

## Copenhagen Pioneers Smart Electric-Bike Sharing

The city hopes people will zip around on electric bikes instead of clogging the streets with cars

By Lucas Laursen

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Copenhagen, the city that popularized bike sharing in the 1990s, is replacing its coin-operated clunkers with electric motor–assisted bicycles (/tag/electric%20bikes) with their own touch-screen instrument panels. The bikes, which the city beta-tested this past September and October, house motors that can provide up to 450 watts of power from a battery pack that's rechargeable at dozens of docking stations around the city. But all that power may be too much of a good thing.

Beta testers last month “got very good at keeping [their] momentum to where the engine does most of the work,” reports Niklas Marschall, CEO of Cykel DK, the program's operator. That was the first lesson Cykel DK learned: Riders will go to great lengths to avoid exerting themselves.

There were lessons from Copenhagen's 1990s trend-setting bike-sharing scheme too. At that time, sharing relied on coin deposits to persuade users to return the bikes, but the deposits weren't big enough. People wouldn't bother returning the bikes, many of which ended up bent out of shape and abandoned on the streets. Since then, other cities have been successful with smarter bike-share systems, such as Paris's vaunted Vélib' and New York City's Citi Bike. Those rely on smart docking stations to handle credit card deposits and payments. When Marschall and his colleagues finish scaling up the electric bike–sharing system they tested this autumn, Copenhagen could either become a leader again or stumble, given the additional complexity.

On a rainy day in Copenhagen this past November, the city bikes were intact and gleaming in white paint outside a train station. They sported tablet computers between the handlebars and showed no signs of vandalism or weathering after three months in use by 50 beta testers. The tablets allow users to book and pay for the bike and to navigate with GPS. They will also be able to reserve a bike remotely through a phone app or from a computer, which ensures that a bike is available when they arrive to pick it up. The smart bike system “seems like it is an interesting tool, but it might be too much for the job it needs to do,” says bike-sharing consultant Matt Christensen, who is also the managing editor of Bikeshare.com, in Santa Monica, Calif. Copenhagen, he notes, is already a very bike-friendly city. It may be so bike-friendly that the bikes won't meet residents' high design standards, as one Copenhagen bike designer, Mikael Colville-Andersen, wrote (<http://www.copenhagenize.com/2013/05/the-bike-share-bicycle-copenhagen.html>) in a blog post earlier this year.

Bike-sharing proponents can rhapsodize about payment systems and ease of use, but the most important factor, Christensen says, is availability. That's where the bikes' tablet computers earn their keep. If the system detects that a certain dock is getting more reservation requests than it has bikes, it pings nearby cyclists with an offer: Leave your bike at the requested location when you're done and you'll get credit toward future rides. That should help Cykel DK minimize the number of costly shuttles required to keep the city's bikes where they're needed and also help minimize the number of bicycles necessary.



(/img/12NWCopenhagenEBikegobike-1387300152614.jpg)

Photo: gobike

To Sleep, Perchance to Recharge: Copenhagen is planning to launch an electric bike-sharing system.

Needing fewer bikes is a big deal, because leasing each one—including the docking ports and maintenance—costs about 6000 Danish crowns (about US \$1000) a year, Marschall says. Divide that by the anticipated four rides per bike per day and the cost per ride comes to less than \$1. The cost to riders, however, will depend on whether they subscribe to the service and how long they ride. Marschall says the city expects to foot the bill for around 60 percent of the system and that user fees will cover the remainder. That's typical for other public transit systems as well.

It's also a reflection of how the system's planners see Cykel DK's role within the city. Vélib', Citi Bike, and London's bike-sharing scheme are all supported in part by advertising. But Copenhagen's system grew from the Danish rail service's desire to compete with cars for commuters, says Jeffrey Dost, the CEO of GoBike International, the company supplying the bikes to Cykel DK. "Efforts [in various cities] to try to ban the car from the city center created negative publicity," he says, so cities have begun asking bike-sharing operators to come up with ways to pry drivers out of their cars instead.

Offering commuters a self-powered vehicle—preferably one that's smaller and slower than a car, such as Barcelona's electric scooter, which is also used in a sharing scheme—would be one way to achieve that. But full-power electric scooters would introduce different safety and liability issues, Christensen says. Some Chinese cities have banned full-power electric bikes after reckless riders caused thousands of fatal accidents (<http://online.wsj.com/news/articles/SB10001424052748703657604575005140241751852>). New York City has followed suit ([http://www.greencarreports.com/news/1084757\\_nyc-bans-electric-bikes-again-launches-bike-sharing-system](http://www.greencarreports.com/news/1084757_nyc-bans-electric-bikes-again-launches-bike-sharing-system)). Operators will have to adjust the amount of electric boost the motor provides for each city, Marschall says: In hillier cities, the motors will need extra boosting capability, for example, up to the bike's maximum power output—which is between 400 and 450 watts—but below a speed limit assigned by the city. In flatter cities, bike-share operators may want to lay off the current, as Cykel DK learned during its trial: Copenhagen's bikes will stop assisting riders below 16 kilometers per hour.

Metering electrons more carefully should be the easy part. Seducing people out of their cars will be harder, Christensen predicts. But Marschall is patient. Cykel DK has until late 2014 to bring the system up to the intended scale of 1800 bikes and between 65 and 135 stations, and it has an additional seven years on its contract, so it will have time to learn from early mistakes and to habituate riders. "We're working on changing the way people think and how they behave, and we know that's not something you do overnight," he says.

## About the Author

From Madrid, Lucas Laursen (<http://lucaslaursen.com/>) covers odd things for *IEEE Spectrum*, such as an effort to turn snails into fuel cells (<http://spectrum.ieee.org/green-tech/fuel-cells/snails-in-a-race-for-biological-energy-harvesting>) and how to tell when a hen is plotting murder (<http://spectrum.ieee.org/biomedical/diagnostics/computer-system-counters-hen-horrors>).