Washington
Green Transportation Program
Moving forward with Washington's public fleets

EV Batteries: Improvements Down the Road

Improved Battery Range

By 2030, scientists believe they can get more than 600 miles from a single charge using a gel to optimize the high charge capacity of silicon anodes and cathodes in lithium ion (Li-ion) batteries. The gel allows the silicon to expand when a charge runs through it, protecting the longevity and safety of the battery.[1]

Faster Charging

Quantum charging

Researchers at the Center for Theoretical Physics of Complex Systems in Korea are working on quantum batteries, where cells in a battery charge simultaneously rather than individually (as they do now). This breakthrough could allow EVs to charge in seconds instead of minutes or hours.

The Korea Advanced Institute of Science and Technology is developing a sodium-ion super capacitor and battery to alter the traditional Li-ion graphite anode and cathode. This new battery promises a higher energy density than Li-ion batteries and rapid charging capabilities.[2]

Wireless charging

Wireless charging could replace Level 2 at-home chargers and eliminate the need for a physical connection to transfer charge from source to battery. Prototypes of this technology include parking pads, where the pad and a receiver in the vehicle create a magnetic field so power is immediately transferred to the vehicle.[3]

SonicEnergy is developing long-range wireless charging via ultrasound technology.[4]

Wireless EV charging pads that vehicles park over when charging. Source: Ars Technica

Lighter Weight

Stellantis is working to reduce EV battery weight by 50% by 2030. Li-sulfur batteries could increase energy density by 30% compared to Li-ion batteries[5] and deliver the current range at a quarter of the battery weight.

While current EV batteries are not structural or load bearing, researchers at Chalmers University in Sweden are working on a structural EV battery with a breakthrough carbon-fiber material. This battery is designed to be load bearing when integrated into the vehicle structure. The energy density of this material is 24 Wh/kg, about 20% greater than current Li-ion battery technology.[6]

French company NAWA says they have created a vertically aligned carbon nanotube that provides three times the energy density and ten times the power of current EV batteries with no increase in volume. This could be the fastest electrode conduction in the world: the vertical alignment of components would support higher energy delivery by reducing the distance ions have to travel.[7]

Lower EV Prices & Costs

By 2027, battery EVs (BEVs) are expected to be cheaper to produce than internal combustion engine (ICE) vehicles. Toyota announced that BEV production costs will decrease by 30% in the coming years.

Research firm Gartner anticipates that while initial costs of BEVs could be cheaper than ICE counterparts by 2030, serious accident repair of BEVs will be 30% higher, on average, than for ICE vehicles. As a new production process, most repairs today involve totaling and scrapping the entire vehicle.[8]

These costs may come down but it will take time as technicians enter the workforce and parts come down in price.

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[1] Future electric cars could go more than 600 miles on a single charge thanks to battery-boosting gel. LiveScience. February 16, 2024.
[2] Researchers from Korea's IBS suggest quantum charging could cut EV charge time to 3 minutes at home. Batteries News. March 21, 2022.
[3] This Watertown Company wants to charge your EV wirelessly. *Boston Globe*. Aug 22, 2023.
[4] New Sodium-Ion Battery Could Charge An Electric Vehicle In Seconds, Not Minutes. CleanTechnica. May 2024.
[5] Stellantis Will Reduce EV Battery Weight By Half. CarBuzz. Sept 13, 2023.
[6] Big breakthrough for 'massless' energy storage. Chalmers. Mar 22, 2021.
[7] NAWA Technologies' Game-Changing Ultra-Fast Carbon Battery. AZO Materials. Nov 6, 2020.
[8] Gartner Outlines a New Phase for Electric Vehicles. Gartner. March 7, 2024.

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