

# A WIND FARM

SPROUTS IN THE OCEAN

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**DO YOU KNOW** where your electricity comes from? In most cases, when you turn on a light or charge a phone, the power comes from a plant that burns gas or coal, which pollutes the environment and contributes to climate change. But there are other ways to generate electricity — even from air.

Engineers harness the power of the wind with tall towers called turbines. Maybe you've seen some on a road trip: They look like enormous white fans, and generate energy when the wind blows and makes them spin.

Power companies are building turbines all over the country, but there's

a problem: They take up a lot of space. That's why developers have their sights set on the sea, where there's tons of room and "the winds are stronger, and blow more steady and more often," says Walter Musial, who leads offshore wind research at the National Renewable Energy Laboratory.

By the end of the decade, President Joe Biden wants the United States to cut its greenhouse-gas emissions (the pollutants created from burning fossil fuels that cause climate change) by 50 percent. As part of that plan, he has set a goal for "offshore wind" to power 10 million homes. Construction has

already started on the first major offshore wind farm in the United States, called Vineyard Wind 1, off the coast of Massachusetts. With 62 gigantic turbines, it will create enough electricity for 400,000 homes. Here's how the spinning propellers turn the power of wind into electricity.

## TURBINE

Wind turbines in the ocean can be twice as big as those on land. The ones at Vineyard Wind will be 853 feet tall — as high as a 78-story building. And that's just counting what's above the surface of the water.

## WIND

Sensors read the speed of the wind and where it's coming from. A motor at the top of the tower swivels the turbine so it reacts to the direction of the wind. Turbines are built to stand up to whatever the ocean throws at them, including big storms like hurricanes and gusts of over 150 miles per hour. But they are designed to stop spinning when the wind blows faster than about 55 miles an hour, to protect the mechanisms inside from becoming overworked.

## SUBSTATIONS

Electric cables coming from the turbines feed into a substation, which collects all the power and transmits it to another substation onshore. From there, it connects to the electrical grid.

## RESEARCH AND MONITORING

Because the technology is new here in the United States, we don't fully know yet what kind of effects wind farms might have on marine animals and their environment. Researchers will monitor things like noise and the electromagnetic fields created by underwater power cables to see if they are influencing wildlife or changing how they behave.

## BLADES AND ROTOR

When the wind blows, it spins the turbine's three hollow blades, which can each be longer than a football field. The blades are curved, similar to an airplane wing. Their spinning turns a generator to produce electricity. A single rotation of the world's biggest offshore wind turbine could power a house for two days.

## FOUNDATION

The turbine's foundation can reach nearly 200 feet down to the bottom of the ocean. This type, called a monopile, is basically a humongous pipe as big around as a small house. Engineers use a gigantic hammer to pound it like a fence post into the seabed.

## CABLES

A thick cable carries the electricity generated by the turbine. It runs down the inside of the tower and is buried several feet below the seabed.

