

# Battery innovation enhances EV technology, generates worldwide patent boom

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For years auto industry insiders talked about the “dawn” of the electric vehicle (EV) era. A confluence of developments demonstrates that we’re past mid-morning and hitting high noon of the EV epoch.

While many factors account for an increase in EV expansion – environmental regulations, technological advancements, and major financial investments, to name a few – two related trends provide more evidence that the growth is palpable: a spike in EV battery innovation and a surge in patent application filings.

Investors, lenders, and other financial players who are considering entering this area can benefit from a primer on the basics about the rechargeable EV battery, which has been called the vehicle’s “heart.”

While of course a vehicle with an internal combustion engine is powered by burning gas or diesel fuel, an EV runs on a current of energy generated from its battery, or actually a pack of batteries. Think of the same lithium-ion battery inside a cell phone, but considerably larger and multiplied.

EVs use a pack of thousands of cylindrical, lithium-ion cells, like a Duracell battery, that all operate in sync when driving. Collectively, these batteries essentially serve as an energy storage unit. During the time the vehicle is connected to a charger, the battery pack collects electricity through chemical changes and discharges that energy through an opposite chemical change in the battery to power the vehicle on the road.

The battery thus works in tandem with the electric motor. When the accelerator is stepped on, the battery delivers energy to the motor, which powers the vehicle’s wheels. An added benefit is that modern electric motors have very few moving parts to wear out and provide virtually instant torque for acceleration while offering a longer, lower-maintenance lifespan.

Lithium-ion batteries bring several benefits to EV owners, not the least of which is a lifespan of between 10 to 20 years. “They also have a high power-to-weight ratio, high energy efficiency, good high-temperature performance, and low self-discharge,” according to a [U.S. Department of Energy report](#) by its Alternative Fuels Data Center. “Most components of lithium-ion batteries can be recycled, but the cost of material recovery remains a challenge for the industry.” The agency continues to work on improving recycling efforts.

While lithium-ion batteries remain the prevailing technology, engineers have made inroads on an alternative that may eventually replace them – lithium-based batteries that use solid-state electrolytes instead of liquid ones, for example. This solid-state technology is expected to reduce the size of batteries, enhance safety,

increase efficiency (because they'll have higher energy density,) and, importantly, live even longer. They also charge faster.

All of this, and other innovations, are keeping intellectual property lawyers busy as companies around the globe scramble to protect their IP by filing patent applications.

Consider information from the joint study, "[Innovation in batteries and electricity storage – a global analysis based on patent data](#)," published in 2020 by the **European Patent Office (EPO)** and the **International Energy Agency**. From 2005 through 2018, patents for electric storage technologies – primarily for lithium-ion batteries – increased annually by 14% worldwide. That's four times as much as the average patent hike in all other technology industries.

"Electricity storage technology is critical when it comes to meeting the demand for electric mobility and achieving the shift towards renewable energy that is needed if we are to mitigate climate change," said EPO President **Antonio Campinos**. "The rapid and sustained rise in electricity storage innovation shows that inventors and businesses are tackling the challenge of the energy transition."

Campinos also said that, while Asia leads the way in this area, the U.S. and Europe continue to "stay in the race for the next generation of batteries."

This healthy competition and the technological progress it has created have improved battery manufacturing operations, driving down the cost consumers pay for electric vehicles. This in turn increases sales, placing more EVs on the roads. It's clear that we've seen the successful transition of this technology from a pilot program to a vibrant and growing industry that helps address climate change.

While the experimentation phase is behind us, it seems the time to invest is right before us.

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