



2021 | Q2 Global

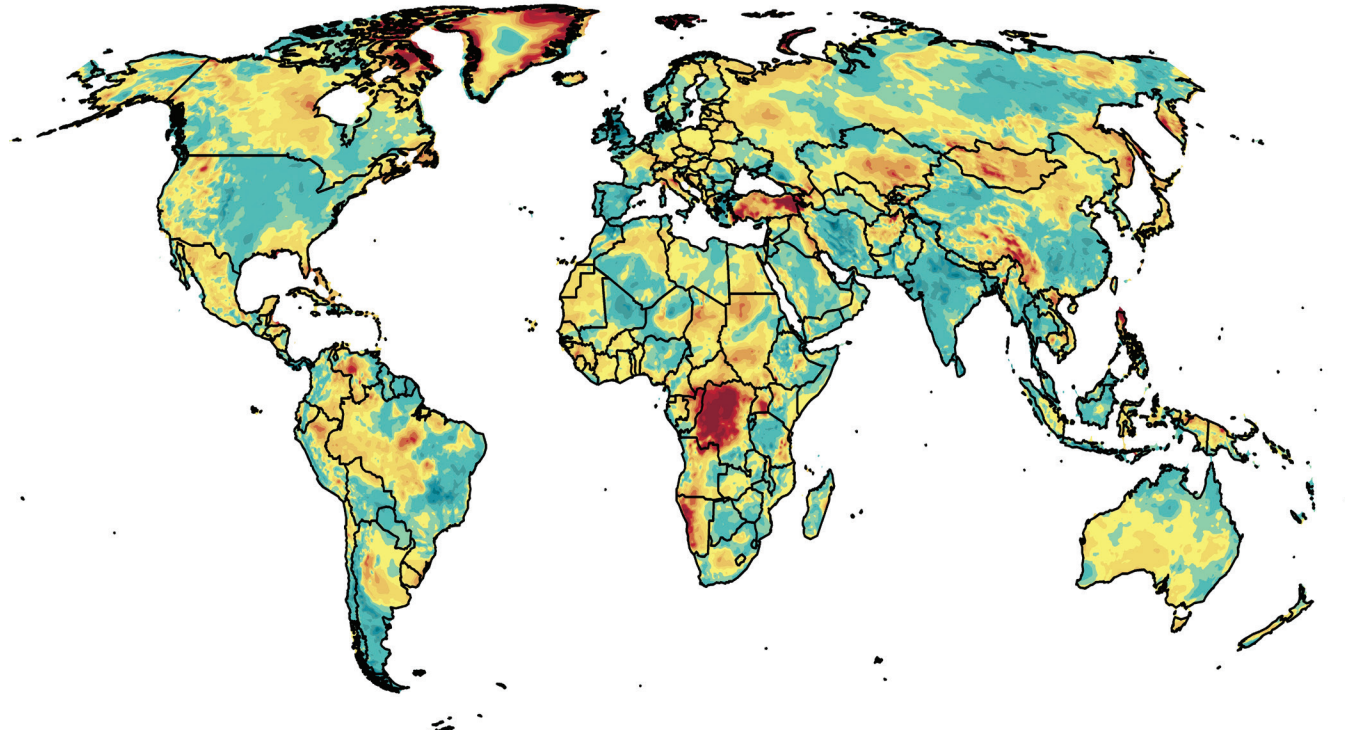
Wind Trends

Global wind speed performance

2021 | Q2

Global

The Wind Trends Bulletin depicts anomalies of the global wind resource from the historical norm on a monthly, quarterly, and annual basis. The anomalies are calculated as a percent deviation from the 1995 – 2019 mean speed at 100-m above ground level for the calendar period. The latest Wind Trends dataset is derived using the ERA5, a contemporary global reanalysis dataset. For more information about customized analyses for your project portfolio, data or subscription options, please contact us at renewableenergyservices@ul.com.



Wind Trends
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According to ERA5 reanalysis data, global wind speeds in the second quarter of 2021 were below the long-term, second-quarter norm (1995-2019). Most regions experienced near-normal to slightly below-normal wind speeds. Asia and Europe showed the strongest regional departures, with localized wind speeds in excess of 21% above or below the long-term norm, respectively.

North America

The second quarter signaled an abrupt halt to the favorable wind conditions of previous quarters across North America, and wind speeds dropped below the norm across many key wind power producing areas. A wind speed deficit enveloped a large swath of the interior USA and CAN, from the Rocky Mountain region in the west through the Midwest USA, southern Ontario, and into Mid-Atlantic states. Many wind power producing areas of North America experienced a strong reversal in wind speeds between March and April: from moderately or strongly above the norm at the end of Q1 (9 to 21%), to moderately below the norm at the beginning of Q2 (-6 to -9%). The wind

speeds picked up again across the eastern USA, CAN and Caribbean by the quarter's end.

South America

Near-normal conditions across South America at the beginning of the year dropped slightly below-normal in the second quarter. Of the top 5 countries with largest installed capacity in the region (representing over 99% of the regional installations), only Uruguay completed the second quarter with a surplus in the wind resource. Above-normal wind speeds across northeast Brazil (6 to 9%) dropped to near-normal (-3 to 3%). A wind speed deficit continued across interior Bahia and Minas Gerais, BRA (two important states in terms of renewable energy development – both wind and solar). A north-south wind speed gradient persisted throughout the quarter across Chile and Argentina, with moderately above-normal wind speeds in the north (3 to 12%) and moderately below-normal wind speeds to the south (-6 to -12%). Elsewhere, anomalously windy conditions continue for far northern Colombia (e.g., the Guajira Peninsula)

and the ABC Islands – while wind speeds remained below the norm over key areas of Peru and Ecuador.

Europe

The decline in wind speeds continues for another quarter across Europe. However, the pattern of wind speed departures across the region has shifted. Central Europe and southern Scandinavia experienced below-normal wind speeds in the first quarter of 2021, with near-normal to slightly above-normal wind speeds elsewhere. In the second quarter, the deficit shifted to Western Europe (the UK, the North Sea area and the Iberian Peninsula), with above-normal winds across Central Europe, the Baltic States, Belarus, and eastern Ukraine. Europe saw strong wind speed anomalies every month of the quarter. In April, wind speeds were well below the norm across the UK and the Iberian Peninsula (-6 to -21%), while strongly above-normal across Scandinavia and Turkey (6 to 21%). In May, much of Central, Eastern, and Southern Europe had strongly above-normal wind speeds (9 to more

than 21%), with strongly below-normal speeds across Northern Europe (-3 to -18%). By June, only Iceland and localized areas of southeast Europe had wind speeds above the long-term norm.

Africa and the Middle East

Quarterly wind speeds across Africa and the Middle East declined to near-normal. The period began with moderate to strong wind speed deficits in April (-9 to -19%), particularly across South Africa and southern Mozambique and to the north across Morocco, Western Sahara and the Canary Islands. In contrast, the Cape Verde Islands and nearby onshore areas had a windy start to the period at 3 to 9%. By May, the wind speeds across many of these areas rebounded, or further intensified, above the norm. Between April and May, wind speeds increased substantially across the Canary Islands and adjacent western Morocco, and the Eastern Cape of South Africa (continued on the next page).



Africa and the Middle East (cont.)

Wind speeds continued to intensify across wind power producing areas in Africa during the month of June, with some strong wind speed anomalies across key areas of central East Africa (namely Kenya at 21% or more), and across the Northwest coast of Africa (e.g., the Canaries, Western Sahara, Cape Verde and Mauritania at 3 to 18%). Wind speeds across much of the Middle East finished Q1 at strongly above the norm in March (3 to 21%), but then dropped to near-normal in April. Generally speaking, key areas of the Middle East saw little change in their wind speed index throughout the quarter (e.g., Egypt and Jordan).

Asia

AWind speeds declined across much of Asia. Slightly above-normal conditions across China in the first quarter gave way to near-normal conditions overall, although the wind speed index varied greatly across the territory. A wind speed deficit continued for much of central and eastern China, while above-normal wind speeds across northern China in the first quarter retreated

further to the northeast. Notably, wind speeds did increase across some of China: the highlands in the southwest, e.g., the Yunnan and Sichuan provinces. Elsewhere, moderate to strong deficits held across much of Pakistan, India, and Sri Lanka (-6% to -12%). Wind speeds varied across Southeast Asia; strongly below-normal wind speeds across the area in April and May (-6% to -12%) reversed by June (12% to 15%), allowing Vietnam to round out the quarter above the norm (although the quarter-ending wind speed for Thailand did not rebound). Strongly above-normal wind speeds across much of the Philippines in April and May (in excess of 21%) gave way to strongly below-normal conditions by the quarter's end (-6 to -21%) except in far northwest Luzon, where wind speeds finished well above the norm (more than 21%). The wind speed index across Taiwan showed great gains, from slightly below-normal conditions in Q1 2021 (-3 to -6%), to strongly above-normal conditions in Q2 (9% to 12%). The wind speeds across Japan held at above the norm (3% to 6%).

Oceania

The quarterly wind speed index for Oceania remains nearly unchanged at near-normal conditions, as above-normal wind speeds in April and May balanced deficits in June. The second quarter started with a strong wind speed gradient from south to north across Tasmania and mainland Australia, as well as South Island and North Island in New Zealand in April. By May, much of the region had wind speeds above the norm (with the exception of coastal New South Wales, AUS and southeast South Island, NZL). By June, this pattern reversed for Australia, with below-normal speeds across Victoria and Tasmania, with above normal speeds in the South Australia and much of New South Wales..

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North America

Below normal:

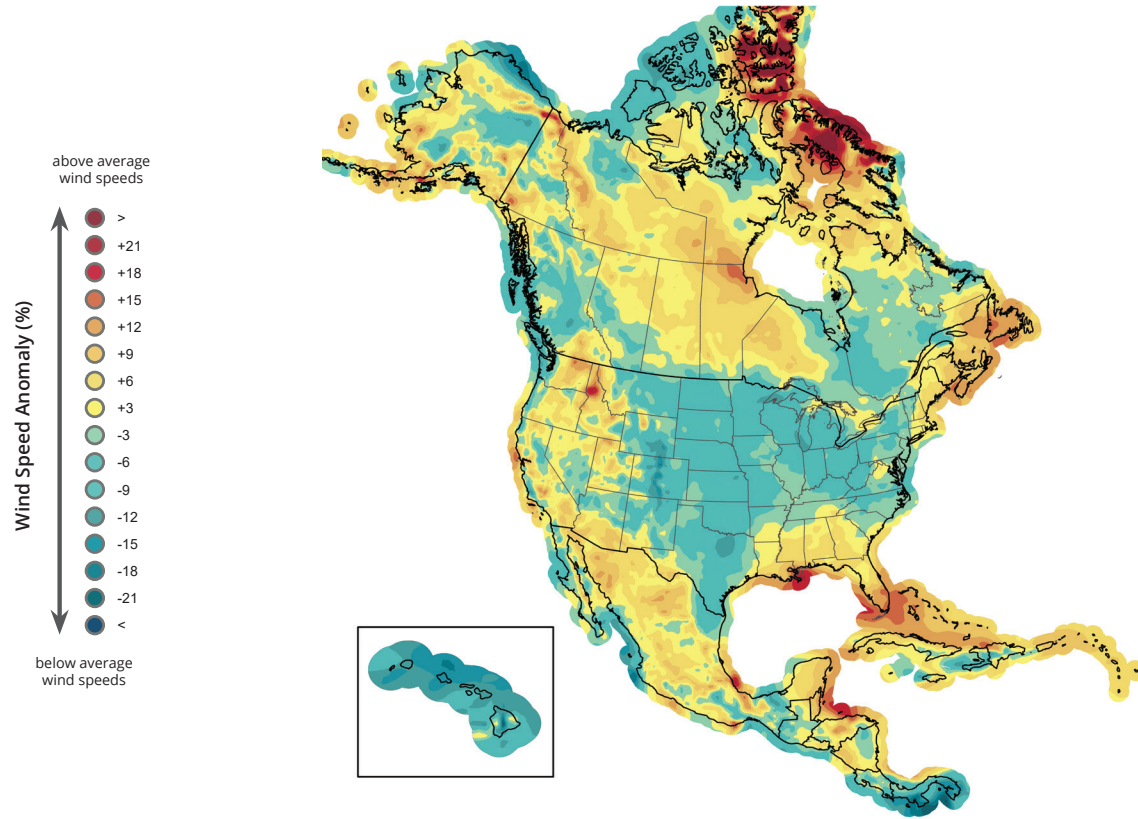
- Hawaii, USA
- Great Plains, USA
- Midwest, USA
- Southern Rocky Mountains
- Mid Atlantic, USA
- South-Central Plains, CAN
- Southern Ontario, CAN
- Tamaulipas, MEX

Above normal:

- Canadian Maritimes
- New England, USA
- The Pacific Northwest, USA
- Yucatan Peninsula, MEX
- Puerto Rico
- Eastern Caribbean



Wind plant locations source:
www.thewindpower.net



South America

Below normal:

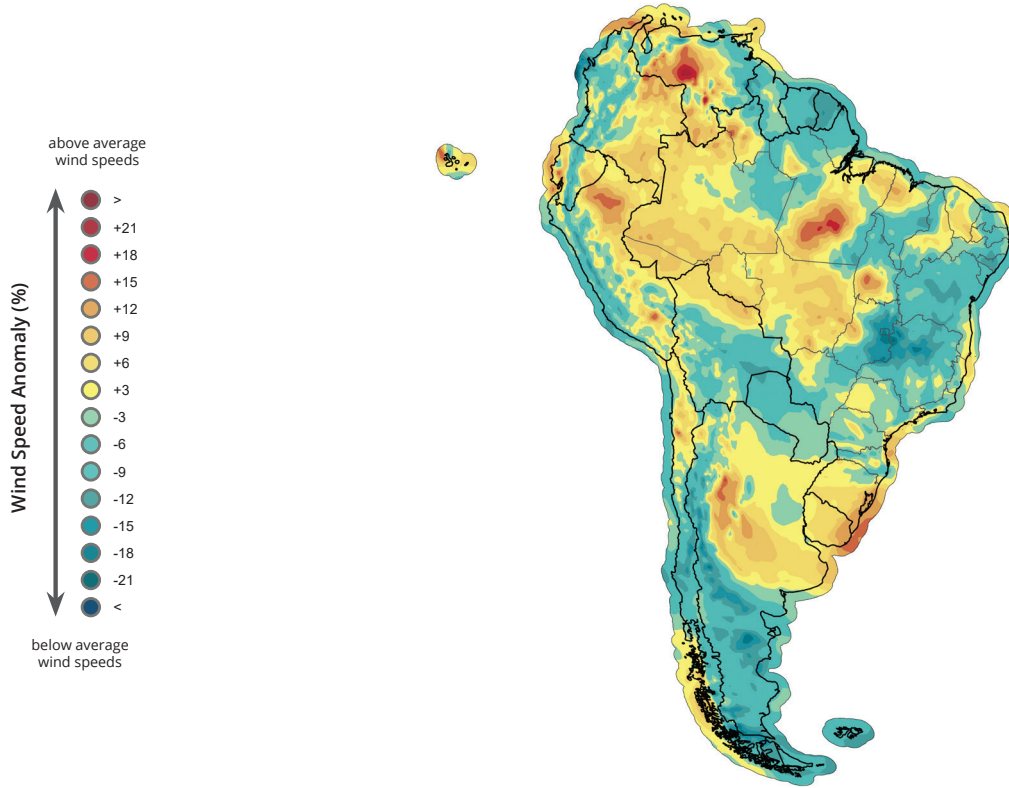
- Northeast Brazil
- Southern Argentina
- Southern Chile
- Coastal Peru

Above normal:

- ABC Islands
- Northern Chile
- Northern Argentina
- Uruguay
- Guajira Peninsula, COL



Wind plant locations source:
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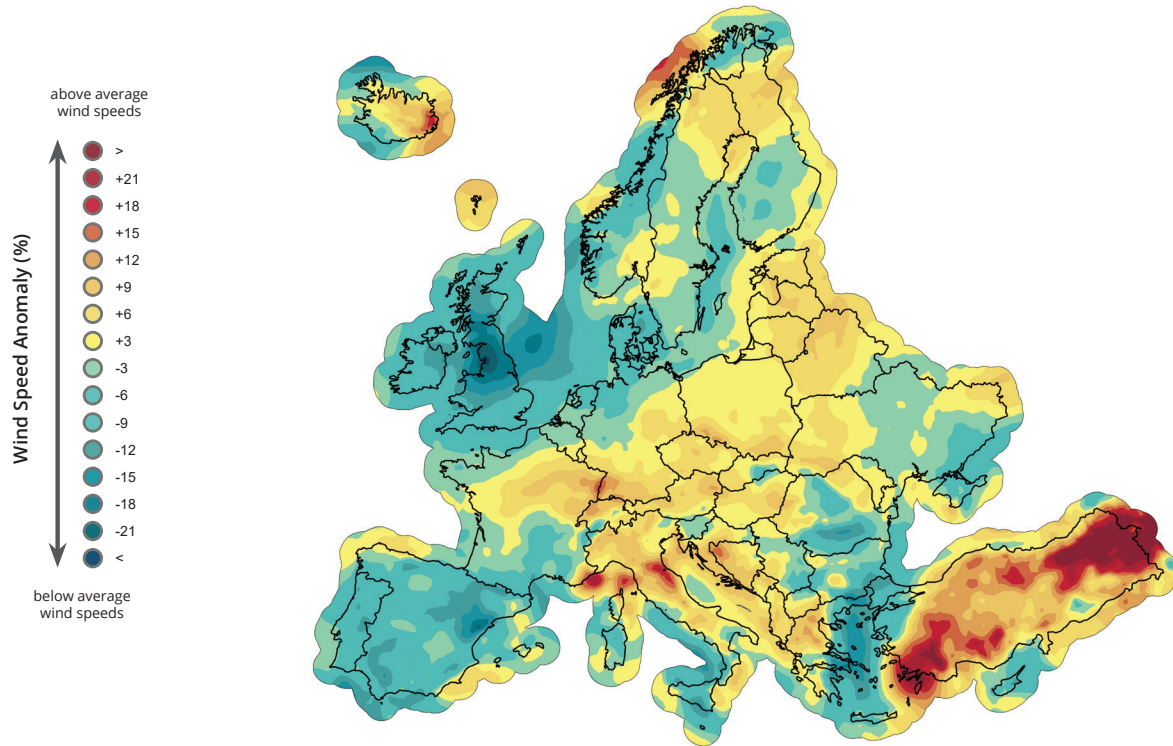


above average wind speeds

Wind Speed Anomaly (%)

below average wind speeds

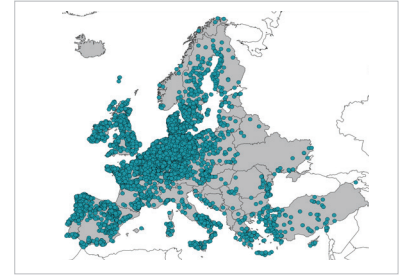


**Below normal:**

- Iberian Peninsula
- United Kingdom
- Denmark
- Aegean Sea
- The Balkans
- Sicily and Sardinia, ITA
- Southern Kherson & Crimea, UKR

Above normal:

- Southwest Turkey
- Italian Peninsula
- Central Europe
- Baltic States
- Northern Scandinavia



Wind plant locations source:
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2021 | Q2

Africa / Middle East

Below normal:

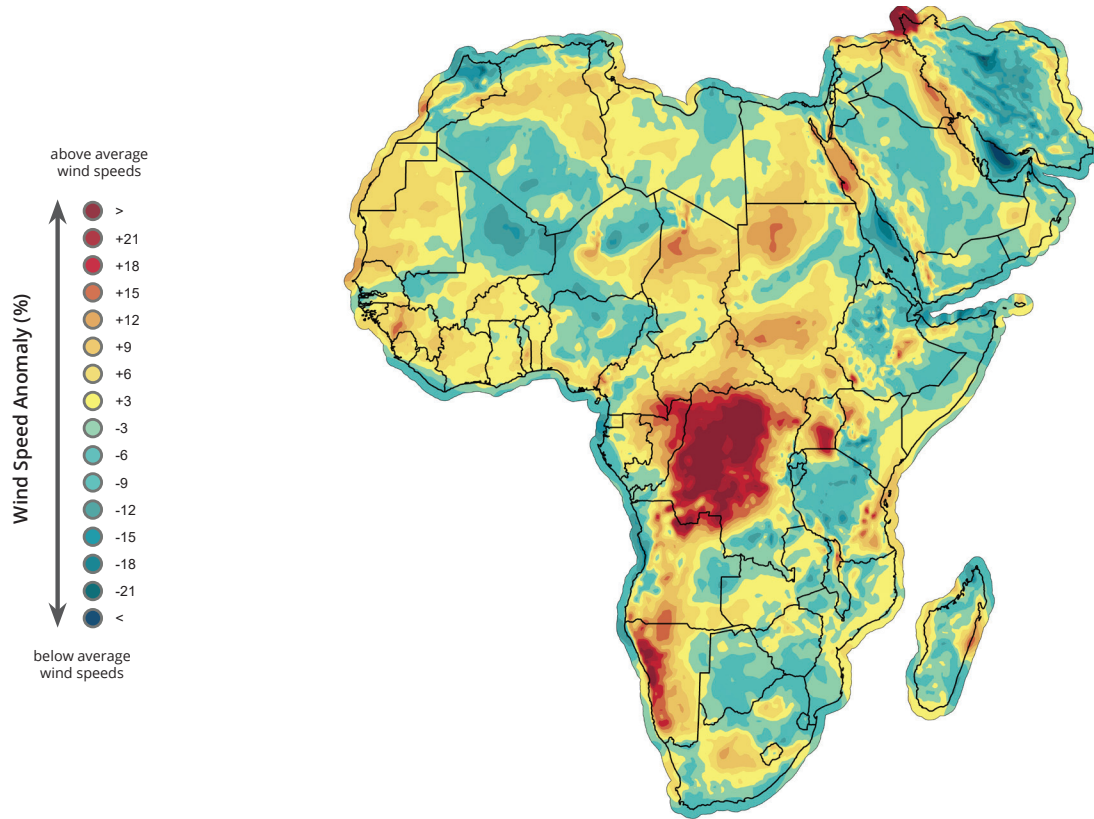
- Coastal South Africa
- Mainland East Africa
- Morocco

Above normal:

- Central South Africa
- Canary Islands
- Western Sahara
- Egypt
- Namibia



Wind plant locations source:
www.thewindpower.net



above average
wind speeds

Wind Speed Anomaly (%)

below average
wind speeds



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Below normal:

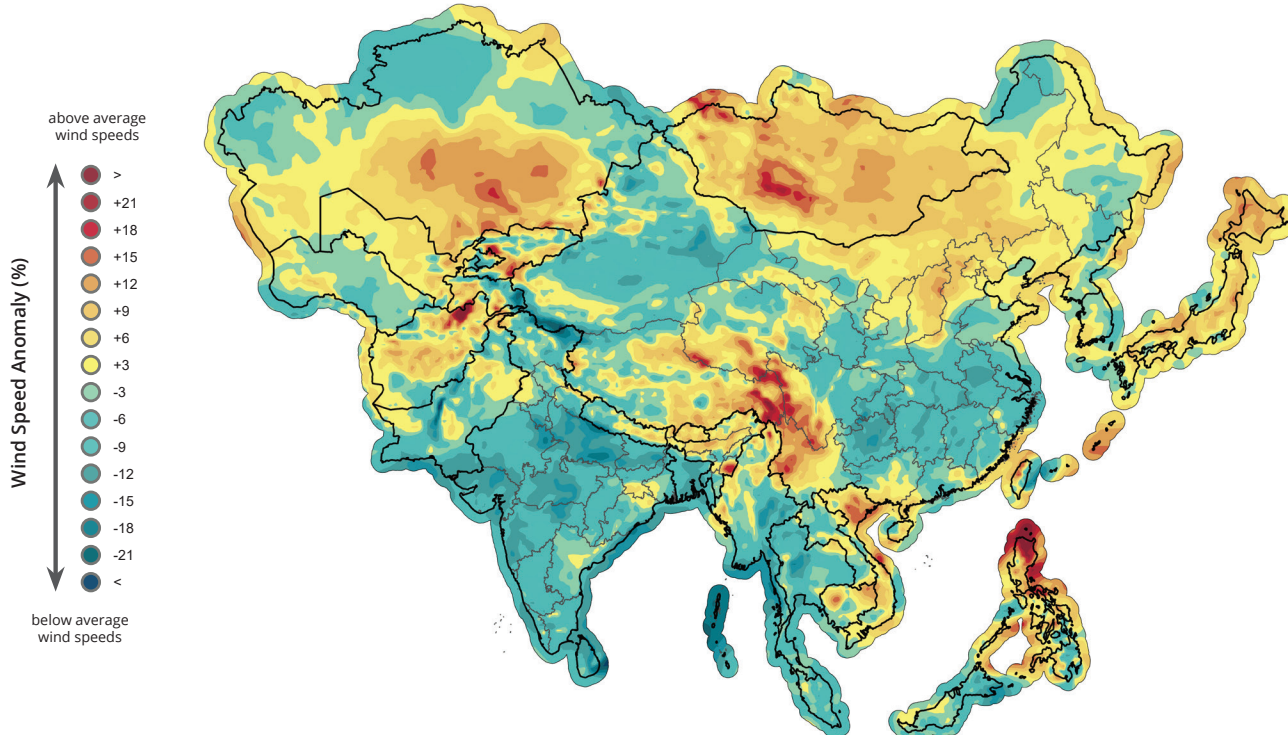
- India
- Pakistan
- Bangladesh
- Thailand
- Southern and Central China

Above normal:

- Northern China
- Japan
- Taiwan
- Vietnam
- Northern Philippines



Wind plant locations source:
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Oceania

Below normal:

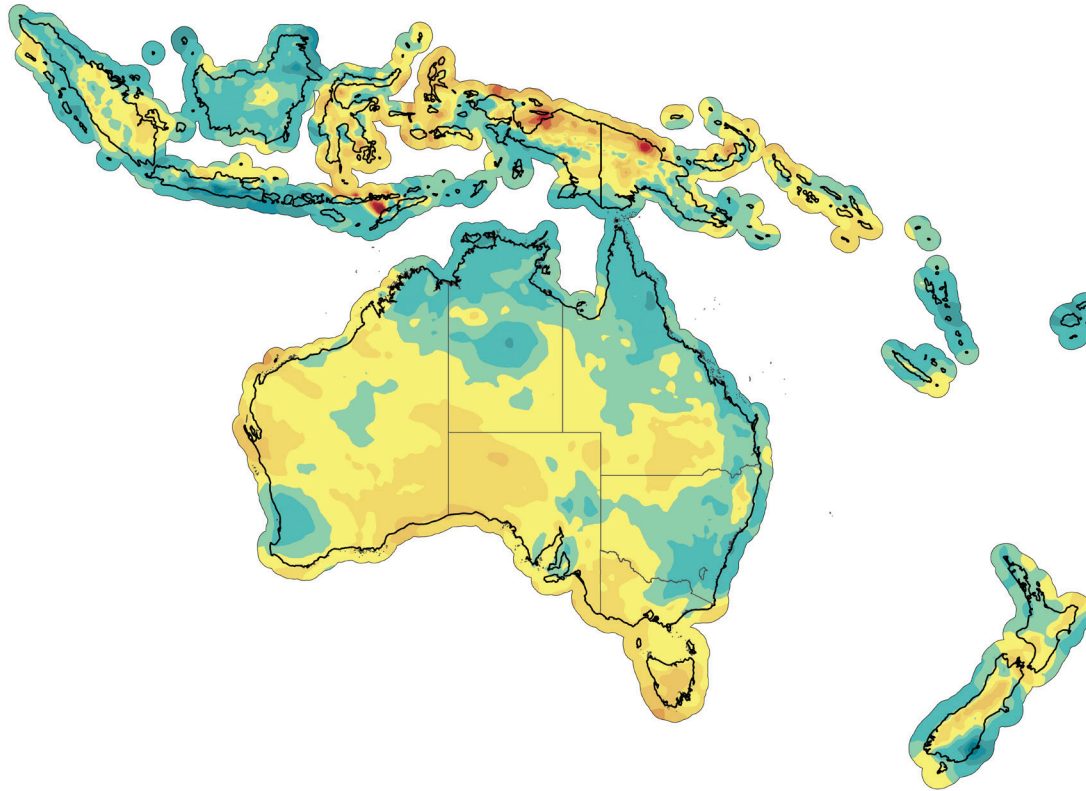
- Southwest Australia (Perth)
- New South Wales, AUS
- Fiji
- Vanuatu

Above normal:

- Southwest Victoria, AUS
- Tasmania, AUS
- Cook Strait, NZL
- Eastern New Caledonia
- Sulawesi, IND

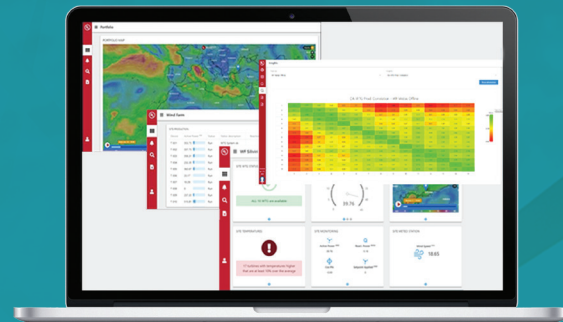


Wind plant locations source:
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Locations	Jan	Feb	Mar	Q1	Apr	May	Jun	Q2	Jul	Aug	Sep	Q3	Oct	Nov	Dec	Q4	ANNUAL
North America	-4.9	-1.5	8.1	0.5	-3.4	-1	-4	-2.9									
USA	-4.2	-1.3	7.6	0.7	-3.3	-1.5	-4.7	-3.2									
Canada	-12.1	-2.6	14.2	-0.4	-6	-3.7	9.7	-0.5									
Mexico	-3.7	-4.1	5.8	-0.7	0.2	9	-18.3	-2.3									
South America	7.4	-5.4	-0.3	0.7	1.9	-1	-4.7	-1.7									
Brazil	10.2	-5.8	1.2	2	3.5	-2.5	-5.9	-2.2									
Argentina	1.1	-4.9	-3.1	-2.2	-4.7	0.6	-4.1	-2.8									
Chile	-0.1	-4.2	-2.8	-2.4	-0.8	-0.1	-5.1	-2.1									
Europe	-1.7	1.3	-3.8	-1.5	-4.4	7.9	-10.7	-2.4									
Germany	-8.9	-7.8	-4.7	-7.2	1.6	17.3	-19.7	0.1									
Spain	11.7	8.2	-10.7	3.1	-15.1	1.5	-3.5	-6.2									
France	-2.0	5.3	-1.5	0.6	-2.5	21	16.4	1									
United Kingdom	-18.5	14.9	2	-0.7	-21	-8	-6	-12									
Italy	19.9	-10.3	-10.9	-0.6	-4.3	13.2	-8.7	0.3									
Portugal	10.9	15.4	-9.6	5.4	-23	4.8	0	-6.6									
Denmark	-15.1	-3.1	-3.4	-7.4	4.5	-6.9	-13.7	-5.2									
Ireland	-15.9	15.8	-0.1	-0.2	-15	-1.8	-4.6	-7.3									
Africa / Middle East	3.8	0.5	1.8	2.1	-3.7	2.3	3.4	0.7									
South Africa	-0.1	1.6	-1.1	0.2	-9	4.4	2.3	-0.5									
Morocco	6.7	-4.6	-7.1	-1.8	-13.3	4.8	1.3	-2.6									
Egypt	3.1	11.7	11.8	9.1	9.6	7	7.5	8									
Asia	10.4	3.4	-3.8	2.9	-4.6	5	-1.8	-0.5									
China	12.0	4.2	-4.4	3.4	-4.4	6.6	-1	0.3									
India	-0.9	-3.9	0.7	-1.6	-7.7	-6.9	-8.2	-7.8									
Thailand	10.4	5.2	-6.5	3.3	-12.5	-7.8	10.5	-1.8									
Ind, Aus, Oceania	3.6	-0.1	-2.5	0.4	-1.1	3.5	-1.2	0.4									
Australia	3.6	1	-1.9	0.9	-1.6	3.4	-0.8	0.4									
New Zealand	4.7	-18.3	-11.4	-8	1.7	3.6	-4.5	0.3									
World	3.5	1.3	-0.8	1.1	-4	4.1	-4.6	-1.6									

2021 | Q2

Wind index

The wind index represents the average wind speed anomaly across all plants across the country or region in production by the end of Q2 2021. The anomalies are calculated as a percent deviation from the 1995 – 2019 mean speed at 100-m above ground level for the calendar period, and are weighted by the location and rated capacity of wind projects.

The wind project details have been obtained from [Windpower Monthly Intelligence](#).

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