A Brief History of the E-Bike

Dumaresq de Pencier
Exhibit & Projects Coordinator
Canadian Automotive Museum

The history of the electric bicycle (e-bike) is surprisingly long and complex, and can't be discussed in a purely Canadian context. From the 19th century to today, the vast majority of Canadian e-mobility projects have been international collaborations. The history of the e-bike in particular covers two distinct surges in popularity, the first at the beginning of the 20th century and the second in the second decade of the 21st century.

The Birth of the Electric Bicycle (1817-1899)

Before there was the e-bike, there was the bicycle; its earliest ancestor originated in Germany in 1817, with the Laufmaschine of Karl Drais, a simple push-bike. By 1867, French companies were manufacturing pedal-powered bikes. The modern "safety" bicycle, with equally-sized wheels, brakes, and a chain drive appeared in 1885, manufactured in England by the Rover company. The Rover design spread worldwide, triggering a global personal mobility revolution.

As the general public took to safety bicycles, inventors took to mechanizing them; experiments in steam-powered bicycles began in the 1860s on both sides of the Atlantic.

Steam wasn't the only power source available. Inventors had been building electric-powered vehicles since the 1820s, and two of the first true "electric cars" were built on the chassis of commercial tricycles.

The first European electric tricycle was built by Gustave Trouvé of Paris (France) in 1881, and the first in North America, built by the Possons brothers of Cleveland, Ohio in 1886.

But who invented the e-bike? One-off electric bicycles were built as early as the summer of 1894, but all the technology needed to make an e-bike had existed for decades. The first e-bike patented in North America comes in late 1895, when Ogden Bolton, Jr. of Canton, Ohio registered an "Electric Bicycle", incorporating a DC motor in the rear wheel hub with a weatherproofed battery case slung under the frame and a throttle control mounted on the handlebars

Bolton wasn't the only inventor who'd combined electrical technology with the popularity of bicycles, and his patent was followed by many more. Canada's first e-bike patent, for a tandem bicycle with three battery cells and a hub motor, was filed in 1897, on behalf of a Franco-British electric bicycle manufacturer.

The next year would see Canada's first commercial e-trike, which was also the country's first -

> ***"The electric motorcycle is impractical on account of the weight of the storage battery necessary to produce power, and also because its radius of action and possible speed would be limited… it is difficult to see how electric power could be applied to advantage on a two-wheeler and obtain the same desirable features [as] …the gasoline motor."***
>
> Motorcycles, Sidecars and Cyclecar: Construction, Management, Repair by Victor W. Pagé, 1916.

commercially-sold motor vehicle; a delivery tricycle built by the Canadian Motor Syndicate (CMS) in 1898 and exhibited at that year's Canadian National Exhibition. Much information on this vehicle has been lost; it was probably powered by a single motor that used a chain drive to turn the rear wheels, and capable of speeds of up to 24km/h, with lead-acid batteries providing a range of just below 50 km. CMS would reuse their tricycle design for their first commercial passenger vehicle, a two-seater, launched later in 1898. This design's wicker-work seating and 400-pound wrought-iron frame simply weren't practical.

Rough Canadian roads and a lack of charging infrastructure, as well as the high cost of electric technology itself, ensured that Canadian electric vehicles were rapidly overshadowed by gasoline-engined cars, trucks and motorcycles.

The Gasoline Years (1900-1990)

During the years of gasoline transport dominance in the 20th century, the electric vehicle industry didn't disappear, so much as it retreated into niche manufacturing. Between 1900 and the 1940s, manufacture of electric bicycles, scooters and trikes can be found in England, Germany, Norway, the United States, France, Sweden, the Netherlands and Belgium.

In North America, subscribers to *Popular Science* could order electric bicycle plans by mail from several different American companies.

During the gasoline rationing of the Second World War, the magazine featured home-made electric bicycles, scooters, motorbikes and similar vehicles under headlines like "How Ingenious Readers Solve Their Gasoline Problems."

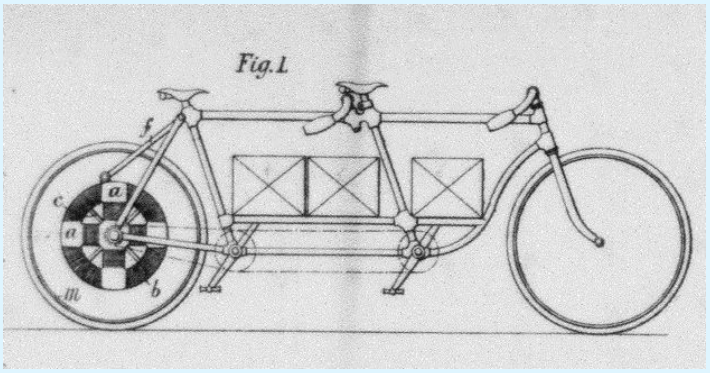
A major incentive for electric vehicle development of all kinds came in the form of the first oil crisis in the 1970s. Several major bicycle and electronics manufacturers, chief among them Bosch, Zundapp, and Hercules, began producing e-bikes which were sold by mail-order in North America.

Perhaps one of the best-publicized e-trike projects ever came in 1985, when British computer tycoon Sir Clive Sinclair launched the unsuccessful Sinclair C-5, a badly flawed pedal-assisted "vehicle of the future" intended to replace both cars and bikes. The C-5 was cancelled within a year, at a cost of millions of pounds to its manufacturer.

By the end of the 1980s, the electric bike as a concept was back in the minds of a more energy-conscious public; it was only a matter of time before a market would begin to form.

The Second E-Bike Boom (1989-Present)

The origins of the current popularity of the e-bike probably date back to 1989, when Michael Kutter of Germany invented the "pedelec," or modern electric pedal-assist.



Patent 63089 1897: The Canadian patent drawing for Patent No. 63089, "ELECTRIC PROPULSION", filed in 1897 on behalf of the British Motor Syndicate. This is the first Canadian patent for an e-bike. *Credit*: Canadian Intellectual Property Office, Canadian Patent Database.

Yamaha of Japan claims to have invented the same technology in the same year, but the end result was the same; the proliferation of a new generation of e-bikes.

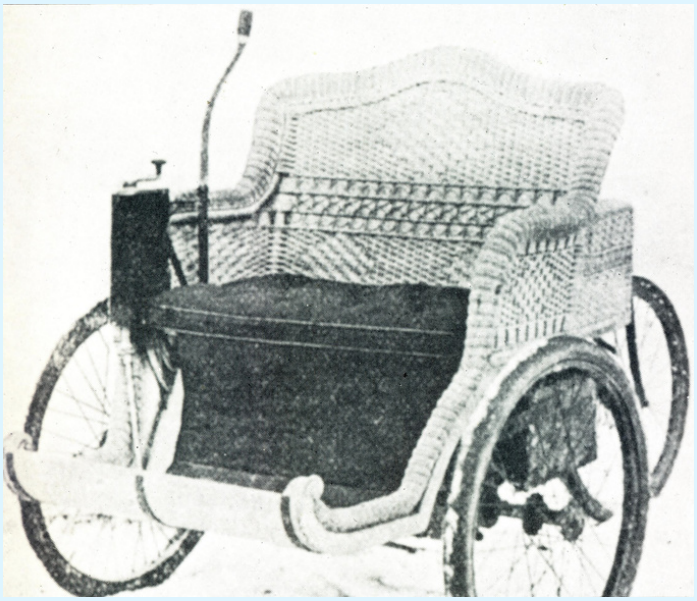
Early e-bikes like Kutter's Dolphin or Sinclair's follow-up to the C-5, the Zike, didn't sell well, but new innovations in compact electronics and torque controls helped the technology evolve. Yamaha began selling large numbers of pedal-assist e-bikes in Japan and southeast Asia in 1993; noted auto entrepreneur Malcolm Bricklin introduced the EV Warrior that same year to abide by new zero-emission vehicle rules in California.

By 2000, a true international e-bike industry had developed, though its reach was often regional. In the summer of 2000, a Transport Canada project to test the feasibility of e-bike use on Canadian roads, and in Canadian parks, sourced the industry's state of the art for its use. Contenders included two Canadian manufacturers, Procycle (now Rocky Mountain) of Quebec, and Electric Propulsion Systems of Ontario. Other bikes came from subsidiaries of Ford, Honda, Renault, Peugeot and Toyota, and U.S. independents like Global Motors, Zapworld, and AeroVironment.

The period between 1999 and 2001 was one of rapid legislative change in Canada. E-bikes had previously been licensed as low-speed motorcycles instead of bicycles, and the removal of this restriction allowed them to proliferate everywhere bicycles were already used.

Unlike many vehicle communities, e-bike users were largely dependent on the Internet in the early 2000s. While some big-box stores, notably Canadian Tire, began stocking e-bikes by around 2005, spare parts and the expertise needed to repair and maintain them were in short supply.

Local bicycle stores often didn't stock e-bike equipment, or might even be openly hostile to what was seen as a direct competitor to standard bicycles. E-bike stores were very much niche businesses, usually based in major cities; parts and knowledge had to be distributed by mail or Internet.



1899 CMS Passenger Tricycle: The Canadian Motor Syndicate passenger tricycle, Canada's first mass-market electric passenger car. *Credit*: Collection of the Canadian Automotive Museum.

In 2019 the Canadian Electric Bicycle Association (CEBA) was formed to support the e-bike industry in Canada. CEBA recognized that the industry needed representation as Canada did not have a national association representing the interests of the e-bike industry. CEBA also recognized that during the pandemic a huge influx of consumers were buying e-bikes online, but when they needed service, they were hard pressed to find a shop that would service their brand as most shops only service what they sell, leaving consumers frustrated.

Recognizing the lack of service centres and e-bike technicians that consumers could have their e-bike repaired and diagnosed, CEBA developed the E-bike Technician Certification Training program.

This program turned out to be a welcome solution to the lack of service options, providing shops with the critical knowledge necessary to diagnose different makes and models while helping to ensure e-bike owners would have access to properly trained e-bike service technicians.

It is difficult to pinpoint exactly when the e-bike became a mainstream and well-accepted form of transportation; certainly, by 2007 most Canadian

> ***"The CEBA training program has been very successful in supporting Canada's growing e-bike industry, having trained hundreds of technicians in Canada and worldwide."***
>
> Sean Gibson, Director, CEBA

cities had at least one major e-bike vendor, and large and well-established online e-bike communities existed internationally. Increasingly, more traditional electric scooters, designed to resemble European-style motor scooters, fell out of fashion, and were replaced by pedelec or other power-assist models closer in weight and form factor to bicycles.

Improvements in lithium-ion battery technologies, and their decreasing costs, made powerful and long-range e-bikes substantially lighter and more affordable, as well as forcing down the costs of e-bike designs with older battery systems.

By the early 2020s, bike-sharing, ride-sharing and more efficient e-scooter designs had combined to create intense competition in the United States e-scooter industry, which spread to Canada. Rideshare e-scooters became ubiquitous in Canadian cities, further supplementing the rapid growth of e-bike usage across the country.

On February 4th, 2021 Transport Canada repealed its definition of a power assisted bicycle. In doing so, it became the jurisdiction of each province and territory to define the different types of e-bikes and micro mobility devices permitted and to put in place rules governing users.

To most, the modern e-bike industry might seem as if it has sprung from nothing, fully-formed, in the past decade. That couldn't be further from the truth. The modern spread of the e-bike is the result of more than a century of innovation, experimentation, failure and re-invention from engineers, scientists, hobbyists and bicycle enthusiasts across Canada and around the world.

Cover image: *1898 SMC Electric Delivery Tricycle*: The Still Motor Company delivery tricycle, Canada's first commercial electric vehicle. *Credit*: Collection of the Canadian Automotive Museum.

Thank you to Dumaresq de Pencier and the Canadian Automotive Museum for their contribution and collaboration on this project.

The Canadian Coalition for Green Health Care is Canada's premier green health care resource network and is leading the evolution of green in Canada's health sector as a national voice and catalyst for environmental change. Collaboratively, we strive to reduce health care's ecological impact from compassionate care delivery while providing a platform upon which to discuss and promote best practices, innovation, environmental responsibility and climate change resiliency. www.greenhealthcare.ca

Reviewed by Kent Waddington, Communications Director and Project Lead, Canadian Coalition for Green Health Care and Michael Pasquali, CEO, E-Bike Pros.

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