



# RENEWABLE ENERGY

Norway's goal is to become carbon-neutral within the next 10 years. Between its maritime traditions and its current emphasis on renewable energy research, creation and funding, the future is looking green.

# REVOLUTION

BY TAYLOR HUGO

PHOTO BY BUCKMINNELL / ALAMY STOCKPHOTO

**BY 2030,** Norway aims to reduce greenhouse gas emissions by 95% across sources like energy, waste, buildings and transport.

It's a lofty goal, but if there's any nation that can achieve it, it's Norway. The country has been leading the charge toward a greener, more environmentally conscious future for more than a century, thanks to research, businesses and public funding that place an emphasis on renewable energy.

“Renewable energy is not the only answer, but it's the key enabler to achieve the goal of reaching zero emissions. The green transition represents a golden opportunity for value

creation,” says Eivind Heløe, director of the renewables and environment department for Energi Norge, a nonprofit organization that represents roughly 300 electric companies in Norway.

There are many positives to tapping resources like water, wind and sun:



Hunderfossen power station is one of the most famous power stations in Norway.

expensive option to provide power,” says Tina Bru, Norway’s Minister of Petroleum and Energy. “In many ways, the utilization of our hydropower resources became the gateway to a modern, industrialized Norway.”

With support from parliament, both privately and publicly funded hydropower plants began popping up in cities like Telemark, Hammerfest and Rjukan, using rivers and waterfalls to generate electricity. This was a rarity at the turn of the century, when many countries were using coal and oil to fuel their manufacturing revolutions.

“Unlike almost every other country in

reduction of air pollution, a diversified energy supply and the creation of jobs. But perhaps most significantly, relying more heavily on renewable energy will aid in the fight against global warming to help create a healthier planet for future generations.

#### AHEAD OF THE CURVE

Norway has always been on the cutting edge when it comes to renewable energy. It started back in the late 1800s, when enterprising Norwegian businessmen and politicians realized the power that could be harnessed by tapping the country’s most valuable natural resource: water.

“Norway has built its renewable energy system on hydro resources for over a hundred years. Back then, hydropower was not built for its renewable qualities—but for its availability and for being the least

the world, the power production here has always been emission-free. That does not, of course, mean that it does not have an environmental impact, but it is CO2-free power production,” says Heløe.

Street lighting and public rail transportation were some of the first conveniences to become electrified, and as Norway’s reliance on electricity grew—along with the rest of the world’s—so did the need for hydropower. When Hammeren power station (the oldest operating power plant in Norway) opened just outside of Oslo in 1900, it was said that the capital city had “secured power forever,” according to Norway’s Ministry of Petroleum and Energy. Measuring against today’s electricity consumption rates, however, the amount of electricity produced by the plant annually in 1900 would only



cover Oslo for less than a day in 2021.

“The energy demand in Norway is continually increasing, in terms of both private use—for example, electrical cars—but also for new green industries like battery factories and data centers,” says Bru. “Building infrastructure for increased renewable energy is vital to secure jobs, and further green industry development and value creation.”

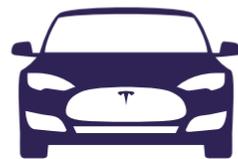
#### WAVES OF CHANGE

More than 100 years later, Norway is still a powerhouse when it comes to hydropower. Not only does

hydropower remain the largest source of renewable energy in Norway—which Bru believes will continue to be the spine of the Norwegian energy system a decade into the future—but the country is also the number-one producer of hydropower in Europe, and sixth in the world.

Water isn’t the only natural resource that’s been harnessed for its energy-producing potential, however. Wind, hydrogen and solar energy also contribute to the 98% of electricity production in Norway that comes from renewable sources.

Ocean Sun is at the forefront of solar power solutions. The organization’s solar power systems float on water. Its technology takes advantage of water’s natural cooling effect that lowers operating temperature and increases power output.



**NORWAY  
has the  
MOST  
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PHOTO BY TASAFOTO/ALAMY STOCK PHOTO

PHOTO COURTESY OCEAN SUN



**THE EUROPEAN COMMISSION AWARDED OSLO THE TITLE OF EUROPEAN GREEN CAPITAL FOR 2019.**

Ocean Sun is one such company at the forefront of solar power solutions. Based in Fornebu, Norway, just west of Oslo, the organization has developed solar power systems that float on bodies of water. Its patented technology is based on a flexible polymer material that is both durable and cost-effective, taking advantage of water's natural cooling effect that lowers operating temperature and increases power output.

Withstanding even the roughest of wind and waves, Ocean Sun's installations "have an almost limitless application area, and the cost of building these floating systems is now approaching the same cost as building them on land," explains Dr. Børge Bjørneklett, Ocean Sun's CEO and inventor of the patented solution. There are now six of these around the globe in Norway, Singapore, Albania and the Philippines.

"The reason we will succeed with floating solar is because of the maritime traditions and heritage in Norway, dating all the way back to the Vikings.

Ship building and construction has a very strong tradition here, plus we have the fjords," says Bjørneklett, noting that Ocean Sun has been named a "future unicorn"—a company that will be valued at \$1 billion or more within 10 years.

Ocean Sun isn't the only renewable energy-focused company making waves in Norway. Grålum-based Comlight developed motion-sensing lights to save energy and reduce light pollution on public roadways, while BRIGHT sells solar-powered lamps and phone chargers from its headquarters in Oslo. On a mission to make food production more "efficient, sustainable and profitable," Aquabyte uses machine learning to aid in fish farming off the Norwegian coast, and Blueye's underwater drones provide valuable environmental monitoring and research.

There's no denying there's something in the water (pun intended) in Norway when it comes to inventing renewable energy solutions. Both Heløe and Bjørneklett agree that Norway's



PHOTO BY JANICE ALAMANDOU / ALAMY STOCK PHOTO

landscape deserves a lot of the credit, with mountains and fjords providing the reserves for hydropower and the cool climate that allows solar cells to thrive. Plus, "we have the best wind conditions in Europe," says Heløe, creating the ideal environment for wind power production—which he believes is the future of renewable energy.

Right now, there are 53 wind farms in Norway, including Statkraft, the leading producer of wind power in northern Europe. Wind power accounts for roughly 10% of the country's overall electricity production from renewable sources, but that is likely to increase in the coming decade. At the end of 2020, Bru announced a nearly \$14 million investment in a new wind power research center in Norway, NorthWind. Comprised of more than 50 research institutions around the globe, NorthWind will be in operation through 2028, with a mission to make wind power more affordable, efficient and sustainable—largely through offshore turbines.

#### THE FUTURE IS GREEN

Despite all of the progress Norway has made with renewable energy, oil and gas is still big business for Norway's economy: The country is the third-largest exporter of natural gas in the world behind Russia and Qatar, supplying 20 to 25% of gas demand in the European Union. In fact, the total export value of crude oil and natural gas in 2019 was NOK 424 billion, more than \$50 million—about half of the total value of Norway's exports of goods.

"Norway is currently developing its petroleum sector to produce with decreasing emissions through, for example, electrification of the platforms to meet the demand of the

future," says Bru. "However, oil and gas are fossil resources, and we need to make our economy less reliant on this industry."

Heløe believes the answer to filling coffers when Norway can no longer rely on petroleum income lies in renewables, but early action is still needed to electrify a lot of the country. While Norway's power production is completely renewable, that doesn't necessarily translate to total renewable power *consumption*—that figure sits closer to 50%.

"We have taken the responsibility of trying to lead and motivate the Norwegian public and politicians to make this country the first renewable and zero-emissions country in the world," says Heløe. "Many cars are still driven by gasoline. A lot of industries like the agricultural sector depend on fossil fuels. All the ferries, all the planes need to be electrified, but this, of course, needs a lot of development of infrastructure. That's what we work on every day, to motivate and incentivize that electrification."

It's going to take more than solar panels and electric cars, but it's a shift that must happen to achieve climate goals and create a better way of living.

"I don't think we have a choice. We cannot choose not to develop this further. In order to avoid a major catastrophe, we need to achieve zero emissions," Heløe says when asked about the future of renewable energy. "What makes me fundamentally optimistic is that we can see that technologies that were not economically viable just a few years ago are now profit-makers. Companies all over the world have succeeded and proven that you can earn money by being green." 🌱

## WHICH COUNTRIES EXPORT THE MOST NATURAL GAS?

Norway is the third-largest exporter of natural gas in the world. Here's a look at the top countries on the list.



1. Russia



2. Qatar



3. Norway



4. Australia



5. Canada



6. United States



7. Algeria



8. Malaysia



9. Turkmenistan



10. Nigeria

SOURCE: BP STATISTICAL REVIEW OF WORLD ENERGY 2020