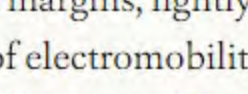


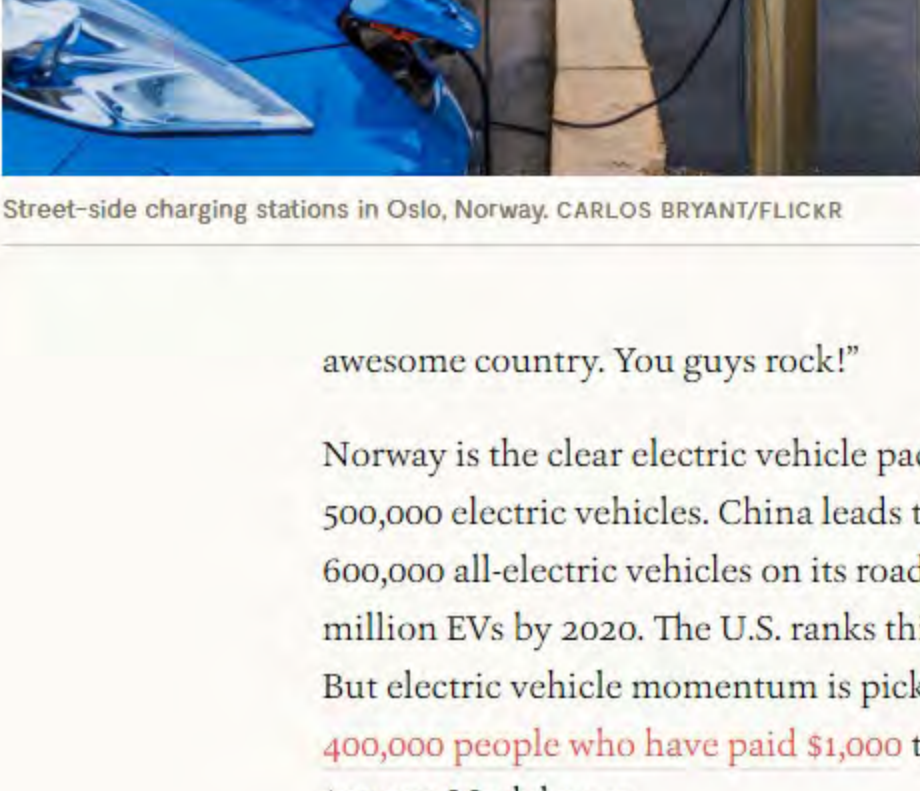
With Norway in Lead, Europe Set for Surge in Electric Vehicles

With the help of ambitious emissions-reduction targets, growing support from government and the auto industry, and rapid technological advances, electric vehicles appear to be on the verge of a major expansion in Europe.

BY PAUL HOCKENOS · FEBRUARY 6, 2017



On Europe's northern margins, lightly populated Norway has been at the cutting edge of electromobility for years, even decades now. The capital of Oslo, like most of Norway's cities and towns, boasts bus-lane access for electric vehicles (EVs), recharging stations aplenty, privileged parking, and toll-free travel for electric cars. The initiative began in the 1990s as an effort to cut pollution, congestion, and noise in urban centers; now its primary rationale is combating climate change. Today, Norway has the highest per capita number of all-electric [battery only] cars in the world: **more than 100,000** in a country of 5.2 million people. Last year, EVs constituted **nearly 40 percent** of the nation's newly registered passenger cars.



Street-side charging stations in Oslo, Norway. CARLOS BRYANT/FLICKR

Not resting on its laurels, the Norwegian experiment shows every sign of accelerating. Earlier this year, Norway opened the world's largest fast-charging station, which can charge up to 28 vehicles in about half an hour. The country, joined by Europe's No. 2 in e-mobility, the Netherlands, intends to phase out **all fossil fuel-powered automobiles by 2025**. Elon Musk, CEO of the U.S. electric car company Tesla Motors, responded to Norway's declared goal by tweeting: "What an amazingly

awesome country. You guys rock!"

Norway is the clear electric vehicle pacesetter in Europe, which now has about 500,000 electric vehicles. China leads the world in EV usage, with about 600,000 all-electric vehicles on its roads and an ambitious plan to deploy 5 million EVs by 2020. The U.S. ranks third globally, with fewer than 500,000 EVs. But electric vehicle momentum is picking up in the U.S., as evidenced by the **400,000 people who have paid \$1,000** to be on the waiting list for Tesla's \$33,000 Model 3 car.

The trailblazing achievements of the Norwegians and the Dutch are just one reason that many experts see 2017 as a crucial breakout year for the electric mobility in Europe and beyond. Experts acknowledge that in the past the numbers have **never quite lived up to the hype** around EVs or other alternative transportation technologies. Indeed, in 2016 **only 2 million** electric and hybrid passenger cars were on the road worldwide – about 0.2 percent of the global fleet; in Europe, significantly less than 1 percent of new car registrations are battery-electric vehicles (as opposed to hybrid cars). And key questions still loom, such as whether there will be sufficient renewable energy supplies to power vast new fleets of EVs. If electric vehicles are charged with fossil fuel-generated electricity, the result is more, not fewer, greenhouse gas emissions.

Nevertheless, because of rapid technological advances and strong government support for EVs in Europe and China, experts maintain that a new era in electromobility is dawning – and that this time there's more to the prediction than industry optimism.

"We're convinced that Europe and other continents, too, are now turning the corner on e-mobility," says Lars Mönch of Germany's Federal Environment Agency. "It's the aim of all big cities worldwide to ambitiously tackle the climate and urban congestion issues that they all face." Referring to the provisions of the Paris Agreement on climate change, in which nations pledged emissions cuts aimed at holding temperature increases below 2 degrees C, Mönch added, "There are goals now for the transportation sector that can only be met with alternative forms of mobility."

Norway illustrates that with incentives that eliminate the price advantage of conventional gas-burning vehicles, many people will go for the electric option. "It works, absolutely," says Martin Norman of Greenpeace Norway, who has driven an EV since 2004. "It's clearly feasible, especially in urban areas. We've found that the range of EVs is enough for most of what people need." And since 98 percent of Norway's electricity comes from hydropower, the country's burgeoning EV fleet leaves almost no carbon footprint.

Because of its lucrative offshore oil business, Norway can afford to promote e-mobility with generous incentives.

Many European experts and industry representatives see the Norwegian model – minus the whopping subsidies – as a sign of where European electromobility is heading in the not-too-distant future. Magdalena Jozwicka of the European Environment Agency, a Copenhagen-based European Union body, says EU Europe looks to non-EU member Norway for inspiration. Even though it's highly subsidized, e-mobility in Norway has caught fire on account of its own virtues, she says, noting its contribution to air quality, its quiet, and the many perks e-cars enjoy.

"People aren't just using them as hobby cars for city shopping anymore," she says. "They're switching to full e-mobility because it's possible now."

Thanks to its lucrative offshore oil and natural gas business, Norway can afford to promote e-mobility with generous incentives, including the considerable bonus of exemption from a 25 percent sales tax. Norway's access to abundant and cheap zero-emission hydroelectric power means it can even offer e-car owners **free power charging** at public charging stations.

Elsewhere in Europe, the main driver for EV growth isn't subsidies but legislation, explains Wolfgang Bernhart of the international consulting firm Roland Berger, referring to the EU's **mandatory emissions-reduction targets** for new cars. By 2021, the average emissions of all new cars sold must be 40 percent less than what the average car on the road emits today – an extremely ambitious goal that can only be met by the rapid, large-scale adoption of electric vehicles.

"Every city in the EU is working toward this," he says, noting that fine particulate pollution is also an issue in European metropolises. "A certain share of electric mobility of one type or another is really the only solution."

In Europe, transportation is responsible for a quarter of all greenhouse gas emissions. And while Europe's industrial emissions have **fallen by 38 percent** since 1990, those in the transportation sector – including aviation – have increased by 9 percent.

The 2015 Paris climate accord and follow-up agreements stipulate that every signatory country propose national goals for climate protection, including – explicitly for the first time – for the transportation sector. Moreover, the **International Energy Agency (IEA)** forecasts that greenhouse gas emissions from transportation will "increase by 120 percent from 2000 to 2050 as a result of a projected three-fold increase" in the number of cars worldwide. Some industry and advocacy groups have set a **global deployment target** of 100 million electric cars and 400 million electric motorcycles and scooters by 2030.

The upbeat assessments about e-mobility's future are grounded in recent developments, including rapid advances in EV technology and China's new-found commitment to de-carbonization. Moreover, 2016 saw a surge in EV sales globally – **30 percent more** than in 2015 – and an expansion of charging infrastructure, both trends that will carry into 2017 and probably beyond. Europe's most popular EVs were three all-electric plug-ins – the BMW i3, Renault Zoe, and Nissan Leaf, as well as Mitsubishi's plug-in hybrid, Outlander.



An assembly line for the Zoe electric car at French carmaker Renault's plant in Flins-sur-Seine. ERIC PIERMONT/AFP/GETTY IMAGES

Falling prices for EVs and recent technological developments—several of them led by Tesla – have changed the game. For one, the cost of lithium-ion batteries, which account for about 40 percent of an EV or hybrid vehicle's cost, has **fallen by two-thirds** since 2010 – much faster than experts had anticipated and with further steep reductions expected in the near future. Six years ago, the average EV battery sold for more than \$1,000 per kilowatt-hour; now it goes for less than \$350. It could drop to as low as \$125 in the near future, industry experts say.

What's more, as battery technology develops – in particular the improving "energy density" of lithium-ion batteries, enabling them to store more power with less weight – the range of EVs is rising dramatically from the under 100-miles-per-charge of the first generation of e-cars. The BMW i3 lasts for **114 miles without a recharge**, and the newest Renault Zoe **claims to push** the 200-mile mark. Yet none of the competitors matches Tesla's leading models with ranges of **more than 215 miles**. The battery's steady efficiency evolution, which is expected to continue at about **5 percent a year**, implies that the plug-in all-electric is no longer just a second car for city errands.

This drop in battery price is reflected in the lower price tags on the newest models. The latest Chevy Bolt goes for around \$37,500, and the price tag of the BMW i3 is about \$38,500.

A second generation of EVs is in production now and they are considerably lighter, longer-range automobiles than those launched five years ago. With the shock of Tesla's unexpected advances, European car manufacturers have invested heavily in the forthcoming EVs, convinced that they either do so or lose out in the long run.

"We're now flipping the switch," Daimler CEO Dieter Zetsche **said last year**. "We're ready for the launch of an electric product offensive that will cover all vehicle segments, from the compact to the luxury class." European car makers have also lobbied forcefully for governments to provide bigger rebates and tax incentives in different forms to stimulate the domestic markets.

However, even a range exceeding 200 miles doesn't alleviate the necessity for periodically recharging. The frequency of – and distance between – charging facilities has long been, and remains, one of the key sticking points that make potential buyers hesitate. Charging infrastructure in Europe has grown since 2013 at a rate of 30 percent to 60 percent a year. The continent now has **more than 100,000 charging spots**, all but a few thousand of them "slow chargers," which take as long as eight hours to juice up a battery.

Significantly reducing charging times is essential to the widespread adoption of EVs, and Europe has recently added 1,300 DC "fast chargers" to the network, namely stations that repower EVs in little more time that it takes to fill up with gas. But, unless you're in Scandinavia, it's still difficult to travel long distances in Europe with an all-electric plug-in vehicle.

"This is why the hybrid plug-in is going to be important for the next five years or so," says Bernhart of Roland Berger consulting, noting that it adds an entire tank of gas to the plug-in's range.

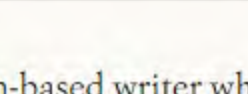
The EU appears newly determined to get behind the push for more charging points by stipulating that as of 2019, every newly built or refurbished house from Cyprus to Lapland will have to have an EV charging station. By 2023, 10 percent of all buildings' parking spaces must have EV chargers. Europe's automakers now recognize their own interest in finally outfitting the continent with the chargers that their electric fleets require. As a group, BMW, Daimler, Ford, and Volkswagen intend to install **thousands of EV fast chargers** along European autobahns.

"The e-mobility revolution has to go hand-in-hand with a transition to clean energy or it doesn't make sense," says a European official.

Finally, China's sudden and muscular emergence in the world of electromobility has internationalized momentum for EVs. **No country sold more** EVs than China in 2015 – 34 percent of global plug-in sales. Carmakers in the U.S. and Europe consider China as **their most important market** for manufacturing and sales. General Motors, for example, last year found buyers in China for 35 percent of its global production of electric vehicles through GM China and its joint ventures with Chinese companies. This, apparently, is just a taste of what the industry believes will come.

But as the EEA's Jozwicka notes, EVs "are only as clean as their source of power. The e-mobility revolution has to go hand-in-hand with a transition to clean energy or it doesn't make any sense."

Adds R. Andreas Kraemer of the Institute for Advanced Sustainability Studies in Potsdam, Germany, "Our energy and the transport sectors are engaged in a co-transformation." Kraemer points out that battery electric cars can be employed to store renewably generated power at times of surplus, thus aiding the growth of renewable energy.



Paul Hocken is a Berlin-based writer whose work has appeared in the *New York Times*, *Newsweek*, *The Nation*, *Foreign Policy*, *Spiegel International*, and elsewhere. He is the Europe Correspondent for the *Chronicle of Higher Education* and has authored several books on European politics. **MORE →**

TOPICS	REGIONS
Electric Cars	Europe
Technology	
Transportation	
Sustainable Design	

Join the conversation: With Norway in Lead, Europe Set for Surge in Electric Vehicles

Show comments →

Never miss a feature! Sign up for the E360 Newsletter →

RELATED ARTICLES



A Vulnerable Community Braces for the Impacts of Sea Level Rise By BRUCE STUTZ

How Far Can Technology Go to Stave Off Climate Change? By DAVID BIELLO

How Costa Rica is Moving Toward a Green Economy By DIANE TOOMEY

MORE FROM E360

- SOLUTIONS** With Norway in Lead, Europe Set for Surge in Electric Vehicles
- BEFORE THE STORM** A Vulnerable Community Braces for the Impacts of Sea Level Rise
- EDITORS' NOTE** A Brand New Look for Yale Environment 360
- POLICY** Republican Who Led the EPA Urges Confronting Trump on Climate
- NO LONGER WILD** How Natural World Heritage Sites Are Being Spoiled
- BREAKING RECORDS** How the World Passed a Carbon Threshold and Why It Matters
- POLITICS** Canada's Trudeau Is Under Fire For His Record on Green Issues
- WILDLIFE** As Asian Luxury Market Grows, A Surge in Tiger Killings in India
- INTERVIEW** For a Defender of Elephants, China's Ivory Ban Comes Just in Time
- CLIMATE** With the Rise of Trump, Is It Game Over for the Climate Fight?
- ANALYSIS** How Far Can Technology Go to Stave Off Climate Change?
- SOLUTIONS** How Costa Rica is Moving Toward a Green Economy