

How long do electric vehicle batteries actually last?

Warm-up question: What concerns do people usually have about electric cars?

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SCOTT DETROW, HOST:

How long do electric vehicle batteries actually last? Back in the early days of the modern EV, there was a real fear that the answer was not that long and that they would need to be replaced midway through owning a car. The good news is those expensive batteries seem to keep going and going. NPR's Camila Domonoske reports.

CAMILA DOMONOSKE, BYLINE: That worry that batteries would be short-lived, it wasn't unreasonable. Batteries do age and hold less power. And unlike the little lead-acid starter batteries in gas cars, a giant lithium-ion battery costs thousands of dollars. Norman Hajjar, who works for the EV drivers app PlugShare, was an early adopter. He got his Tesla Model S back in 2013, when that **landmark** vehicle was just redefining what EVs could be. And as for that battery?

NORMAN HAJJAR: I mean, there was really no way of knowing what the future held for it because there was zero **track record**.

DOMONOSKE: In 2010, The New York Times estimated EV batteries would last, quote, "upward from seven years." Well, Hajjar has put nearly 200,000 miles on his Model S, **coming on** 12 years now on a single battery, and it drives great.

HAJJAR: The car was originally rated to have 265 miles of range. It now has around 220, so the amount of **degradation** is pretty minor.

DOMONOSKE: Today, there's enough data emerging to say, good news - batteries are lasting longer than anybody thought. Now, batteries do sometimes have **defects**. Hajjar actually had his replaced in 2014, very early on, so it's a bit younger than his car. But that kind of bad luck is covered under warranty. As for normal aging, let's look at that data. Adam George works for Cox Automotive, which runs big wholesale auto actions. He says they'd expected to see batteries really degrade, even in really new cars.

ADAM GEORGE: What we have seen, though, is that these 2-, 3-, 4-year-old **off-lease** cars that are coming back have battery health scores well upwards of 95%, which is solidifying that batteries are **standing the test of time**.

DOMONOSKE: Cox Automotive has tested nearly 80,000 used EVs of all ages. The average battery health score overall was 92%. That's good. But averages can be **misleading**. So what about just the oldest cars? Liz Najman is the director of market insights at Recurrent, a research firm that pulls in data from over 30,000 EV drivers. Now, she warns that the dataset of old EVs is pretty small, but based on their community, for EVs a decade old and up, more than 90% are still driving on their original battery.

LIZ NAJMAN: What we know is that EV batteries are holding up **phenomenally** well.

DOMONOSKE: Hajjar's experience sure looks like the rule, not the exception. Now, why exactly did these batteries last so much longer than expected? Well, one, **kudos** to the engineers. And two, the way batteries are tested is actually tougher on them than real life. Simona Onori is an associate professor at Stanford University. She says batteries are normally tested by cycling them very quickly from a high state of charge to a low state of charge. All the way up. All the way down.

SIMONA ONORI: Whenever you are, you know, on off, on off, it is lots of stress, right?

DOMONOSKE: But when you're actually driving, you never slam the accelerator to the floor and keep it there until the battery is dead, right? It's a lot more varied.

ONORI: We accelerate. We decelerate. The battery will be charged and then discharge. Some rest if you're at a traffic light.

DOMONOSKE: Stanford found if you test batteries in ways that are more like actual driving, they last a lot longer. Onori says real-world data is now confirming those lab results - that when they're actually driven...

ONORI: Those batteries **age gracefully**. Very gracefully.

DOMONOSKE: Meanwhile, the systems that take care of batteries keep getting better. A lot of new EVs have a different battery chemistry that lasts longer. So we still don't know how long exactly batteries being made now will last. But the new expectation, increasingly, is that they should **outlast** the cars themselves. Camila Domonoske, NPR News.

Vocabulary and Phrases:

1. **Landmark:** an important event or development that marks a significant change or achievement.
2. **Track record:** a history of past performance that can be used to judge reliability or success.
3. **Coming on (12 years):** approaching or nearly reaching a specific amount of time.
4. **Degradation:** a gradual loss of quality, power, or performance.
5. **Defect:** a flaw or problem in something that prevents it from working correctly.
6. **Off-lease:** describing a vehicle that is returned to the dealer after a leasing contract ends.
7. **Stand the test of time:** to remain strong, useful, or effective over a long period.
8. **Misleading:** giving a false or inaccurate impression.
9. **Phenomenally:** extremely well or to a very great degree.
10. **Age gracefully:** to remain in good condition or continue performing well as time passes.
11. **Outlast:** to last longer than something else.

Fill in the Blank Use the correct word or phrase from the vocabulary list.

1. The company has a strong _____ of producing reliable products.
2. The smartphone was considered a _____ innovation when it was first released.
3. The car is _____ ten years old and still running smoothly.
4. Over time, batteries can experience some _____ in their performance.
5. The product was recalled because engineers discovered a _____ in the design.
6. Many _____ vehicles are sold as used cars after the lease period ends.
7. Some buildings are built so well that they _____.
8. Statistics can sometimes be _____ if they are not explained properly.
9. The athlete recovered _____ quickly after the injury.
10. Some materials _____ and continue to look good for many years.
11. The new engine is expected to _____ the rest of the car.

Comprehension Questions:

1. Why were people originally worried about EV batteries?
2. How long did early estimates suggest EV batteries might last?
3. How many miles has Norman Hajar driven his Tesla Model S?
4. What did researchers find about the battery health of off-lease EVs?
5. Why might real-world driving be easier on batteries than laboratory testing?

Discussion Questions:

1. Would concerns about battery life stop you from buying an electric car? Why or why not?
2. Why do you think early predictions about EV battery life were too pessimistic?
3. What factors might help electric vehicle batteries last longer in the future?
4. Do you think electric vehicles will eventually replace gasoline cars completely?
5. What are some advantages and disadvantages of electric vehicles?