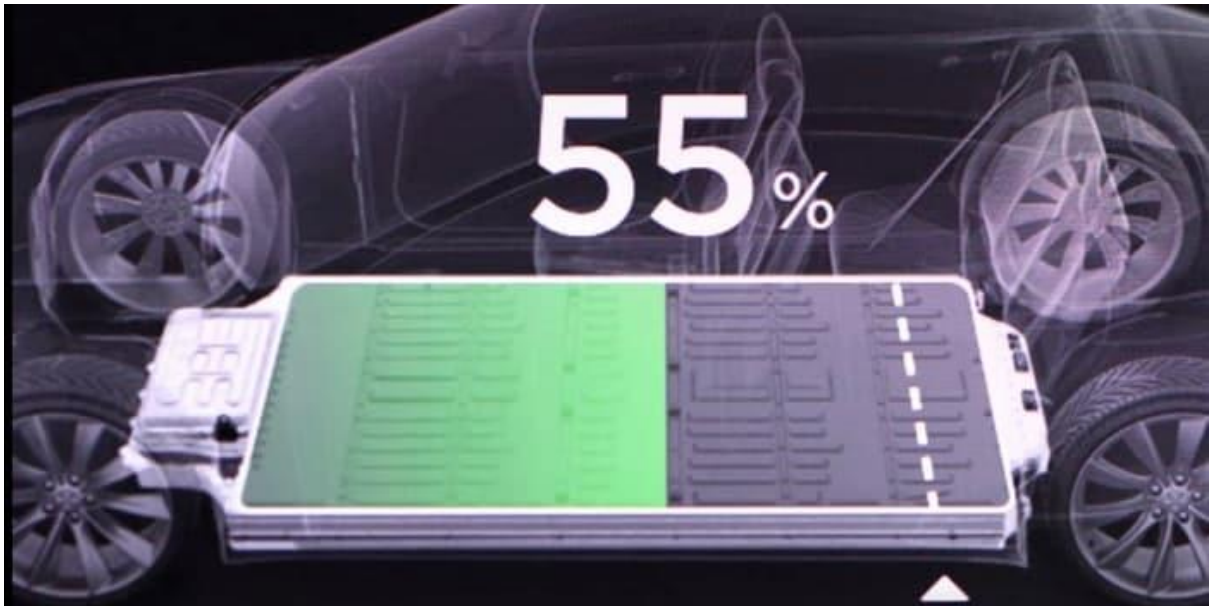




Are EV Batteries Bad For The Environment?

EV batteries a highly complicated topic but I want to break it down into two main sections that I think get the most attention first emissions and then materials and mining so starting with emissions we need to answer two questions how much emissions are produced for vehicle production and how much emissions result from vehicle usage.

based on these two parts of the equation we can determine which vehicle is better overall for the life of the vehicle now of course there are emissions related to the vehicles end of life getting rid of it once it's no longer useful however a study out of Yale University found that end of life emissions for both electric cars and gasoline-powered cars is relatively low very low in comparison to usage and production so we're not going to be looking at end of life emissions in this video all right so the first part of the question is vehicle production and there's a wide variety of estimates out there as far as the carbon required to produce a vehicle.

now that makes sense because there's a wide variety of vehicles out there so I looked at about a dozen studies looking at what are the average emissions required to produce the average vehicle and so I saw a low estimate a study out of MIT saying about two metric tons of carbon required to produce a vehicle and then I saw a cost analysis saying as high as 17 metric tons in order to produce a vehicle now every single study I looked at agreed that electric cars.

require more co2 emissions to produce than gasoline-powered cars and this is primarily because of the batteries so they range from about 15% more emissions to about 70% more emissions now this percentage is based on the size of the battery so [a small Nissan Leaf battery](#) will require about a third of the carbon emissions to produce versus a larger Tesla battery so it's important when you're buying an electric car that you buy the right size battery for your needs for the purposes.

we're going to give the combustion engine every benefit of the doubt and so we're going to assume that both of these vehicles require the same baseline of emissions to produce them assuming you don't include the emissions required for the battery and this is a safe assumption to make because most studies show that an electric car would actually have less emissions than producing an internal combustion car if it weren't for the battery then so we're gonna start with that common baseline and we'll add on top of that the emissions required for producing the battery for just the electric car from the wide range of estimates out there let's.

simply say that it requires 10 metric tons of co2 emissions to produce a new car now whether or not that's higher low doesn't really matter all that much because we're giving the same number to both cars then we add the emissions for battery production the studies I read showed a range of co2 emissions for battery production from about one to five tons for a small battery 30 kilowatt hours like in the previous leaf - about 6 to 17.5 tons for a larger battery pack such as the hundred kilowatt hour pack in a tesla p 100 d so to play it safe let's go with the higher estimate so once again we're giving the internal combustion engine the benefit of the doubt.

okay so for the production of an average gasoline vehicle we start with 10 metric tons of carbon emissions for an electric car with a 30 kilowatt hour battery pack we have 10 tons of carbon emissions plus [5.3 tons of emissions for the battery for an electric car](#) with a large 100 kilowatt hour battery pack we add 17.5 metric tons for the battery so here we can clearly see that producing an electric car requires more emissions now it's time to get into vehicle use emissions thankfully there are wonderful data resources on vehicle emissions as this is something that is heavily regulated so on every single vehicle Munro knee you'll see the emissions.

the vehicle produces the US Department of Energy summarizes this data and you can see that the average gasoline vehicle in the United States creates 11,000 435 pounds or about 5.2 metric tons of co2 emissions each year this is while driving the national average of about 12,000 miles or about 19,000 300 kilometers per year that's an average commute of about 33 miles per day which is well within the capability of any modern electric car this is something you can verify looking at a vehicle Munroe nice sticker take this pickup truck as an example it produces 528 grams of co2 per mile multiply that by the average annual mileage and you get 6.2 for metric tons of co2 per year.

about 20% higher than the average u.s. vehicle which is at 5.2 metric tons per year the alternative fuels data center also provides us with emissions for electric vehicles and this is specifically based on the electric mix that provide charging for the electric vehicle so a state like West Virginia which is heavily coal dependent will have much different numbers than a state like Idaho which is heavily hydroelectric dependent looking at national averages we can get a good idea of electric cars as a whole which produce about four thousand four hundred fifty five pounds of co2 emissions each year or about two metric tons now here comes the fun part where we can start making conclusions based on this data if we take the amount of carbon for gasoline vehicle production and add to that the amount of annual emissions multiplied by T for time.

and set this equal to the amount of carbon for electric vehicle production and add to that the amount of annual emissions also multiplied by T then by solving for T we get the exact number of years required in order for an electric car to have less life time emissions than a gasoline car putting in the numbers for the average gasoline vehicle in the United States against the average 30 kilowatt hour battery electric car using the average energy mix we find out that after just one

point six seven years an electric car is already producing less emissions than its gasoline competitor with many many years of useful life to.

come in fact even if you had to replace the battery meaning you have the additional carbon of that second battery's production you'd still break-even in less than three and a half years and clearly batteries are going to last far longer than a couple years because manufacturers are providing eight year hundred thousand mile warranties with them now the story isn't quite as clean once you start getting into the higher capacity batteries so doing the same car comparison with a hundred kilowatt hour battery versus the average gasoline car results in five point five years needed to offset the carbon production but five point five years is still way less than an electric cars useful life remember these cars have very few moving parts and they require much less preventative maintenance than gasoline cars and again these are using conservative estimates for the carbon emissions related to battery production.