from GWEC forecasts 2,230 GW of wind in 2030 according to current national policies with annual installations rising from 130 GW in 2024 to 218 GW in 2030.

However, the current rate of additions, and forecasts for future additions, still fall short of what is needed to meet the global tripling goal. To reach 2,742 GW by 2030, annual additions of wind need to average 246 GW per year from 2024 to 2030.



## Forecasts of global wind growth suggest national 2030 targets are achievable, but they fall short of a tripling

Global wind power capacity (GW)



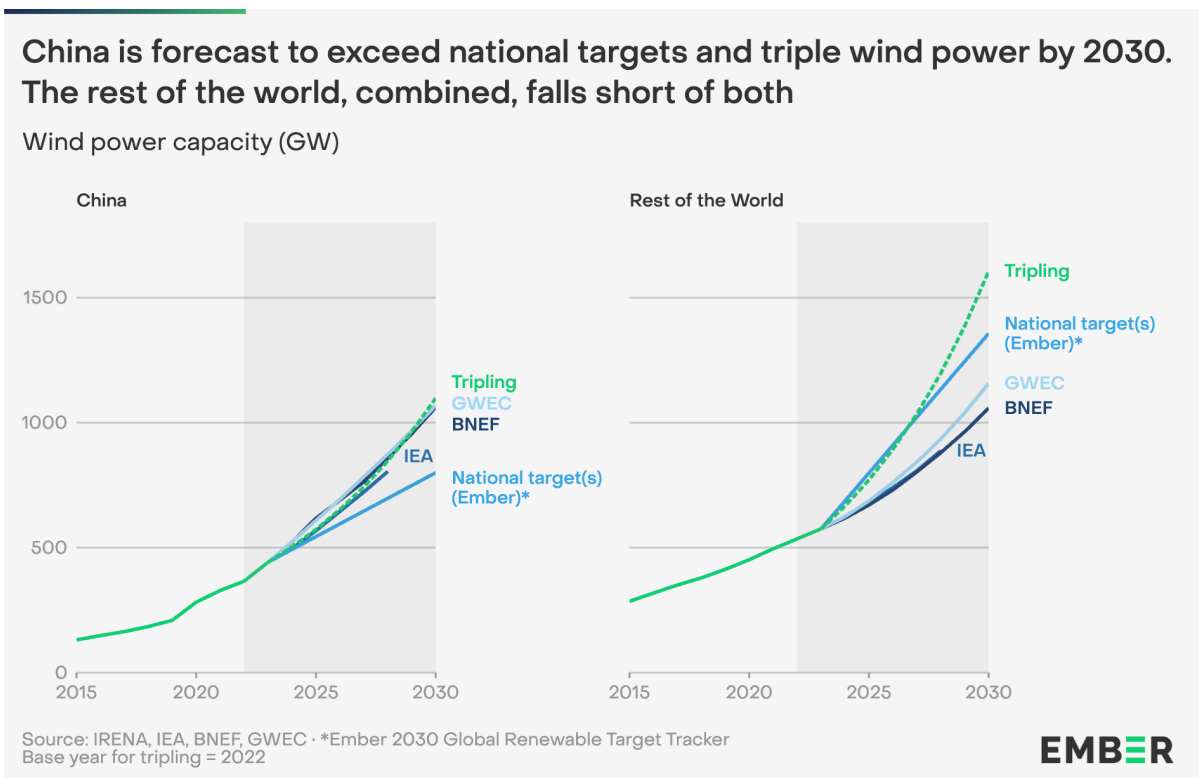
Source: IEA Renewables 2023, BNEF Global Wind Market Outlook 1H 2024, GWEC Global Wind Report 2024  
 \*\*Base year = 2022

## Forecasts suggest China will overachieve its target, and the rest of the world will lag

Global forecasts suggest that wind will be able to deliver on its doubling, but that is primarily because China is expected to over-deliver and the rest of the world in aggregate is on course to under-deliver.

BNEF, [GWEC](#) and [IEA](#) forecasts suggest that China will not only exceed its implicit target, but will in fact triple wind capacity by 2030. The implicit target for China used in this report is

800 GW of wind, which comes from a [2021 national energy forecast study conducted by GEIDO](#), a government-affiliated think-tank. Based on recent wind additions and forecasts, it is expected that China will exceed 800 GW of wind as early as 2027. All forecasts indicate that China will continue to account for over half of global wind additions every year. This means that wind in the rest of the world in aggregate is projected to less than double (1.9x) to 1,058 GW by 2030 according to BNEF. These forecasts are significantly below the 1,357 GW that is Ember’s assessment of national targets, which means there is not only an ambition gap but also an implementation gap.

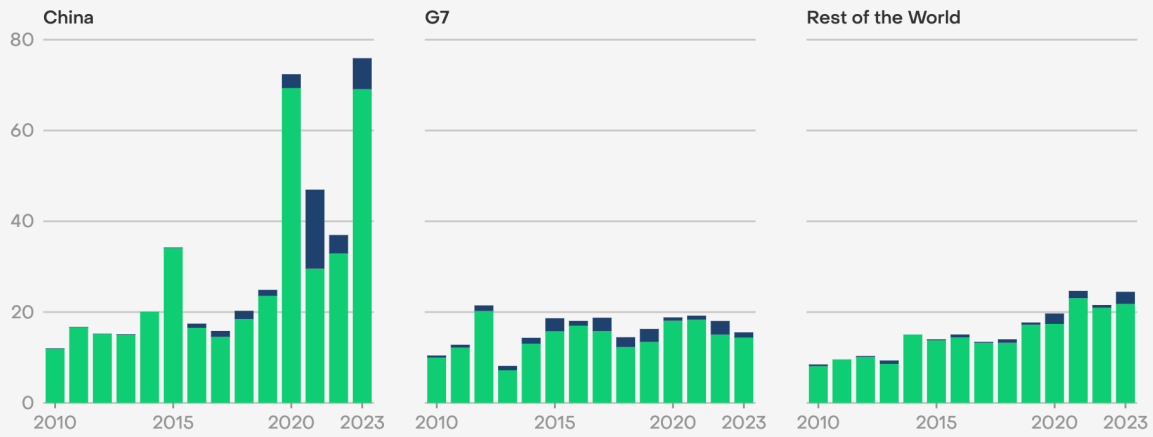


China has seen a large boom in wind since 2020. In 2023, 66% of global onshore additions and 64% of global offshore additions were in China. Whilst much is written on China’s dominance in global solar installations, it has the same market share for wind.

## China continues to soar on wind additions, adding five times more wind capacity than the G7 in 2023

Wind capacity additions in GW

Onshore Offshore



Source: IRENA · Rest of the world excludes the G7 and China

## Chapter 2 National wind target outlook

# Ambition must increase to meet wind targets and a tripling

National targets are not ambitious enough for a global tripling, and most countries are still not on track to deliver even these. Finding where and how ambition can be increased is needed to meet the tripling goal.

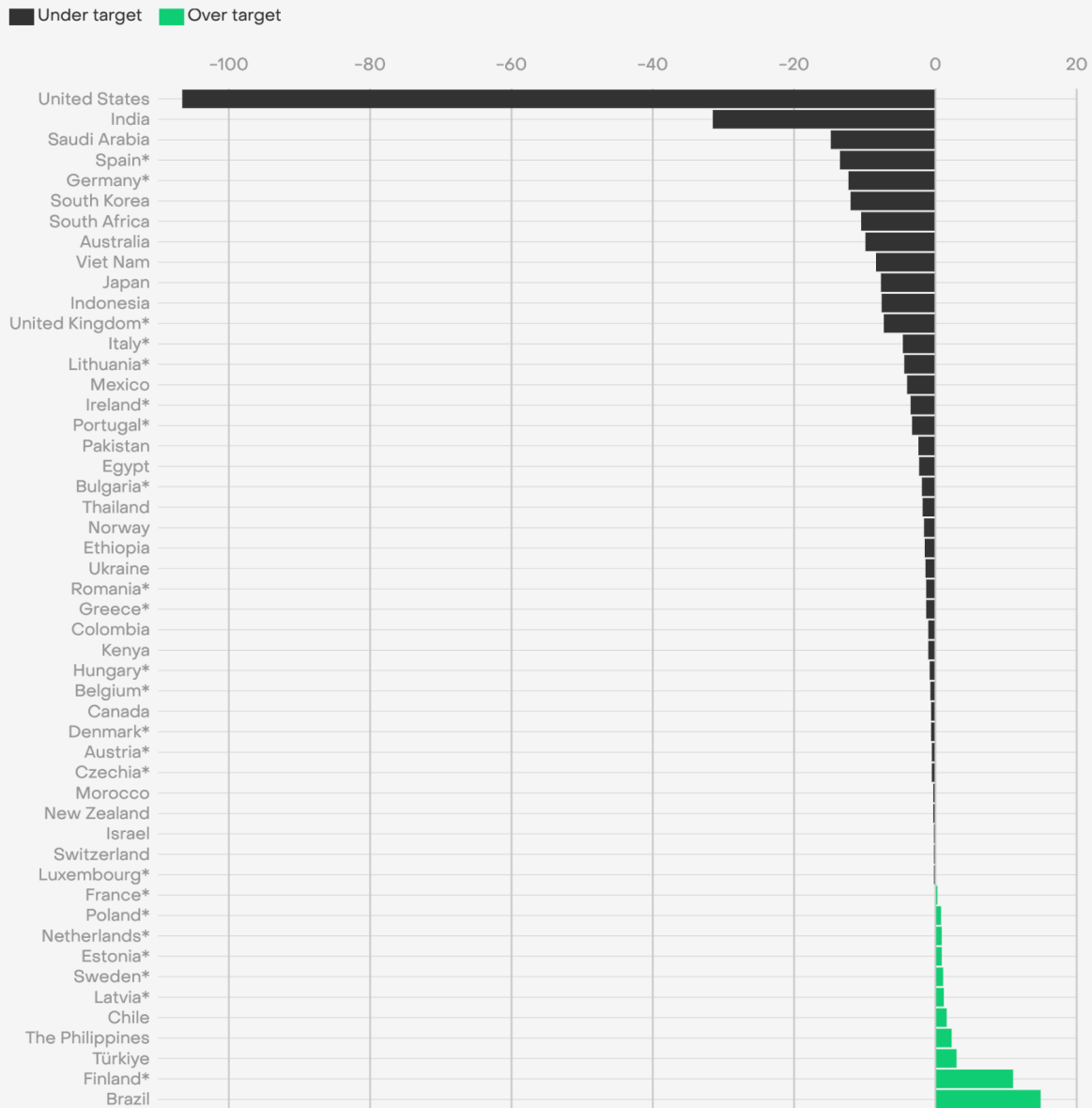
The previous chapter highlighted that once China is excluded from global calculations, the situation looks less positive, with forecasts for the rest of the world falling far short of 2030 national targets and a global tripling.

Of the 51 countries with forecast data and targets, only six are projected to meet or exceed their 2030 wind target, while 45 are expected to fall short. Those gaps are biggest in large wind markets such as the US, India, and the EU. Although the gap is largest in these markets, it is important to note that the US, India, and the EU are adding at least half of the wind needed each year to meet their 2030 target. In contrast, the gap is also large in countries with wind targets that are growing from a small baseline such as Saudi Arabia and Indonesia, and there the additions are only 5 to 10% of what is needed to meet 2030 targets. Forecasts are based on current policies but to reach the tripling goal, ambition along with the pace of additions must be increased through updated policies and incentives.

The “gap” is defined as the difference between the national 2030 target and the [IEA Renewable Energy Progress Tracker](#) or the [WindEurope Outlook](#) for EU countries. The WindEurope Outlook for 2024-2030 is a detailed assessment based on political or economic developments that may affect installations, as well as developments in EU regulation, national policies, signed power purchase agreements, and upcoming auctions. The IEA forecasts for 2024-2028 are based on an assessment of current policies and market developments in the renewables sector for each country. The IEA forecast runs up to 2028, and Ember’s methodology assumes the average of 2024 to 2028 is the same for 2029 and 2030 installations.

### Not on track to meet wind targets

National wind targets minus IEA forecast build by 2030 (GW)



Source: IEA forecast build is taken from the IEA's January 2024 Renewables Trancker, using 2028 additions for 2029 and 2030 to calculate a forecast to 2030 (unless marked \*, which is sourced from WindEurope Outlook 2024), National wind targets sourced from Ember's Global Renewable Target Tracker.

The US and India are discussed further as the countries with the biggest gaps between forecast installations and what is needed to meet 2030 targets. Brazil and Türkiye are

discussed as examples of countries that are making progress and are set to over-achieve on their wind targets.

### **US and India need to increase installations to achieve current 2030 targets**

The US is the second largest wind market in the world after China, as well as the country with the largest GW gap between forecast installations and what is needed to meet their 2030 target. The US does not have an explicit renewables target; the implicit target for the US comes from a [study done by the National Renewable Energy Laboratory](#) (NREL) to evaluate the impact of the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL) policies on the US power system. This modelling study suggests these policies are expected to set the country on course for 938 GW of renewables by 2030, an increase of 2.6x from 2022. For wind, this means a 2.6x increase from 142 GW in 2022 to 369 GW in 2030.

Achieving the NREL level requires building 32 GW of wind per year from 2024 to 2030. The latest [IEA main forecast](#), however, is for half of this rate; they forecast that wind additions in the US will average 16.5 GW per year from 2024 to 2028. The current build-rate is even lower - just 6.4 GW was added in 2023, which is the lowest value since 2017 and 57% lower than the highest annual additions ever in 2020. The forecasts for onshore wind in the US have been recently revised downwards by BNEF and GWEC to values even lower than the IEA forecast due to high interest rates, project delays, and continual permitting and grid connection issues.

Offshore wind is supposed to provide 35 GW of the US 2030 wind target. It is starting from a <1 MW baseline in offshore wind, and in order to meet the 2030 target, 5 GW per year must be installed from 2024 to 2030. Offshore wind additions are forecast to rise from 0.9 GW in 2024 to 2.8 GW in 2028 for an average of 1.5 GW per year according to the IEA main forecast. GWEC has more optimistic forecasts than the IEA in the [2024 Global Offshore Wind Report](#), which states that there are currently four projects, with a combined capacity of 4.3 GW, under construction such that there will be 15 GW of offshore wind by 2030. However, this is a 40% downward revision compared to the 2023 GWEC Global Offshore Wind Report. The IRA is in the early stages of implementation and still provides a positive signal for investors. However, increased [public approval of wind farms and grid modernisation](#) are both critical for generating momentum on wind capacity in the US.

India is the fourth largest wind market globally, and has the second largest gap between forecast installations and what is needed to meet the 2030 target. India's overall renewables

capacity target is for a tripling from 163 GW in 2022 to 509 GW by 2030. For wind, this means a 2.6x increase from 42 GW in 2022 to 110 GW in 2030 according to the latest [National Electricity Plans](#).

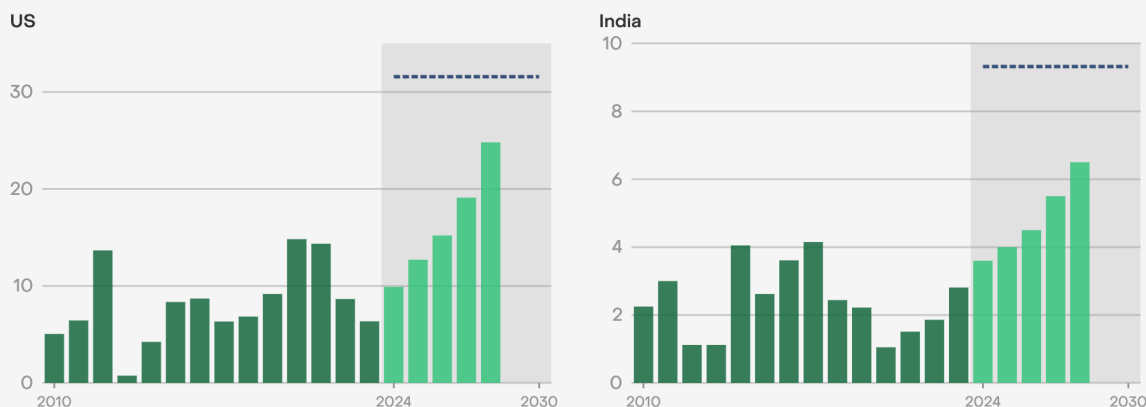
Achieving this level requires building 9.3 GW of wind capacity per year from 2024 to 2030. Although annual wind installations in India have risen over the past three years and were 51% higher in 2023 than in 2022, the current build rate of 2.8 GW in 2023 is well below what is needed.

Forecasts for onshore wind in India have recently been revised upwards by [GWEC](#) and BNEF due to a number of positive policy interventions in 2023 including wind-specific [renewable purchase obligations](#), [targets to tender 10 GW of wind per year for the next five years](#) starting in April 2023, and an updated policy to [repower existing wind turbines](#). However, the forecasted rate of additions is still only half of what is needed to meet 2030 targets. The latest [IEA main forecast](#) is that wind additions will average 4.8 GW per year from 2024 to 2028. This is similar to the BNEF forecast of 5 GW per year from 2024 to 2030 and the GWEC forecast of 4.6 GW per year from 2024 to 2028. India has domestic wind manufacturing capability, and increased confidence in supply chains, along with positive policy and regulatory momentum could help lower the gap between forecast additions and what is needed to meet the 2030 target.

### The US and India are expected to be furthest from their wind targets by 2030

Wind capacity additions in GW

■ Historical ■ IEA forecast\* ■ Additions needed to meet 2030 national target



Source: Historical data from IRENA, \*IEA forecast = 2024–2028 main forecast in the Renewable Energy Progress Tracker, Jan 2024, Ember 2030 Global Renewable Target Tracker

### **Brazil and Türkiye are forecast to exceed their 2030 wind targets**

Not all countries are under-achieving on their wind targets. For instance, Brazil and Türkiye's recent wind and forecast additions are greater than what is needed to meet the current 2030 wind targets.

Brazil is the world's sixth largest onshore wind power and a global leader in the clean energy transition with 91% clean electricity in 2023. The 2030 total renewable capacity target set out in the [Ten Year Energy Expansion Plan](#) in 2022 is 217 GW. For wind, this means 31 GW by 2030, generating 12% of electricity.

Achieving this requires building 0.3 GW of wind per year from 2024 to 2030. Brazil's wind capacity target is clearly set too low, as the latest [IEA main forecast](#) predicts 2.4 GW of wind per year from 2024 to 2028. The current build-rate is even higher; Brazil set a record in 2023 by adding 5 GW of wind. Brazil's current total onshore wind capacity is 29 GW and wind already has a 13% share in the country's electricity mix, exceeding the 2030 share target for wind. The rapid [build-out](#) of wind and solar has kept fossil generation to just 9% of Brazil's electricity in 2023, making it one of the lowest CO2 electricity grids in the world. It is also important to note that the rapid buildout of wind in Brazil has caused [social and environmental concerns](#), highlighting the importance of implementation that maximises benefits for local communities as well as clean generation.

Türkiye is also set to exceed its 2030 wind target. It ranks 12th in the world in onshore wind power and currently has 12 GW of onshore wind capacity, generating 11% of its electricity. The total 2030 renewable capacity target set out in the [2022 National Energy Plan](#) is 91 GW. For wind, this means an increase from 11 GW in 2022 to 18 GW in 2030, rising again to 29.6 GW in 2035. Türkiye's goal is to generate 12% of electricity from wind in 2030, which is already almost achieved, further rising to 18% in 2035.

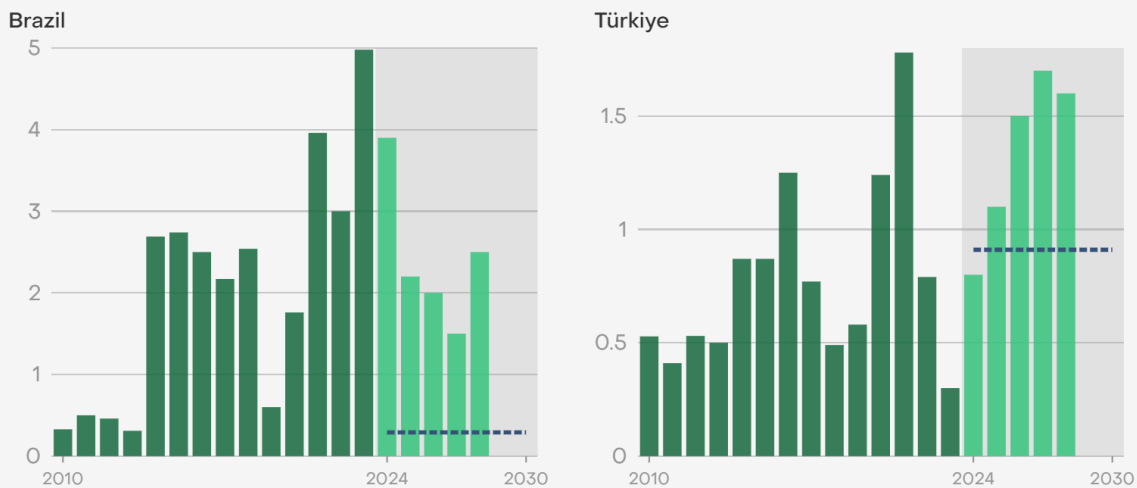
Achieving this level requires building 0.9 GW per year of wind from 2024 to 2030. The latest [IEA main forecast](#) predicts 1.3 GW of wind per year from 2024 to 2028. The current build-rate is in between these values, averaging 1.1 GW over the last four years. Türkiye is able to overachieve its target, though, in part because its [target lacks ambition](#). Currently, there are [26 GW of onshore wind projects under development](#). Türkiye is capable of doing more, and indeed [wind potential for Türkiye](#) is estimated to be up to 150 GW.



## Brazil and Türkiye are projected to add well over the wind power capacity needed to meet their 2030 national targets

Wind capacity additions in GW

■ Historical ■ IEA Forecast ■ Addns to 2030 national target



Source: Historical data from IRENA, IEA Forecast is the 2024–2028 main forecast in the Renewable Energy Progress Tracker, Jan 2024, Ember 2030 Global Renewable Target Tracker



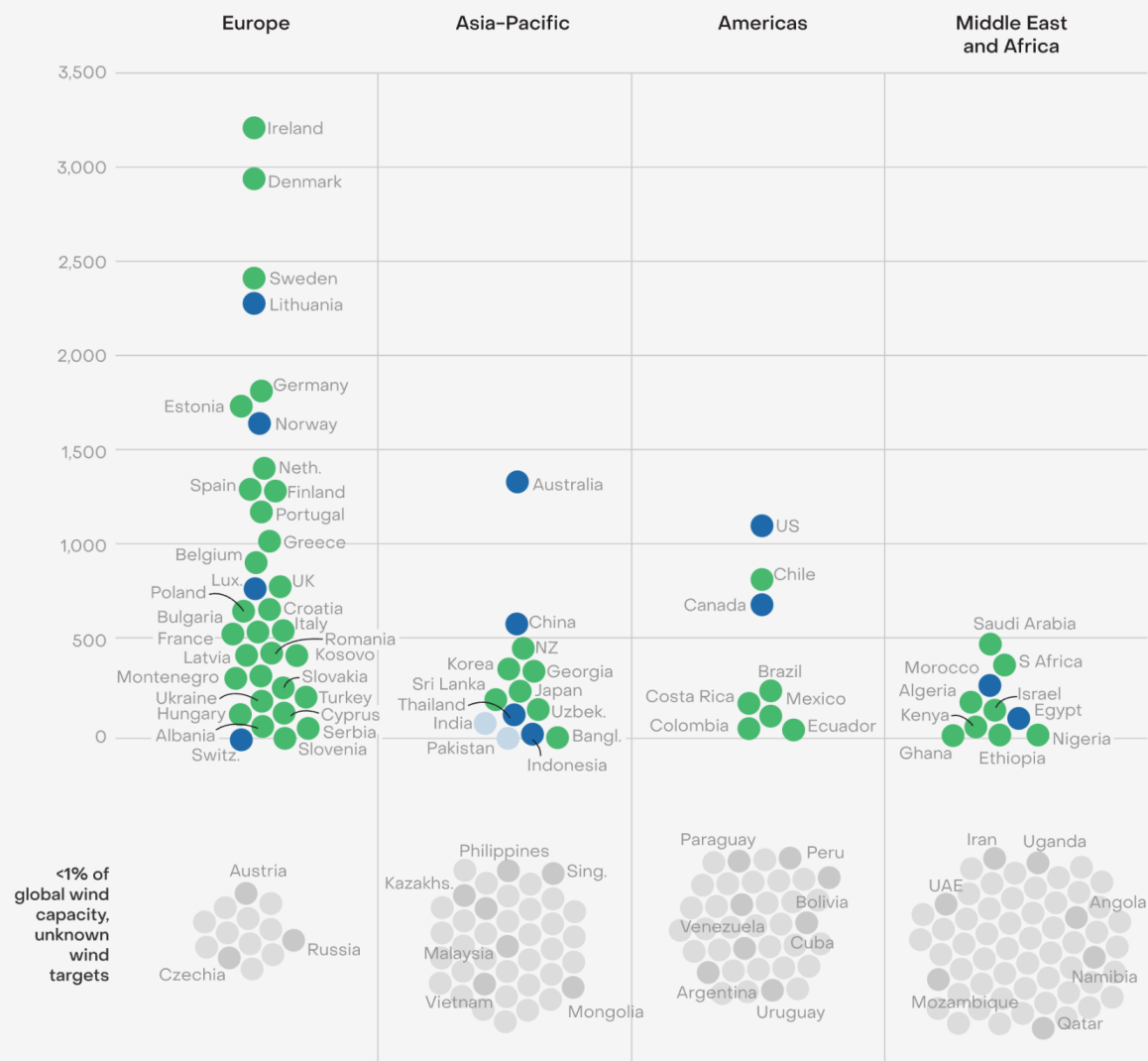
### The majority of countries do not yet have explicit wind targets

Ember’s analysis shows that there are only 56 countries that have explicit wind targets. There are also two countries with wind capacity targets that were derived from explicit targets for years other than 2030. 12 more countries have implicit wind targets that are extracted from national modelling studies and are not enshrined in national policy or strategy documents. Critically, they include major countries such as China and the US. Interestingly, the 70 countries that have wind targets account for 99% of current global wind capacity. Many countries in the Middle East, Africa, Central and South East Asia are yet to install wind capacity and it is still not clear if they have wind targets. Of the countries with a quantifiable target, the levels of wind per capita are very different. Many European countries, the US and Australia are targeted to be above 1,000 watts of wind per person by 2030. Most countries, however, are currently below 500 watts of wind per person.

### Many countries still lack wind targets, and ambition varies in those that have targets

2030 wind capacity target in Watts per capita

Target type ● Explicit ● Implicit ● Derived ● No target



Source: Ember 2030 Global Renewable Target Tracker

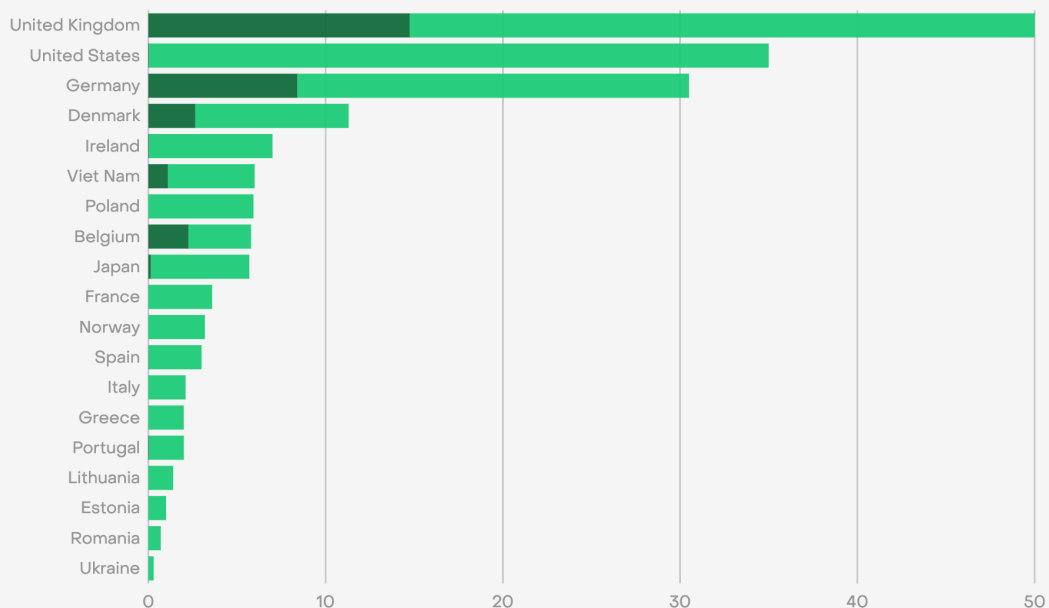
# Current offshore wind targets aim for an almost tripling by 2030

Offshore wind is a subset of the global wind industry that is already established in Europe and China, but still emerging in many other regions. There are 19 countries with offshore wind targets that sum to 177 GW, a 2.9x increase from 2022 capacity of 62 GW. Offshore wind targets are currently only 8% of the 2,157 GW sum of 2030 national wind targets in total. However, offshore wind produces almost twice as much electricity as onshore wind, due to higher wind speeds. Still, offshore wind is in its infancy and installations are starting from a low base. Seven of the countries with offshore wind targets have yet to install offshore wind, and only five have installed at least 1 GW.

## 19 countries have offshore wind targets and five have already installed more than 1 GW

Offshore wind capacity in GW

2023 Still to build for 2030 target



Source: IRENA, Ember 2030 Global Renewable Target Tracker - These 19 countries account for over a quarter of global electricity demand. China leads the world in current offshore wind capacity, but is excluded from the chart as it does not have a 2030 offshore wind target.

---

Even though offshore wind in many countries is in its infancy, [BNEF](#), [GWEC](#) and [IEA](#) all forecast that by 2030, total offshore wind will exceed the sum of 2030 offshore wind targets. IEA forecasts that offshore additions will rise from 17.5 GW in 2024 to 39.5 GW in 2028, which will bring global capacity of offshore wind to 218 GW by 2028, already more than the sum of 2030 targets. BNEF forecasts 258 GW of offshore wind by 2030, led by installations in China and the UK. GWEC has the most optimistic forecast for offshore wind with 298 GW forecast by 2030.

The GWEC [Global Offshore Wind Report 2024](#) forecasts China accounting for almost half of global offshore wind in 2030. China does not have an offshore wind target although they are the largest offshore wind market with 37.3 GW as of 2023. In fact, China has more offshore wind than the rest of the world combined. Offshore wind has increased rapidly in China from 1 GW in 2015 to 37 GW in 2023.

Offshore wind has longer lead times than onshore wind and solar PV, but the rapid rise in China and other emerging markets shows that offshore wind can also grow rapidly with the right incentives. [GWEC](#) highlights a number of markets to watch for offshore wind in countries that do not yet have offshore wind targets including the Philippines, South Korea, Australia, India, Colombia, and Brazil. Unlocking more offshore wind to help contribute to a global tripling of wind requires unlocking [permitting, financing, supply chains, and grids](#).

## Conclusion

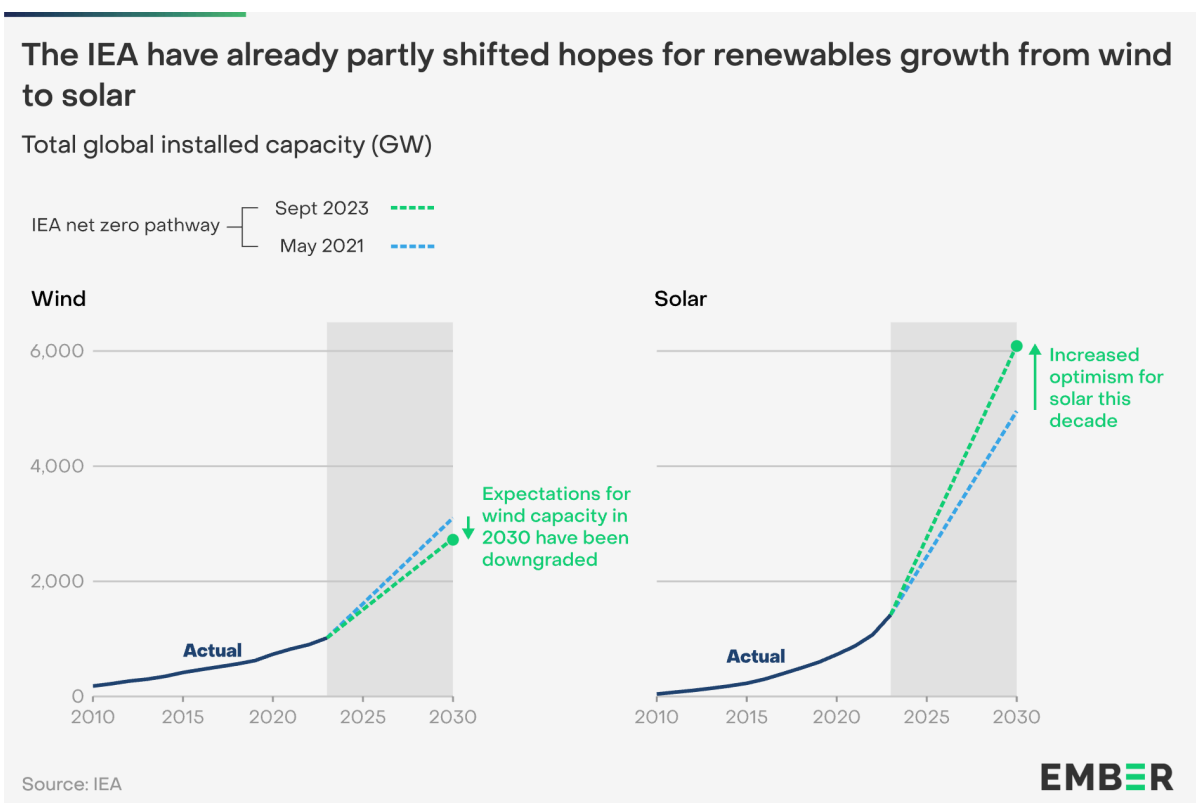
# Governments must enable faster wind growth and increase ambition

National targets are not ambitious enough for a global tripling, and most countries are still not on track to deliver even these.

A global tripling of renewables capacity as agreed at COP28 last year means at least a tripling of wind capacity. The vast majority of countries that currently have wind capacity installed also have wind targets for 2030. However, the sum of those targets only aims for just over a doubling of capacity, and falls short of the tripling needed to stay on the 1.5C pathway. Forecasts for global wind capacity suggest that meeting the 2030 national targets is achievable, in aggregate. However, this is almost entirely due to China's dramatic rise as a global wind leader. Without China, the rest of the world is set to fall far short of national targets and even farther from a tripling.

Wind has an important role to play in meeting electricity generation needs associated with the global tripling of capacity. Solar contributes more than half of the 11,000 GW of renewables capacity in the global tripling, while wind only contributes a quarter. But wind has a higher capacity factor than solar, meaning 1 GW of wind provides twice as much electricity generation as 1 GW of solar. As a result, although their capacity contributions are different, wind and solar contribute similar amounts to 2030 renewables generation (31% and 36%, respectively). Practically this means that if wind falls short of the global tripling by 1 GW, then 2 GW of solar must be added to generate the same amount of electricity. It is also important to note that [wind and solar work well together](#) to provide electricity throughout the day, with wind peaking in the morning and evening and solar at midday, as well as [seasonally](#) with wind peaking in winter and solar in summer.

One should be cautious in assuming that the current boom in solar could make up for a deficit in wind. When the IEA published their [September 2023](#) analysis showing that wind needs to triple by 2030, this was already a downgrade from their previous analysis in [2021](#), primarily because solar was upgraded. This reflected the reality on the ground from 2021 to 2023, where wind's prospects were clipped with higher costs, and solar saw exponential growth as prices collapsed.



The vast majority of countries that currently have wind capacity also have 2030 wind targets, and forecasts suggest global 2030 targets are achievable in sum. However, it is clear from forecasts and targets that the existing set of policies fall short of a global tripling of wind. Furthermore, outside of China, policy interventions are needed to get installations back on track to meet targets in many countries. Given the long lead times for wind and the need for permitting, policy and regulatory frameworks are even more important for wind than solar. Investments in grid and transmission infrastructure, and actions to streamline permitting could signal confidence for increasing ambition on wind. The rapid growth in key markets, especially in China, and the upward revisions of forecasts in key regions, indicate that with the right combination of policy, regulatory and financial support, rapid and large-scale wind growth can be enabled.

Supporting Materials

# Acknowledgements

## **Contributors**

### Report Authors

Katye Altieri, Dave Jones, Kostanza Rangelova

### Report Contributors

Ufuk Alparslan, Hannah Broadbent, Sarah Brown, Chelsea Bruce-Lockhart, Reynaldo Dizon, Nicolas Fulghum, Euan Graham, Aditya Lolla, Frankie Mayo, Rashmi Mishra, Neshwin Rodrigues, Chris Rosslowe, Ruchita Shah, Oya Zaimoglu

Kindly peer reviewed by Feng Zhao (GWEC)

© Ember, 2024

Published under a Creative Commons ShareAlike Attribution Licence (CC BY-SA 4.0). You are actively encouraged to share and adapt the report, but you must credit the authors and title, and you must share any material you create under the same licence.