

BUSINESS

Renewable Companies Strive for 24-Hour Power

Power developers attempt to balance out fickleness of renewable-energy supply



Sumant Sinha, ReNew Power's CEO, at a wind site in Karnataka, India, that is part of the company's round-the-clock renewables project.

PHOTO: RENEW POWER

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Wind and solar developers are concocting elaborate plans to provide round-the-clock renewable power, the industry's holy grail as countries around the world shift to green energy.

Renewable energy is notoriously unreliable, generating electricity only when the wind is blowing and the sun is shining. Project developers, utilities and grid operators are trying a mix of options to overcome that challenge, including building huge amounts of renewable capacity, storing excess power on batteries, and using algorithms to make project economics work.

A few years ago, ReNew Energy Global PLC RNW -0.87% decrease; red down pointing triangle decided it could supply India's grid with a steady stream of electricity by building wind and solar farms capable of producing as much as three times the amount of power it had contracted to deliver—all in different parts of the country and knit together with sophisticated software.

The project, which is scheduled to come online early this year, is expected to perform more like coal or gas plants, which utilities count on to deliver a reliable amount of power when consumers need it, says Sumant Sinha, ReNew's CEO.

"That is making it easier for [Indian utilities] to absorb more renewable energy," he says.

Building the additional capacity is expensive, with the total project cost at around \$1.2 billion. To help pull in more revenue, ReNew plans to sell extra electricity it generates on India's spot market, where prices tend to be relatively high, using computer models to predict the best times to do that.



Siemens Gamesa, which makes wind turbines at factories such as this one in Hull, England, is working on combining solar farms with energy-storage systems.

PHOTO: PAUL ELLIS/AGENCE FRANCE-PRESSE/GETTY IMAGES

Even so, the project can't guarantee to deliver power on demand 100% of the time—something developers say is still too tough and costly to do with renewable sources and batteries alone.

Companies around the world are wrestling with similar challenges as countries shift away from climate-warming fossil fuels, raising the amount of solar- and wind-generation in the power mix.

In the U.S., for instance, Virginia-based power company AES Corp. is selling 24-hour renewable-power contracts to big corporations that are trying to slash the amount of carbon emissions associated with their electricity use, says Leonardo Moreno, president of the company's clean-energy business unit.

For the first such deal, signed in 2021 with Google, AES pledged to build enough new renewable-energy generation to power the Alphabet Inc. unit's Virginia data centers for 90% of the hours contracted. To do that, AES crunched numbers on thousands of configurations of wind, solar and energy storage, in different locations, to match the times and amounts of electricity Google wanted, says Mr. Moreno. Similar to ReNew, AES ultimately built more than three times the capacity that Google's data centers would have needed from an energy source that was generating at full power all the time.

AES later signed a similar deal with Microsoft Corp. and is now talking to the Defense Department to discuss whether something like that would be feasible for its power procurement, Mr. Moreno says.

Building such large amounts of renewable capacity has its limitations. In addition to the expense, it takes up vast amounts of land and isn't possible in some parts of the world. Getting to 100% renewable energy all the time would require so much battery storage that it isn't economically feasible at this time, says Mr. Moreno.

Many renewables developers are combining batteries with solar farms to let them store some energy during the day, when the sun is shining, power production is at its peak and electricity prices tend to be lower. They discharge that power in the evening, when solar supply falls but demand for electricity, along with prices, is high, says Donny Gallagher, vice president of engineering at Solv Energy LLC, one of the biggest builders of large-scale solar installations in the U.S.

That kind of strategy is especially important in states such as California, where solar in 2021 comprised around a quarter of the state's power generation, with wind contributing 8%, according to the U.S. Energy Information Administration. The rush of power from all those solar panels around midday means there is often more electricity than needed, and the state's grid operator is unable to take it, says Mr. Gallagher.

"It's almost impossible to find a project now in California without batteries," he says.

Spain-based Siemens Gamesa Renewable Energy SA, a wind-farm developer and turbine maker, is similarly working on how best to combine its projects with batteries as well as systems that can store energy in hydrogen, says Poul Skjærbaek, the company's head of innovation and products.



An AES battery site in California stores power from renewable sources to use later.

PHOTO: PATRICK T. FALLON/AGENCE FRANCE-PRESSE/GETTY IMAGES

In India, the country's electric distribution companies are struggling to handle mismatches between power demand and supply as the amount of wind and solar has grown to around 12% of the country's generation. When the sun and wind are strong, those projects can produce a lot of electricity, but over the course of the year, they might generate only 30% or less of their full capacity.

In 2019, the government took a stab at solving that problem by requesting bids for as much as 400 megawatts in renewable energy that would produce at least 80% of its full capacity annually and 70% monthly—the closest India had come to round-the-clock power from sources such as wind and solar. The government also included steep penalties for missing those targets.

ReNew, which is backed by Goldman Sachs Group Inc., calculated it could hit the targets by "oversizing" the amount of capacity installed, says Manya Ranjan, ReNew's head of corporate strategy.

Altogether, ReNew is building 400 megawatts of solar in the sunny state of Rajasthan in India's northwest, along with 900 megawatts of wind in the southwestern states of Karnataka and Maharashtra. The wind, which can produce power day and night, helps balance out the peaks and troughs of solar generation.

ReNew is using batteries to store solar energy during the midday peak and release it when demand rises in the evening. It is also leaning heavily on computer modeling—including digital simulations of its turbines and solar arrays, weather forecasts and projected power demand from the four utilities to which it is feeding its electricity, says Parul Agrawal, who heads ReNew's digital and analytics team.

That modeling helps ReNew time sales of extra electricity on the spot market for maximum profit, says Mr. Ranjan.

Those sales "will give you that extra gravy," he says.