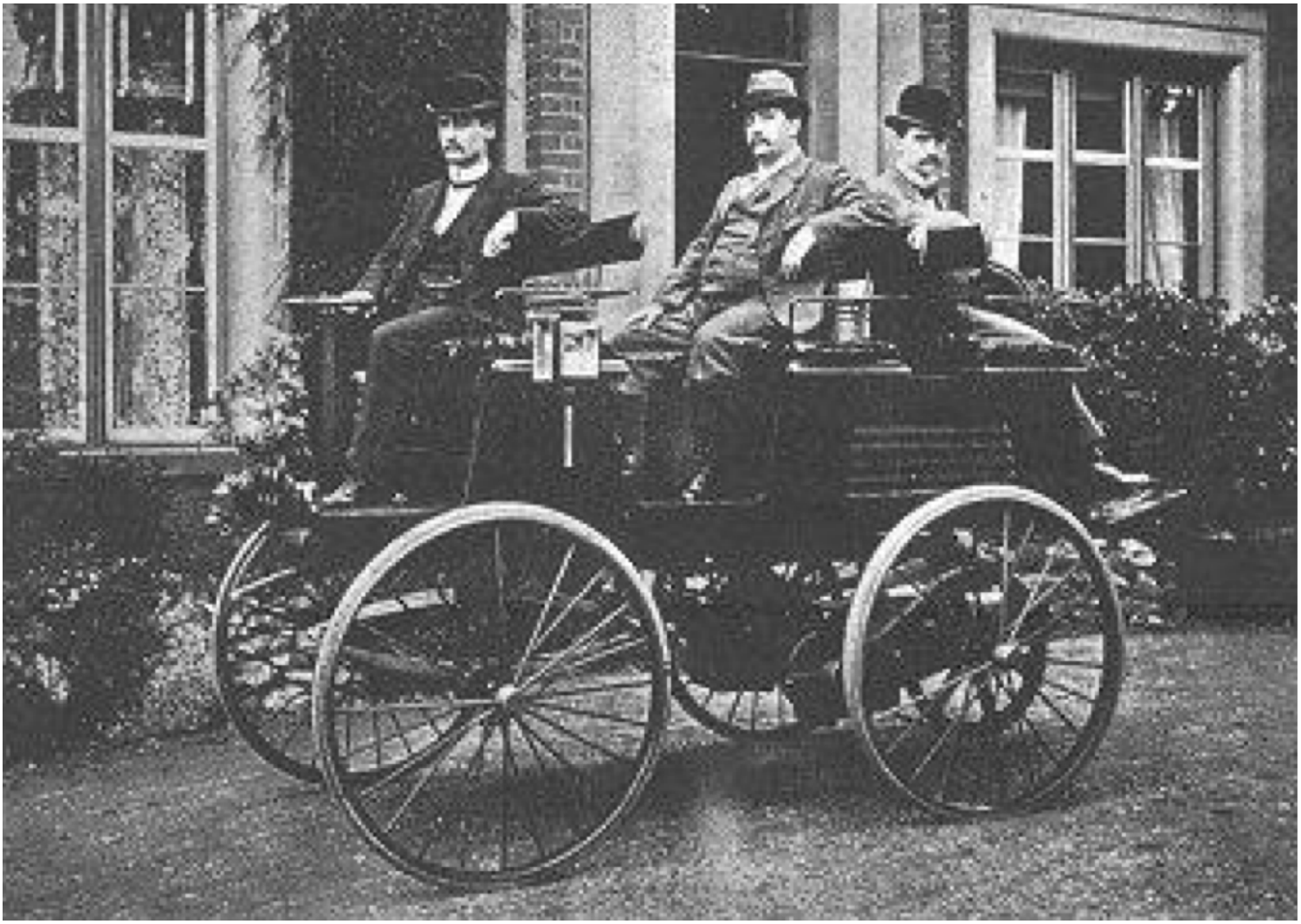
The 4 Biggest Arguments Against Electric Cars…. and Why They're Completely wrong

By Alex Planes – for Motley Fool, February 8, 2015

Electric cars have been around for more than a century [*http://m.fool.com/investing/general/2012/12/08/the-first-charge- of-the-electric-car*], and optimists have predicted their dominance for nearly as long. So far, those predictions have been very wrong. Is it really different this time?



The first production electric car, built in 1884 by Thomas Parker in London. Source: Wikimedia Commons

Here are the facts: Americans have pur- chased more than 290,000 electric ve- hicles since the end of 2010, when the Nissan Leaf became the first "afford- able" EV to ply American roadways since General Motors discontinued its infamous EV1. Nearly 140,000 of those vehicles have been battery-only, eschewing any combustion engine for a ride powered exclusively by electricity. These figures are a lot more impressive than the 1,117 EV1s GM produced before shutting that project down, but battery-only electrics and plug-in hybrids combined still represent less than one-half of 1% of all American vehicle sales since the start of 2011.

Why haven't electric cars gained more traction? They do come with certain drawbacks, and many skeptics have argued that these drawbacks will hold back EV adoption for many years, if not permanently. But the future is not static. The technology is improving all the time, with every little breakthrough and every marginal gain. Over time, many of the core drawbacks of EVs could be eliminated entirely.

Let's take a look at four of the most popular anti-EV arguments to under- stand why they'll be proven wrong over the long run.

1. An electric car's battery range is too limited.

The current king of EV battery range is Tesla's 85 kWh battery Model S, which can drive for up to 265 miles on a fully charged battery. Toyota's electric RAV4 takes a far distant second place with its 103 mile range, and no other mass-market EV now boasts an effective range of more than 100 miles.

A BMW i3 charging up. Source: User Mariordo via Wikimedia Commons

You wouldn't want to enter any EVs in an endurance race against gas-powered cars. The average new vehicle sold last year averaged 24.1 miles per gallon, and many cars can hold at least 12 gallons of gas, which works out to a typical minimum range of about 290 miles.

But consider how EV range has already improved. Tesla was the first car company to really break out of that 100 mile range restriction, and it's done so by lashing together huge numbers of small mass-market battery cells similar to those found in laptops. This ingenious engineering solution to a long standing problem shows that EV range issues are far from intractable, and Tesla managed it with nothing more than off-the-shelf parts that have been around for years.

The Model S won't be the only member of the 200-mile club for long. GM unveiled a concept EV called the Chevrolet Bolt at January's International Auto Show [http://m.fool.com/investing/general/2015/01/12/will-the-surprise-chevy-bolt-disrupt-tesla-motors] that's capable of driving for more than 200 miles without a recharge. It's expected to cost less than half the $70,000 price of Tesla's entry level 60 kWh Model S — which only boasts a 200 mile range because of its smaller battery pack — when it goes on sale in 2017.

So much money has poured into battery development over the past few years that a range of intriguing breakthroughs could soon double or triple a typical battery pack's capacity within the next few years, and greater capacity gains could

well be in store a decade from now. This isn't just a goal for the EV industry — billions of smartphones, laptops, tablets, and other electronic gadgets are terribly limited by short battery lives. This is a trillion dollar problem, and it's too important — both for our tech-driven society and for many companies' bottom lines — for a solution not to be found.

2. It takes too long to recharge an electric car.

EV advocate Plug-In America notes that the typical 240 volt EV charging station can fully recharge a Chevy Volt in about four hours, and a Nissan Leaf in about eight hours. Tesla's proprietary charger can add 58 miles of range to its batteries for every hour of charging time, so fully recharging the Model S would take about four and a half hours. That's way too long to wait if you've got somewhere to be *right now*, especially when filling up an empty tank at the gas station typically takes only two or three minutes.

EVs aren't the ideal vehicle for someone who must drive hundreds of miles each day, but there aren't many people who would actually run into this limitation. The average car in the United States is on the road for only 40 miles each day, and only 7% of the cars in the country travel more than 100 miles in a given day.

Battery technology research has pushed hard toward faster charging times as well as greater storage capacities. One recent breakthrough out of Singapore's Nanyang Technological University uses improvements on existing lithium-ion battery construction to gain charging speeds 20 times faster than what's currently possible. Another breakthrough from Japan promises similar improvements in charging speed using a different improvement to the same lithium-ion foundation. Both breakthroughs are purportedly very close to commercial production. Imagine fully charging your Tesla in less than 15 minutes. That might happen in this decade. How much better might batteries become in the next decade?

They died waiting for their EV to charge. Source: Karlie Alinta via DeviantArt

3. Electric cars are too expensive.

One of the most common practical complaints about electric cars is that they cost more than a comparable alternative. But the data doesn't support this argument at all.

The cheapest new electric car on the market last year was the goofy-looking Mitsubishi i-MiEV subcompact, which retailed for about $24,000 before any rebates or tax credits. The cheapest "family size" EV on the market appears to be the Leaf or the Toyota Prius plug-in, both of which retail for roughly $30,000. That's actually lower than the average new car's price of roughly $32,000. Since virtually every plug-in vehicle is eligible for at least $2,500 in tax credits (the credit tops out at $7,500 and grows based on the vehicle's battery capacity), 10 of the 15 new EVs available to American consumers are actually cheaper than the average gas-burning new car. Most Americans can't buy a new Tesla, but

most Americans can't buy a new Maserati, either. Neither of those brands are (at least currently) designed for Joe Six-Pack in Peoria.

The "EVs cost too much" argument loses even more water when refueling is taken into account. The average gas-burning car, with its 24.1 mpg efficiency, needed about $15 in gas to drive 100 miles last year before the oil price collapse. Even today, it would take about $9 in gas to drive the average car 100 miles. Many pure plug-in electric cars, by contrast, use roughly $3.85 in electricity (at the average U.S. utility rate for electricity per kWh) to drive 100 miles.

4. Electric cars are just as bad for the environment as regular cars.

This point tends to come up only after an EV skeptic has exhausted their other arguments. This argument relies on one study conducted at North Carolina State University, which claims that EVs and hybrid vehicles wouldn't reduce America's polluting air emissions even if EVs and hybrids made up 42% of all passenger vehicles in the country. The study claims that the lack of direct emissions from EVs would be offset by increased emissions from power plants that generate the electricity necessary to power them.

However, this study is countered by another study from the Union of Concerned Scientists showing that even in areas with high-pollution power plants, one mile of driving in a plug-in EV is only marginally worse than one mile of driving a very fuel-efficient gas-burning car. In most parts of the country, the power plant infrastructure produces rates of carbon emissions for EV driving far superior to that of any gas-burning car.

You can charge your EV with wind power, too.Source: User Omniae via Wikimedia Commons

The NC State study also seems to overlook one huge development in American energy production: Renewable energy has become an increasingly important part of the American electricity picture in recent years. Wind and solar energy combined to generate barely 1% of all American electricity five years ago, and these two sources now regularly account for more than 5% of all electricity generated in the country in any given month.

Wind and solar power combined to generate less than a 10th of 1% of America's electricity at the start of the 21st century, and the amount of solar power generated in the United States has been doubling in virtually every month for the past four years. If this trend continues, before the end of the decade solar power will be generating two-thirds as much electricity as nuclear plants do today, and half as much electricity as natural-gas-burning plants. By then, many American EV owners may simply have solar panels installed on their roofs, making their travel time truly emissions-free.

Look toward the long term

Many technologies seemed limited and doomed to fail when they were first developed. The railroad was a folly, until it wasn't. Air travel wasn't possible, until it was. Horses were better than the automobile, until they weren't. Human ingenuity has a way of proving its doubters wrong, and the electric car's problems are by no means permanent. Like all other problems, they're just waiting to be solved.

More Myths about Electric Cars

From a blog post by Thomas Earle Moore

1* An electric car is dirtier than a gasoline car because electricity is generated from coal.

An internal combustion car can never be clean, but an electric car can be as clean as the energy sources used to charge its battery. In most locations, the amount of coal use is declining, and the remaining coal is being burned with cleaner methods. Because electric cars use so much less energy per unit travel than gas powered cars, they net out to be cleaner even when substantial amounts of coal are being used to generate the electricity. In the future, as electric generation becomes cleaner, they will be far cleaner than any gas powered car can ever be.

2* Electricity generation and distribution is expensive, inefficient and wastes energy.

Electric generation wastes less than half the energy wasted by the combustion of gasoline in small engines. And transmission of electricity has been very efficient (avg. 94%) ever since high voltage AC transmission was developed early in the 20th century.

3* If you run out of "juice", no one can bring you a can of it, and you'll have to be towed to get home.

The saving grace of electricity is that it is even more ubiquitous than gasoline stations. You can run out of electricity almost anywhere, and there will be an electrified structure nearby that will have at the very least a 120 V outlet. Though charging from such an outlet is very slow, you are more likely to find electricity than gasoline in most locations. Moreover, emergency repair vehicles will be increasingly equipped with chargers to help motorists in distress. Depending on the criticality and value of your time, you may choose a tow in any case, but that will not be your only option.

4* Public electric car chargers are for people with 4 hours to kill, and quick chargers waste even more energy.

Electric charging facilities exist at Level 1 (120 V, up to 1 kW, ~3 mph), Level 2 (240 V, up to 10 kW, ~30 mph), and Level 3 (DC fast charge, up to 120 kW, ~ 350 mph). One uses Level 1 in an emergency, Level 2 for routine charging while sleeping or shopping/strolling, and Level 3 when road tripping. Charging is more efficient at the higher levels,

over 90%, so it is untrue that fast charging is wasteful. But the ultimate in electric "charging" is the battery swap, which when designed for can be accomplished in minutes, even faster than a gas tank can be filled.

5* EVs are ok in town, but can't go on a road trip, so you'll have to have a second car for that.

Level 3 fast highway charging is not universally available, but proprietary networks do exist for both Tesla and Nissan vehicles, and there is no technical or economic obstacle to their broader use. Fast charging stations are less expensive to build than gas filling stations. If you buy an EV from a manufacturer with fast charging network access, you can travel pretty much anywhere a gas powered car can travel and at the same speeds, assuming reasonable stops for food and restroom breaks. You don't need to own a gas powered vehicle at all.

6* In cold weather at highway speeds EV range drops and you'll be "freezing in the slow lane".

Many people warm up their gas powered cars before driving, but EVs don't require warmup and deliver the pleasant surprise of heat and defrosting immediately. Gas powered cars and hybrids are inefficient when operated cold and this reduces their range substantially in winter months of stop and go driving. This effect is more noticeable for EVs because they use so much less energy for locomotion, that the energy needed to heat the cabin (and batteries) seems like a bigger deal. The bottom line is one needs to stop for charging more frequently in cold weather. However, this can be minimized by pre-warming the vehicle while it is still connected to the charger, so that the energy does not have to come from the battery while driving.

7* Hybrids and Electric cars cost so much more that they cannot be justified economically.

Hybrids cost more than ordinary gas powered vehicles because they are more complex and contain dual redundant drive systems. Their pitch is that they use electric power around town where it is more efficient and gasoline power on the highway where it is more efficient. But really, the advantage of a hybrid is mainly that it can recover energy put into accelerating and hill climbing by using the electric motor as a generator to charge a battery, a process known as "regenerative braking". That energy then becomes available to propel the car, reducing the need for gasoline power. Also the gas engine can be shut off when not needed, saving a small additional amount.

Battery electric vehicles are simpler than gas powered cars and much simpler than hybrids, while enjoying all the advantages of a hybrid in terms of energy recovery. Regenerative braking can be strong enough that one hardly needs to use the normal friction brakes, except to hold the car when stopped. The additional cost of an EV is for the large capacity battery. That has been prohibitive, but is rapidly falling as manufacturing steps up to the demand and new technologies have come to bear on the problem. We have price parity for premium vehicles and are likely to see it soon for lower price vehicles.

8* Charging an EV is an unacceptable inconvenience compared with filling a gas tank.

Routine daily charging is much more convenient that stopping at the gas station. One simply pokes the cable into the charge port upon exiting the car. Charging is usually scheduled to occur at night when other electric loads are light, which helps the power company to level its overall load. In the morning, one starts out every day with a full "tank", and rarely has the need for additional charging, given sufficient battery capacity.

A range of 200 miles approximates the distance we usually drive on the highway without stopping for food or a restroom break (excepting those who wear diapers!). Fast charging stations are placed adjacent to eateries, news stands, bookstores, or coffee shops. One puts the car on charge, walks to a nearby eatery and monitors the charging process on a phone app while taking a break. It feels like having a private filling station and is far from being an inconvenience. There are no attendants, no blaring loudspeakers, no smelly gasoline or oil, and no credit card machine or bill.

9* Hydrogen is a much better option for clean transportation because it can be refueled in minutes.

Hydrogen burning is locally clean, producing only water vapor. And it can be filled in minutes, given a station that is ready. However, there are currently only a dozen stations in the entire USA, though more are planned, and those sta-

tions have a limited supply of hydrogen in a form ready for fueling. The stations are costly owing to the extreme high pressures used to compress the hydrogen, about $3M per station, and the hydrogen comes from processed

natural gas, so hydrogen gives no escape from fossil fuels. The processing releases the CO_2 that would otherwise be released through combustion of the natural gas, so carbon footprint is unchanged.

Hydrogen can also be produced from electricity by splitting water into hydrogen and oxygen. However, hydrogen is an inefficient way to store energy that had to be generated as electricity using some other energy source at the generation plant. Hydrogen can be seen as another battery chemistry rather than as a source of energy, and the question arises: "wouldn't it be more efficient to transmit the electricity and store it in batteries?" Yes, it would.

10* Electric Vehicles are simply status symbols for effete environmental snobs.

EVs offer a viable future in which we can switch to clean renewable energy sources and power our entire transportation industry with them, in place of fossil fuels. The distribution of electric energy is already in place with our existing electric grid, and also allows for local sources such as wind generation and photovoltaic solar energy. Not only is this viable and practical, it is also a much more efficient use of energy, wasting about one fourth as much heat to the environment per unit of transport, and emitting nothing in the way of greenhouse gases or other pollutants.

http://www.washingtonpost.com/opinions/five-myths-about- electric-cars/2013/04/26/5c8504e0-ab77-11e2-a198- 99893f10d6dd_story.html