Electric Auto Association

CURRENTEVENTS

July 2018 Promoting the use of electric vehicles since 1967 Vol. 50 No. 7

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Articles

Columns

CURRENTEVENTS

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The deadline for articles is the first of every month for consideration in the next issue of CE. Articles received after this date will be retained for future issues of CE. Send submissions to: CurrentEvents@electricauto.org.

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Current EVents Back Issues

The EAA has put most of its issues from 2001 to 2018 on its website.

Please visit
http://electricauto.org/ and from the home page, click on "*Documents*" in the top navigation bar.

The resulting page has a listing of years (in a folder), which, when selected, will list the issues for each month. In that folder you will be able to download the pdf that contains the issue you choose.

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Behind the Wheel, Foot on the Pedal

How can we get the EV curious behind the wheel, and perhaps even more importantly, get their foot on the pedal. We EV drivers know the exhilarating sensation of instant acceleration and the satisfying drag when releasing the pedal, knowing that power is being regenerated to our batteries without touching the brakes. Oh, what a feeling!

When a car buyer gets behind the wheel, they start to become familiar with the car. They feel how the car drives. They think about how it would be to have that car in their life. Remember this sales principle,

"People do not buy, what they have not first, mentally possessed."

In the case of electric cars, since the technology (the energy source) is new, they need to get comfortable. For my own part, I did not buy my EV without first renting one for a long road trip; to be sure I was comfortable with away from home charging.

First, we have to get their attention. Secondly, get them close to the cars. Thirdly, behind the wheel. Here are some ways you may not have thought about:

I. Hold a driveway party
Goal: Get people close to your car, open the doors and trunk, get people to sit in your car, take them for a ride.

How this works:

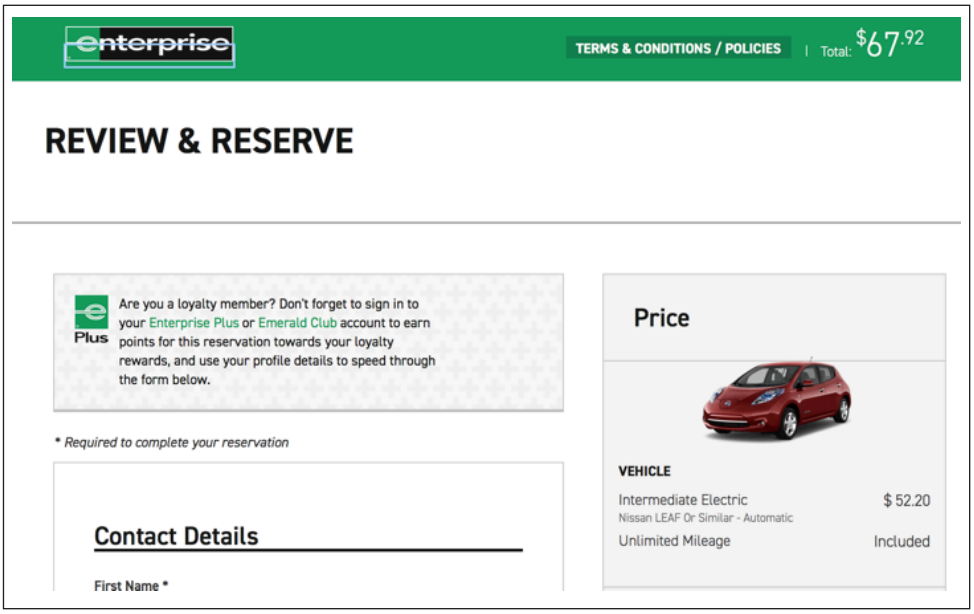
- Invite other EV owners to showcase their EVs at your party
- Develop an invitation flyer; distribute it to your neighbors and friends.
- Some things your party can include:
  - o Music
  - o Kids' Lemonade Stand
  - o Barb-b-que—hot dogs on the grill
  - o Popcorn
  - o Ice Cream—make your own sundae
- Ridealongs – Take people for rides around the block in your EV.

II. Vacation EV Rentals – extended Test Drives:
"An adventure in driving.
Try the latest technology in cars—an electric vehicle!"
Do you live in or near a place where people vacation? Renting an EV is equivalent to experiencing an extended test drive. Vacationers may be more likely to "try something new" on vacation, after all, they are already on an adventure with vacationing.

Raejean Fellows

Enterprise Leasing has an **EV rental program in Orlando, FL**. Perhaps members in your chapter have connections to local rental car companies and can encourage them to follow Enterprise Leasing's lead.

Are you or someone you know willing to **rent your EV on Turo** (https://turo.com)? Encouraging and promoting EV rentals can make a significant impact on sales of electric cars.



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Behind the Wheel

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III. Join the UBER EV Champions!

UBER and partners, Plug In America and FORTH, have launched an EV Champion program. The program runs July 2, 2018 - January 2, 2019.

Drivers have the option to carry in vehicle materials and chat with riders about the benefits of driving electric. Enhancements to the UBER app include notifying riders that, “Your electric vehicle is arriving”.

If you live in one of these cities, you can drive for Uber as an EV Champion.

San Francisco, Los Angeles, San Diego, Sacramento,
Austin, Seattle, Portland, and Montreal

Together, we can make a difference with our “word of mouth” type promotions. Let’s assist car buyers with some of these actions that can put more people behind the wheel, foot on the pedal.

Drive Electric Week WEBINAR:

"Engaging with Media"

Tuesday, July 24, 2018
5–6 pm PST

Plug In America and Sierra Club are hosting the second in a series of webinars to assist City Captains and NDEW event organizers.

Tuesday, July 24, 2018
4–6 pm PST

Registration Required
https://register.gotowebinar.com/register/3517484548230323 21

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Supercharged - Plus $240

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Joe Lervold

2018 BMW i3s Six-Month, 10,000-Mile Long-Term Update

Does the BMW i3 (Sport) still impress after living with it for a time?

By Tom Moloughney

After a little over three years with a 2014 BMW i3 REx, I picked up my 2018 BMW i3s BEV on December 30th, 2017. It was actually the very first i3s delivery in North America.

I had a little over 72,000 miles on my i3 REx when I had the unfortunate luck of crossing an intersection at the same time a woman was looking at her phone when she should have been stopping for a red light, She subsequently t-boned my car on the passenger side, sending it to an early retirement.

It all worked out well, though. At the time I had my eye on the just-

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You can really tell the i3s apart from a regular i3 from the wider rear stance.

EV Educational Resources

for Individuals, Groups and Organizations

Electric Car INSIDER

EV Buyers Guide

Compare electric cars with comprehensive full page profiles

Discount Pricing Guide App

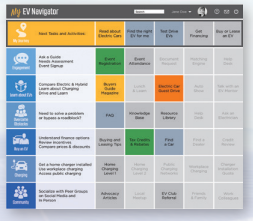
Save thousands of dollars on EV purchases and leases

Educational Exhibits

Large scale interactive exhibits for indoor and outoor events

Electric Car Guest Drive

Test drive the latest EVs and learn from EV owners



EV Navigator

Activity framework to guide prospective EV drivers on the path to EV ownership and advocacy

ECI creates educational resources to promote EV adoption from awareness to advocacy. Email or call us for a complete catalog of products and current pricing.

sales@electric-car-insider.com **619-337-4589**

Longterm Update

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announced Sport version of the i3, and this gave me a legitimate excuse to upgrade. I would also be upgrading from the original i3's 21.6 kWh battery to the larger 33.8 kWh pack which was introduced in 2017. The added battery capacity allowed me to ditch the range extender and go back to a BEV, after driving BEVs for five years previously.

Not long after I picked up this new Sport version, I stated in a post here that this is the i3 that BMW should have given us in 2014, and the six months I've had it has only reinforced that. Don't get me wrong, I thoroughly enjoyed my 2014 i3, but BMW is a premium brand and one that prides itself on the driving experience. There should have been a Sport option available right from the start. I also believe that BMW should have figured out a way to stuff more batteries in the original i3, so it could deliver a solid 100 miles of range.

The original i3 BEV delivered only 81 miles per charge, which is why I needed to get the range extender. Sure, you could squeeze out 100 miles in perfect conditions, but in the harsh winters of the northeast, it would sometimes only deliver about 60 miles of range. With my 2018 i3s, I was able to average 90 miles of range in the coldest winter months, and now that it's warmer, I'm having no problem getting 120+ miles per charge.

Here I have 42 miles to go after driving 100 miles on a charge.

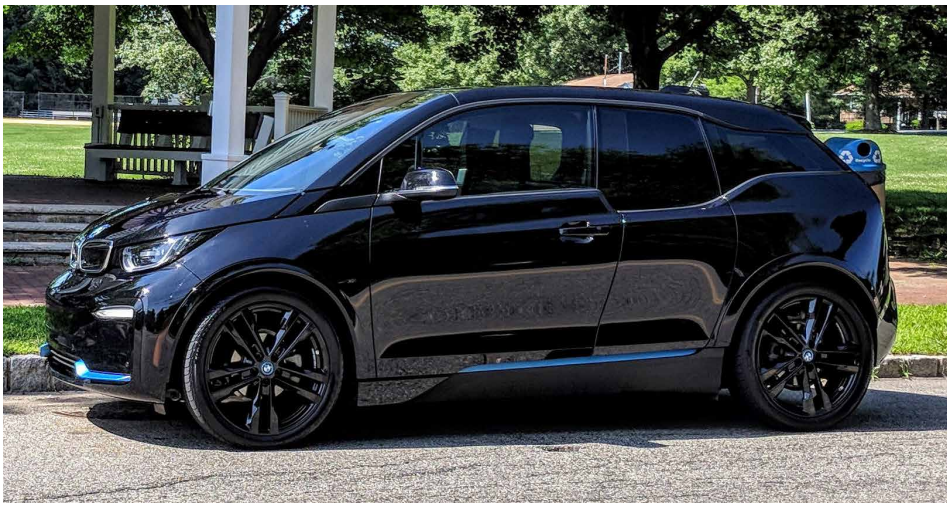
The i3s has 14 more horsepower (184 hp vs. 170 hp), and 15 more lb-ft of torque (199 lb-ft vs. 184 lb-ft) than the regular i3 models. The increase in power isn't really felt much at the low end though, and BMW's claimed zero to sixty times are only .4 seconds faster (6.8 sec vs. 7.2 sec). The real difference in power is felt at speeds above 40 mph. The car pulls strongly all the way up to 90 mph, and the top speed is 6 mph higher than the regular i3 (100 mph vs 94 mph).

However, the biggest improvement may very well be in how the car drives. BMW upgraded the suspension to include specially developed springs, shocks, and anti-roll bars. This new suspension is unique to the i3s, and the car is 10 mm lower, with a 44 mm wider track. In fact, BMW had to add fender flares to accommodate the wider track. Add wider tires and 20″ sport wheels

continued next page

and the i3s feels like a different car than my 2014 i3 REx did.

At highway speeds, the base i3 can be a little skittish at times, especially on windy days. The tall, boxy shape and skinny tires were really designed for lower-speed city driving. However, the lower and wider suspension, plus more rubber on the pavement have eliminated all of the deficiencies the base i3 has at high speeds. The car feels rock solid and planted now, all the way up to the electronically-limited 100 mph top speed.



The base i3 models have always had three driving modes: Comfort (the default mode) Eco Pro, and Eco Pro Plus. The i3s has all of those, but it adds a new Sport mode. The owner's manual says that the Sport mode offers a "more direct accelerator response and tighter steering characteristics" and I definitely agree with that. In fact, it can be too responsive at times. If I'm looking for a more leisurely drive, I won't use Sport mode because the accelerator is so responsive. The car lunges forward with the slightest touch of the accelerator and goes into regen as you back off. The Sport mode isn't designed for casual daily driving, it's really set up for those times that you want a spirited driving experience and it delivers.

BMW also improved the traction control system from the previous generation i3. This feature isn't unique to the i3s, but since it's new for 2018 I didn't have it on my previous i3. BMW says this new system can crunch data 50 times faster than the previous traction control and offer instantaneous power delivery. That's mostly credited to the control process being calculated directly in the powertrain, instead of in a remote unit requiring long signal paths.

In previous model i3s – as well as my ActiveE and MINI-E, when the car experienced uneven road surfaces, or sharp corners, the traction control system would reduce the regenerative braking, or in some cases completely shut it off in an effort to keep the tires from losing traction. That gave the sensation of sudden acceleration to many owners. If you were in full regen, hit a bump and the regen shuts off, the car freewheels. While it doesn't actually speed up, it stops slowing down, and that gives the same feeling as sudden acceleration. That is completely eliminated with this new traction control system. I've actually gone out of my way to try to defeat it and I haven't been able to.

So while I really am loving the new i3s, it is still far from perfect. The one thing that I can't get past is how BMW hasn't added a heated steering wheel and back seats. I can almost forgive them for the back seats, but not for the steering wheel. Every electric vehicle

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The coach doors look good, but can be cumbersome

Longterm Update

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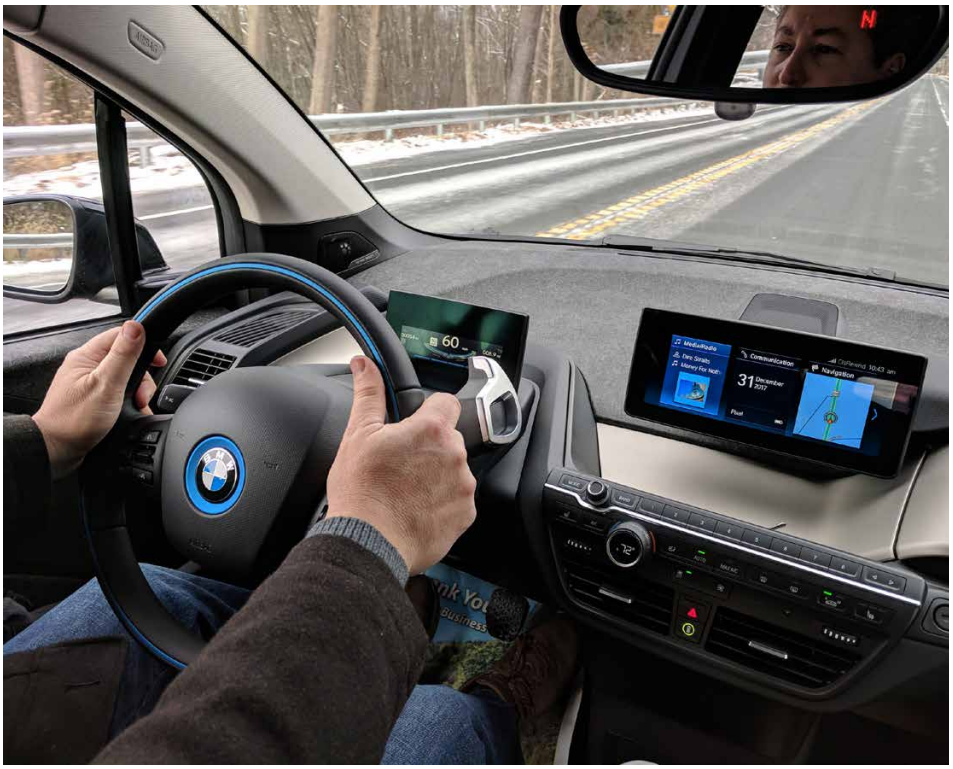
should have a heated steering wheel, period. Especially one that is priced at the higher end of the market. You can really save energy in the winter by using the heated steering wheel and seats, and limiting the use of the cabin heater, and that translated into longer range. While all BEV i3s come with a very efficient heat pump system, the REx versions do not, and have conventional resistive heaters.

Also, the coach doors are still kind of a pain at times. Luckily for me, I don't have any kids, so I rarely use the rear seats. However, when I do, it can be inconvenient for the people sitting in the rear. I have it straight from a high-level BMW i executive that they will not be employing rear coach doors on future BMW i models. Another nitpick is how the windshield wipers drag some of the water back into the view of the driver on their return stroke. This has been the case with all i3 models since the initial launch, and BMW hasn't been able to improve or eliminate it. It can vary from annoying to slightly obstructing your vision depending on how heavy the rain is. I found that if I use a product like Rain-X, it greatly reduces the issue.

With all that said, the i3 is still a tough sell with its current price point. My car is pretty much loaded with every option available, except it has the Deka World interior which is the base interior, and the MSRP was $54,845.00 (including the $995 destination charge). That's a lot when you consider the comparison (Nissan LEAF, Chevy Bolt, Tesla Model 3). Still, the i3 is really a unique vehicle, and in my opinion after more than four years on the market doesn't look outdated yet. I still like the interior better than any other EV, and that's really important to me. BMW knows they are priced high for the segment and have been offering great deals including $10,000 utility discounts (which expire now this July!) and very competitive lease rates to ease the pain of the high MSRP.



The i3 has been rumored to be getting another battery upgrade at the end of this year, increasing the capacity to an estimated 43.2 kWh. That will exactly double the size of the i3's original battery offering which had 21.6 kWh capacity. If true, that would most likely bring the i3's EPA rated range up to around 150 miles per charge. Since I'm getting 120 – 130 miles per charge on my i3s with a 107 EPA range, I'm sure the new i3 will be able to get 175+ miles per charge in favorable weather conditions. The added range of the new battery will most likely drastically reduce the number of range extender models sold.

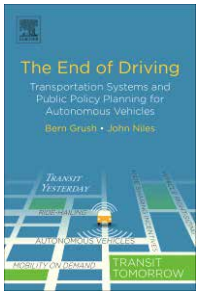
Overall, I'm very happy with my i3s and would absolutely recommend it. Look out for a sizable manufacture discount or special lease rates, as BMW has been putting cash on the hood to help make the i3 more competitively priced in today's growing EV market.

https://insideevs.com/2018-bmw-i3s-six-month-update/

Tom Maloughney has long advocated for EVs and has been driving electric since 2009. A former director at Plug in America, Tom currently works with dealerships to increase their plug in vehicle sales. Tom manages public charging stations he had installed at a strip mall in Montclair, NJ.

The End of Driving

1st Edition: Transportation Systems and Public Policy Planning for Autonomous Vehicles



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Page Count: 332

While many transportation and city planners, researchers, students, practitioners, and political leaders are familiar with the technical nature and promise of vehicle automation, consensus is not yet often seen on the impact that will result, or the policies and actions that those responsible for transportation systems should take.

The End of Driving: Transportation Systems and Public Policy Planning for Autonomous Vehicles explores both the potential of vehicle automation technology and the barriers it faces when considering coherent urban deployment. The book evaluates the case for deliberate development of automated public transportation and mobility-as-a-service as paths towards sustainable mobility, describing critical approaches to the planning and management of vehicle automation technology. It serves as a reference for understanding the full life cycle of the multi-year transportation systems planning processes, including novel regulation, planning, and acquisition tools for regional transportation.

Application-oriented, research-based, and solution-oriented rather than predict-and-warn, *The End of Driving* concludes with a detailed discussion of the systems design needed for accomplishing this shift.

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John Niles: jniles@endofdriving.org

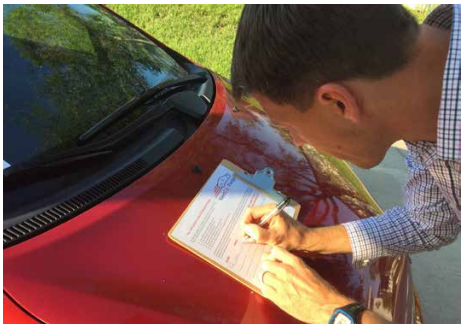
https://www.elsevier.com/books/the-end-of-driving/niles/978-0-12-815451-9

Thinking of Going Electric?

By Mark Hughes, San Diego (EVAoSD)
In many parts of the country, spotting an EV is still a Where's Waldo? kind of experience. Last fall, the Southern Alliance for Clean Energy (SACE) launched their *NextCar Pledge* [*https://www.nextcarpledge.org*] as another way to make that game easier in the future. The Pledge's request is straightforward: the signer agrees to consider an EV for their next car, and to learn more about how EVs can address issues ranging from climate change mitigation to reducing dependence on foreign oil, to simply saving money over the traditional internal combustion engine choice.

The overall goal is to create a community where Pledge signers benefit from becoming more educated through monthly newsletters which highlight current events in the EV world. It also creates a collective voice to inform elected officials and auto manufacturers that citizens and consumers support electric transportation and need more EV models and charging infrastructure, as charger availability continues to be a source of EV reticence in these Waldo? parts of the country.

Lastly, the Pledge campaign's color palette: red, white, and blue, was chosen for inclusiveness. The point is that EVs aren't just activist vehicles. They are vehicles for those who want to save money in the long run. They are cars for people who like performance. They are cars for people who are concerned that foreign oil means foreign oversight. They are cars for everyone.



https://www.nextcarpledge.org

Want to Achieve Better Electric Car Policies in Your City or State? Look No Further

By Mary Lunetta

People often ask what the best policies are to further incentivize making the switch to driving electric vehicles (EVs), so we teamed up with our friends at Plug In America to launch AchiEVe: Model State & Local Policies to Accelerate Electric Vehicle Adoption. It catalogues some of the most effective initiatives driving the growth of clean transportation today, with links to specific templates and real-world examples so they can be adopted in communities anywhere.

Image Source:
Southern Company/Georgia Power Three National Drive Electric Week attendees at Tech Square in Atlanta show why they drive electric.

Thanks to many of the smart and supportive policies helping to accelerate the widespread adoption of EVs here in the U.S., EV sales were up 26 percent in the U.S. in 2017 compared with the previous year, and 2018 sales are on track to exceed that. Today, EVs account for less than twopercent of all new light-duty vehicles in the United States. EVs are no doubt on the rise, but far more electric cars and buses are needed, and quickly, if we want to transition off oil and meet our climate goals. That's where this toolkit comes in. It's designed to accelerate the switch to these clean vehicles in effective, sustainable, and equitable ways.

Expanding Charging Access

Owners of gas-guzzling vehicles have no trouble finding a place to fuel up, but for people who drive EVs, fueling happens differently -- whether it's at home, at work, or on the go. That's why, as the growth of electric mobility continues to gain momentum, the need for more accessible and large-scale charging networks becomes even more pressing.

According to some studies, installing EV-friendly wiring at the time of construction can be 64 to 75 percent less expensive than post-construction installations. Some cities, such as Atlanta, are making commitments, adopting building codes and passing ordinances requiring new homes, buildings and parking structures be "EV ready," which means having the conduit and wiring in place to accommodate EV charging.

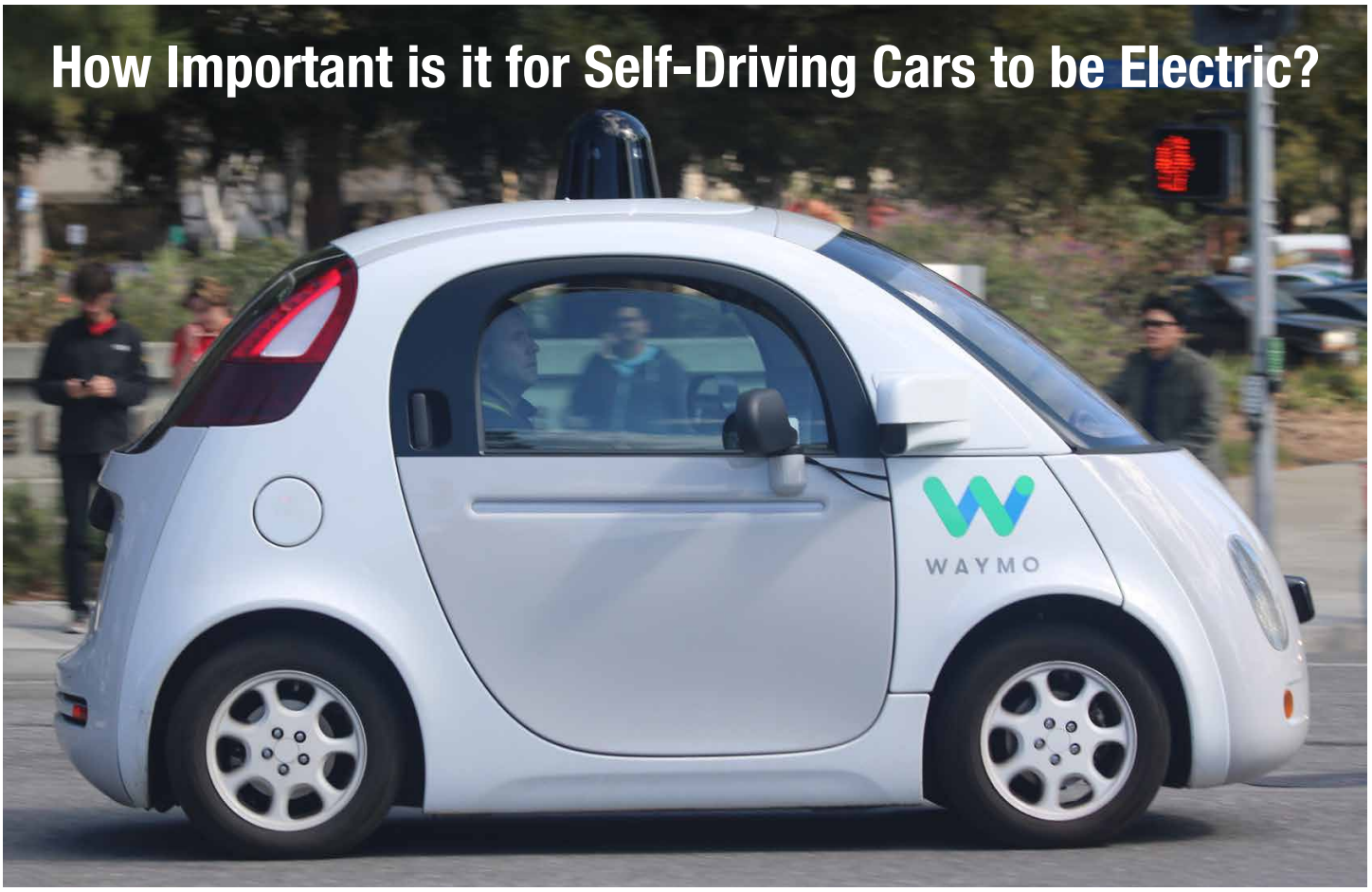
Disadvantaged communities face some of the biggest barriers to charging access, as they less frequently are homeowners and often live in multi-unit buildings without dedicated charging spaces. San Diego Gas & Electric's Power Your Drive Program is deploying 3,500 charging stations at 350 site installations at workplaces and multi-unit dwellings. Installations within disadvantaged areas are exempt from the one-time participation payment.

States, cities, and utilities should adopt programs that increase access to electric transportation and charging for all communities, because everyone deserves to breathe clean air and access clean transportation choices, regardless of income or location.

[Read the rest of this article at the url below for valuable information sponsored by the Sierra Club on their website. The information is useful to those who are willing to volunteer to support the development of better EV policies]

https://www.sierraclub.org/compass/2018/06/want-achieve-better-electric-car-policies-your-city-or-state-look-no-further

How Important is it for Self-Driving Cars to be Electric?



By David Reichmuth, ucsusa.org

The rapid development of self-driving technology has raised many important questions such as the safety of automated vehicles (AVs) and how they could radically alter transportation systems. These are critical questions, but AVs also have the potential to result in significant changes to the global warming emissions from personal transportation.

An interesting recent study from the University of Michigan and Ford Motor Company lays out the details of the likely changes in emissions from using an AV system on both electric and gasoline cars. The main takeaway from the study is that adding AV equipment to a car adds weight, aerodynamic drag, and electrical power consumption that leads to increased fuel consumption. There is the potential to offset emissions from more efficient driving by connected and automated vehicles, but by far the largest impact on emissions is the choice of fuel: gasoline versus electricity.

Direct emissions versus behavioral and usage changes

Switching from human control to fully automated driving will have direct effects on emissions as well as changes to the amount we use vehicles. Direct emissions changes include reductions in efficiency from factors like increased drag from sensor equipment and the power consumption of required computing and communications equipment. Positive direct impacts could include more efficient driving, such as smooth and precise acceleration control in an automated system.

Automation will also change how we use cars and how much we use them, indirectly affecting emissions, though the effect of AVs on these indirect emissions is much more speculative. While some changes, like "right-sizing' (for example, having smaller one or two occupant cars available for solo trips), could decrease emissions, many of the usage changes considered would increase vehicle usage and therefore emissions. Making long distance driving easier or more productive could encourage people to live farther from their jobs. Having fully automated vehicles will mean more people can use a car. The elderly, blind, youth, and people with disabilities could switch from transit to a car, or simply add trips that would not have been able to happen otherwise. While many of these uses of AVs would be beneficial, it's important to understand the potential emissions from AVs and how we could minimize the total contribution of global warming pollution from personal transportation.

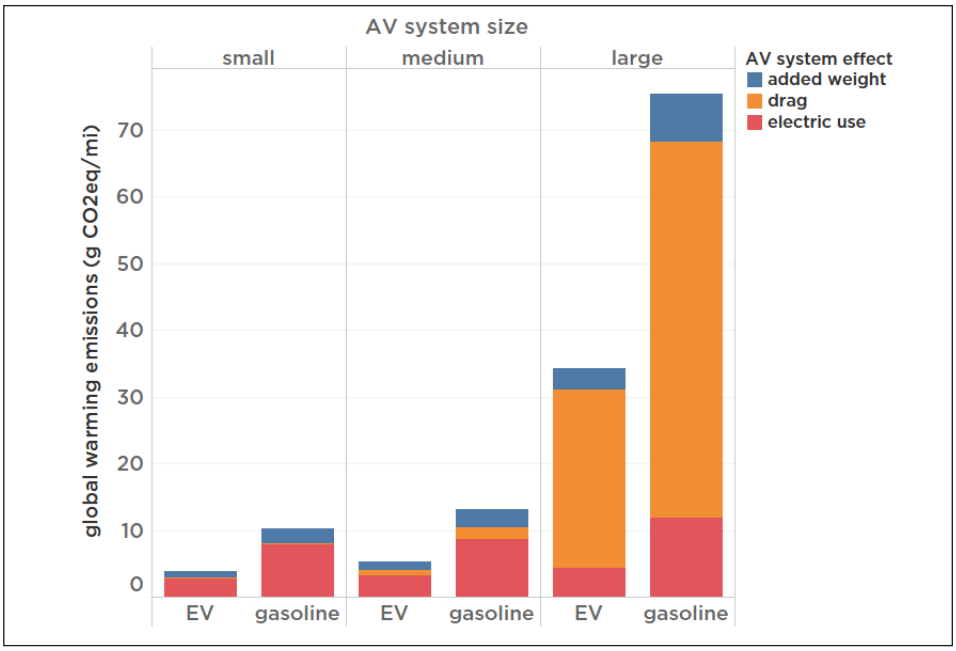
That's why this new study is important: it lets us at least estimate the direct,

continued on next page

short-term implications of AV technologies on emissions. While it doesn't examine the potential impacts of driving more, it does shed light on the direct effects of adding these new features to cars.

AV equipment increases fuel consumption, especially for gasoline vehicles

Focusing on the physical changes to the vehicle, the addition of self-driving and sensor equipment has three major changes to the fuel consumption (and therefore emissions) of the AV. First, the additional weight of the equipment decreases efficiency. Second, AVs that have sensor equipment like cameras and LiDAR (laser-based imaging) often require side bulges and roof-mounted equipment pods. Like a conventional cargo rack, these additions are detrimental to fuel economy as they increase the vehicle's aerodynamic drag. Lastly, the sensors and computing equipment that enable self-driving require additional electrical power beyond a conventional vehicle. For a gasoline car, this means added load on the engine to power an alternator (and therefore higher gasoline consumption), while a battery electric car will have reduced overall driving efficiency (and therefore shorter range between recharges).



(Above) AV systems can increase global warming emission attributed to driving. The largest impact is seen on larger AV systems due to drag from the sensor units. Adapted from Gawron et al.

The researchers from Michigan and Ford examined three sizes of AV systems that could be added to vehicles: an AV system with sensors like a Tesla Model S, a medium-sized system with smaller external sensors similar to a Ford AV prototype, and finally a large AV system modeled after Waymo's modified Chrysler Pacifica AV. While all AV systems have a negative impact on fuel consumption and emissions, the largest impact is seen in the increased drag from the large AV system.

Waymo's AV minivan adds sensors and computing systems that increase weight, drag, and electrical power consumption. This model was used as an example of a 'large' sized AV system in the referenced study. Image source: Waymo

Improved driving behavior and other savings from AVs are possible in the long run

The study also points out the possibility of fuel savings from having self-driving and connected cars. These savings could come from several sources. For example, AVs could have more efficient acceleration and braking ("eco-driving"), especially if they are communicating with other cars to anticipate speed changes in traffic. AVs could also communicate with infrastructure like traffic signals to reduce idling and stop-and-go driving. On highways, groups of connected AVs could drive much closer together than a human driver could. This 'platooning' technology can increase fuel efficiency by reducing aerodynamic resistance, similar to the drafting that competitive cyclists and NASCAR drivers use to save energy. There is also a potential for AV technology to increase fuel consumption because cars could potentially drive safely on the highway at higher speeds and high speeds reduce efficiency.

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Waymo

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These factors are currently harder to quantify than the impact of the AV equipment, and some of the potential benefits require having most or all cars on the road be at least connected, if not fully automated. For example, platooning would require multiple AVs traveling on the same roadway at the same time, which would require a critical mass of AVs to be deployed. The researchers in this study estimate a potential emissions savings on average of 14 percent from these technologies if fully implemented. However, they do not consider changes to vehicles that are already producing some of these benefits, such as improved aerodynamics (which gives some of the same benefits as platooning) or stop-start systems (which already act to reduce some of the adverse impacts of stop-and-go traffic and intersections).

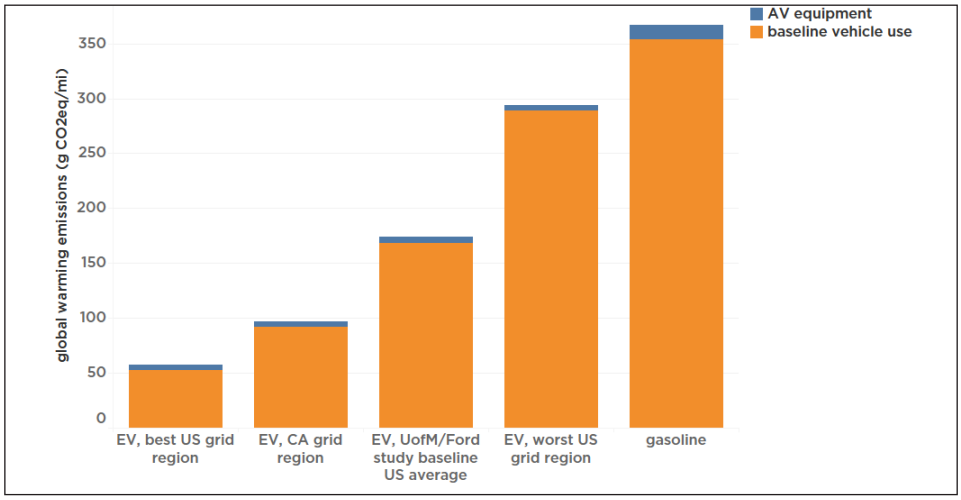
Early AV models are more likely to have higher emissions

The study also considered the impact of the much more power-hungry equipment used in early developmental AV systems. For example, early prototypes have been reported to require in excess of 2,000 W of power, mostly for on-board computing. Increased computer power requirements in these early prototypes, for example going from the from these early AVs (see table). This is especially true for the less-efficient gasoline-engine driven vehicles, where increased electric power requirements would increase emissions over 60 grams CO_2 equivalent per mile. That's equal to reducing the fuel economy of a 35MPG car to 29MPG, or like adding the emissions from running 10-25 iMac computers using a gasoline generator for every car. Since early AVs will not have enough numbers on the road to take advantage of platooning and connected vehicle savings, it is very likely that in the near-term AVs will contribute higher net emissions than a conventionally driven vehicle using the same fuel.

Emissions from AV system's electricity use. Baseline system is 200W computer system, prototype uses 2,000W computing system.

AV system size	Baseline AV system, battery electric vehicle (gCO_2eq/mi)	Baseline AV system, gasoline vehicle (gCO_2eq/mi)	Prototype AV system, battery electric vehicle (gCO_2eq/mi)	Prototype AV system, gasoline vehicle (gCO_2eq/mi)
SMALL	3.0	8.0	25.9	70.3
MEDIUM	3.2	8.6	26.1	71.0
LARGE	4.3	11.8	27.3	74.1

Switching from gasoline to electricity is by far the most important factor in reducing emissions



The choice of fuel (gasoline versus electricity) is the most important choice for reducing emissions. Emissions estimates based on Ford Focus gasoline and battery-electric models and includes 'well-to-wheel' emissions for fuel production, distribution, and use in the vehicle. Emissions related to vehicle or AV system production are not included in this chart.

The most important determinant of direct emissions from vehicles is not the AV system, but is the choice of gasoline or electricity. Choosing a electric vehicle instead of the gasoline version for this analysis reduces global warming emissions from 20 to over 80 percent, depending on the emissions from electricity generation. The addition of AV equipment only increases this difference, making it clear that electric drive is required to have AVs that maximize emissions reductions.

What will the future hold? Some AV companies, like Waymo (spun off from Google) and Cruise Automation (partnered with General Motors) are using EVs and have plans to continue using electric drive in their AVs. Other companies have been less progressive, such as Ford announcing that they anticipate using gasoline-only hybrids for their AVs. If AVs have the transformative effect on mobility and safety that many predict, it will be vital to encourage the use of cleaner electricity instead of gasoline in these future vehicles.

DAVID REICHMUTH is a senior engineer in the Clean Vehicles Program, focusing on oil savings and vehicle electrification.

https://blog.ucsusa.org/dave-reichmuth/how-important-is-it-for-self-driving-cars-to-be-electric

The Misinformation Around Electric Vehicles

The oil and automotive industries' increasingly crude attempts to spread misinformation about electric vehicles...

By Enrique Dans

The oil and automotive industries' increasingly crude attempts to spread misinformation about electric vehicles is a bid to protect a business model increasingly recognized each day as harmful to the planet and to each and every one of us. Media outlets such as The Guardian and CNBC have written about this issue. The misinformation includes the contention that electric vehicles are bigger polluters than conventional vehicles; this has been disproven time and again, especially as more and more states and countries are generating their electricity from sustainable sources. And even when electricity is produced from fossil fuels, the use of electric cars still means a major reduction in air pollution in our cities.

Another falsehood is that transportation is not the real issue, that the actual causes of pollution are heating or industrial emissions. The truth is that cars and trucks account for more than a third of polluting emissions, a good part of which occur precisely in the places where we live and work. So any reduction is likely to have a positive effect on our quality of life.

Then there are the claims that electric vehicles are too expensive or generate anxiety in their drivers: an idea refuted by the growing driving range of electric vehicles, which is already approaching or even surpassing that of their fossil fuel counterparts. Mercedes says its next electric vehicle will have a range of 500 kilometers, and some Teslas, like the next Roadster, are expected to have a range of around 1,000 kilometers. Even though these examples are not precisely cars for regular people, the trend is clear. With the progressive increase in the density of batteries, these figures can only evolve one way: upward.

Batteries are also the targets of misinformation campaigns: some of my readers say that batteries rely on supposedly scarce mineral sources and can't be recycled. First, batteries can be recycled. Their elements are perfectly reusable, and, contrary to what many think, batteries degrade with use or over time much less than expected. Rigorous scientific studies show battery degradation of around 1% every 30,000 kilometers, making them much more efficient than their internal combustion rivals. In many cases, this falsehood has led leasing or renting companies to offer bad deals (based on a supposed residual zero value at the end of the contract) to people interested in electric vehicles, thus discouraging sales. As more batteries are produced, the technology is improving and prices falling, while other technologies, such as solid-state batteries, offer even more potential.

Then there are the fearmongers spreading untruths about our inability to generate enough electricity to charge all those electric cars. This claim has already been refuted by none other than the UK's association of energy providers, which says its members will be more than able to meet the demand of the several million electric vehicles that are projected to arrive in the coming years.

And then there's the issue of maintenance. Internal combustion engines are have more than 10,ooo moving parts that must be permanently lubricated and periodically replaced. As any car owner knows, replacing spare parts is extremely expensive. A typical electric vehicle has around 18 moving parts, with very low degradation and drastically lower maintenance needs than vehicles with internal-combustion engines.

We need to move quickly and efficiently toward using electric vehicles, bypassing hybrids completely (hybrids are inefficient and are only meant to extend the life of the internal combustion engine, an already out-of-date technology that should be banned sooner rather than later. Anybody considering buying a car should forget diesel, gasoline or hybrids, and go electric.

In some countries, such as Spain, the automotive industry is still using trotting out arguments based on its fictional "technological neutrality" that are actually anything but neutral. These arguments are essentially designed for an extremely lengthy transition period to protect a traditional industry that has already exceeded all limits of ethics and corporate social responsibility.

By all means, let's have a discussion about the future of transportation, but let's do so based on facts, not rumors, half-truths and outright lies.

Enrique Dans is Professor of Innovation at IE Business School

https://www.forbes.com/sites/enriquedans/2018/07/03/electric-vehicles-and-disinformation/#56f6b21531e5

Uber to Boost EV Network With Driver Incentives

By Lorraine Chow

Uber launched a new program to increase access to electric vehicles for drivers and riders, the company announced Tuesday.

The "EV Champions Initiative" offers financial incentives to some EV drivers; an in-app feature that alerts EV drivers of trips lasting 30 minutes or more to help combat fears of range anxiety—or the fear that the car's battery will die without timely access to a charging station; and from now on, Uber riders will receive a notification if they are matched with an EV driver.

Among other measures, Uber has partnered with researchers from the University of California, Davis and the non-profit Veloz to raise awareness and encourage adoption of clean transport. Participating drivers may provide riders in-car materials with basic information on the benefits of EVs and the importance of electrification, according to Adam Gromis, Uber's global lead on sustainability and environmental impact.

"We anticipate this initiative will facilitate at least 5 million Uber EV rides over the next year," Gromis wrote in a blog post.

The goal is not too far of a stretch. Roughly 4 million Uber rides were taken in EV last year in the U.S. and Canada, Curbed noted.

After successful pilots in Pittsburgh and Portland, the initiative rolled out yesterday in seven more cities—Austin, Los Angeles, Montreal, Sacramento, San Diego, San Francisco and Seattle.

Photo: Pixabay

The program is tailored differently for each city. For instance, Uber drivers in San Diego, San Francisco and Pittsburgh will be given a $1-per-ride bonus for using plug-in hybrids or full battery EVs, according to the Los Angeles Times. In Sacramento, Uber partnered with the local public utility district to give $1.50 back per trip, Mashable reported.

In Los Angeles, drivers will not get any financial perks for driving an EV, but Uber will notify them of the benefits of owning such a car, such as state rebates, the Southern California Edison clean fuel rebate, HOV-lane access for single occupants and city-specific rebates on installing electric chargers, according to the Los Angeles Times.

"We're excited to continue working with riders, drivers, and cities around the world to facilitate access to more sustainable transportation and work towards solutions that can improve our lifestyles and our cities," Gromis said.

Transportation is a major source of greenhouse gas emissions, and electric vehicles have been touted as one of the keys to help clean the polluting, gas-guzzling sector. Although EV sales are growing rapidly around the world, only a small percentage of cars on the road are electric. In 2017, of the 17 million new cars sold in the U.S., only 200,000 were EVs, ArsTechnica calculated.

Increasing EV adoption will help facilitate "reliable transportation for everyone, everywhere and [make] our cities more efficient and less reliant on personal car ownership," Gromis wrote.

"Studies by the International Transport Forum, UC Davis Institute of Transportation Studies and Lawrence Berkeley National Lab found that when shared and electric mobility are properly combined, along with automation, we can shrink the number of vehicles on the road and reduce transportation's climate footprint," he added.

Uber's move follows rival ridesharing service Lyft's announcement that it will make all of its rides carbon neutral by investing millions of dollars in projects that offset its emissions.

https://www.ecowatch.com/uber-electric-vehicles-2579757151.html

Uber – Electrifying our Network

By Adam Gromis,
Global Lead for Sustainability and Environmental Impact

At Uber, we're committed to facilitating reliable transportation for everyone, everywhere and making our cities more efficient and less reliant on personal car ownership. One important part of realizing this vision is increasing electrical vehicle (EV) adoption. Studies by the International Transport Forum, UC Davis Institute of Transportation Studies, and Lawrence Berkeley National Lab found that when shared and electric mobility are properly combined, along with automation, we can shrink the number of vehicles on the road and reduce transportation's climate footprint.

That's why we're excited to launch the EV Champions Initiative, a pilot program for driver-partners to deliver at least 5 million EV rides over the next year. This program kicks off today in seven cities — Austin, Los Angeles, Montreal, Sacramento, San Diego, San Francisco, and Seattle — in partnership with leading electric vehicle (EV) adoption experts. This program builds off the success of existing pilots in Pittsburgh and Portland and we're proud to team up with experts who have decades of experience in EV adoption. Together, we hope to better equip both plug-in electric and full battery electric vehicle drivers for success.

As our partner Giovanni Circella, director of the 3 Revolutions Future Mobility Program at the UC Davis Institute of Transportation Studies, shares "EV Champions brings together two of today's transportation revolutions: clean electric vehicles and shared-use mobility. We look forward to partnering with Uber to evaluate how the initiative can improve consumer understanding and adoption of EVs."

Over the last year, we've met with hundreds of drivers across the US and Canada who drive or are interested in driving EVs. While they love not paying for gas and being a part of automotive innovation, they also face challenges in losing fare-earning time to charge their vehicles, accessing adequate fast-charging stations in urban areas, and getting affordable access to higher mileage EVs.

The EV Champions Initiative begins to address these concerns by providing:

• **Access to EV education and resources:** Many drivers know about the federal tax credit for EV owners, but there are a myriad of State programs and incentives available as well as local programs provided by utilities and cities that are less widely known. That's why we're focused on ensuring EV drivers have the best, most up to date information on all the resources, incentives and programs they can take advantage of in their areas. In select cities, this pilot provides direct monetary incentives for driving EVs on our network.

• **In-app features built for EV drivers:** One of the biggest challenges for EV drivers is "range anxiety"– worrying your vehicle might run out of charge before making it to a suitable EV charging station. That's why we're introducing a 30 minute trip notification for drivers so they've got an idea of what's in store on the road ahead before they pick up a rider.

• **Advocacy for shared-use EV drivers:** Today's EV infrastructure and resource programs are designed for private car ownership. To shift the conversation towards shared EVs, we've stepping up our advocacy in this space. We've joined Veloz – a leading non-profit comprised of public and private organizations dedicated to addressing the needs for EV adoption and the unique needs of rideshare drivers with EVs in California. And in Quebec, EV drivers who use the Uber app will be offered a free AVEQ membership, which includes opportunities for reduced insurance premium alongside the chance to share their views and advocate for policies that best serve their needs.

Consumers' lack of awareness about EVs is often a barrier to adopting more electric transportation. That's why we're working to make every EV ride requested through our platform a remarkable experience. From now on, any rider in the United States or Montreal, Canada matched with a driver-partner in an EV will receive an in-app notification. This is a small step towards driving awareness and encouraging conversations between riders and drivers about EVs. In our pilot cities, participating drivers may offer riders in-car materials with basic information on the benefits of EVs and importance of electrification.

We're excited to continue working with riders, drivers, and cities around the world to facilitate access to more sustainable transportation and work towards solutions that can improve our lifestyles and our cities.

Read more at:
https://www.uber.com/newsroom/electrifying-our-network/

VW's Electrify America launches 'Green City' initiatives in Sacramento with EV sharing, and more

By Fred Lambert

Along with electric vehicle charging infrastructure, Volkswagen's settlement with the EPA and CARB over the Dieselgate scandal also included investing in a 'Green City' initiative.

In Sacramento this week, VW's Electrify America is now launching the project which includes electric car sharing programs, zero-emissions shuttle bus routes and electric vehicle charging infrastructure.

Sacramento Mayor Darrell Steinberg commented on the announcement:

Our partnership with Electrify America is a key piece of the City of Sacramento's effort to become a national center for testing and development of alternative and autonomous vehicle technologies. And just as importantly, the new shuttles and car services connect this new technology to our neighborhoods by increasing mobility options for residents, particularly in economically disadvantaged areas,

The project includes investments in several different programs listed in a press release:

• **CAR SHARING** – Electrify America is investing between $15 and $18 million for the launch of two ZEV car share services within the City of Sacramento which complement each other with different service areas while providing the same easy access:

— GIG Car Share – Free Float Car Sharing: GIG Car Share, which is powered by AAA Northern California, Nevada, and Utah, will offer free float car share service in Sacramento. This service allows users to pick up and drop off a vehicle at any legal public parking spot, including metered locations, within a 13 sq. mile "Home Zone." Perfect for a first-mile-last-mile connection, the user either pays for rental time or distance traveled, whichever is less expensive. With the GIG app, users can locate the nearest car to reserve it for up to 30 minutes in advance or to initiate a spur of the moment trip. GIG Car Share will initially launch with 260 vehicles. These cars will be easy to recognize with a roof-mounted bike rack, giving users the option of combining two different modes of transportation, bike and car, for daily commutes or weekend adventures.

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More than 70 percent of the census tracts in GIG's proposed car sharing Home Zone are low-income or disadvantaged communities. This service will be available in Q1 2019.

— Envoy – Round Trip Car Sharing: Electrify America is also investing in a program with Envoy Technologies, a community-based EV car-share service based at apartment buildings as an amenity. Vehicles can be reserved, picked up and returned to the same location. The Envoy fleet will feature 142 vehicles spread in pairs across 71 locations. Each car will have a dedicated Level 2 EV charger. With 75 percent of the fleet expected to serve low-income and disadvantaged communities, Envoy provides equitable transportation for drivers running personal errands, as well those looking to participate in the gig economy and generate income that is 30 percent higher than the minimum wage. These cars will be available for rental by residents as a paid service at competitive rates. Initial properties will begin offering service by the end of summer 2018 with more locations coming on board every month.

• ZEV BUS/SHUTTLE SERVICES – Electrify America is investing between $11 and $14 million in a ZEV bus service and an on-demand micro-shuttle service. To support powering the fleets, Electrify America will also install charging stations with ultra-fast chargers to power each service.

— Electric Bus Service – UC Davis to Sacramento: Electrify America will enhance bus service between UC Davis and Sacramento with 12 new electric buses that will run from the main campus to the UC Davis Health campus in Sacramento. The shuttle will be co-run by Sacramento Regional Transit (SacRT) and the Yolo County Transportation District. Plans include increasing route frequency and providing four bus stops, including UC Davis, West Sacramento and two stops in Sacramento, downtown and at the UC Davis Health campus, which will also will be the eventual home of the planned Aggie Square tech complex. The bus service is expected to add more than 400,000 bus rides in the first year of operation. The enhanced route will start in 12 to 18 months once the electric bus manufacturer begins deliveries.

— On-Demand Electric Shuttle Service – Franklin Region: Electrify America has provided the funding for this service which will be operated by Sacramento Regional Transit. SacRT is planning an initial launch in July 2018 as a new, ondemand micro-transit shuttle service. Funding from Electrify America will allow SacRT to transition the three-shuttle fleet to ZEV shuttle buses, once the shuttle manufacturer begins deliveries. The service is expected to provide about 26,000 rides in its first year. Consumers will be able to access it through an app-based ride hailing system, an online reservation or by phone. This service provides additional mobility for residents and visitors to this area, which has been without a bus line since 2008.The proposal for this route serving the neighborhoods of the Franklin Boulevard corridor was submitted by Franklin Neighborhood Development Corporation (FNDC), which is investing in and improving the physical infrastructure, social services, public transportation, education, and job creation for Franklin Boulevard Business District's residents, and business and property owners. More than 90 percent of the micro-shuttle's service territory is in a low-income or disadvantaged Sacramento neighborhood.

• EV CHARGING INFRASTRUCTURE – With an investment of $14 million to $16 million, Electrify America will install more than 10 ultra-fast EV charging stations in the Sacramento region which will be available to the public. The charging stations will have a range of power from 50 kilowatts (kW), which is most commonly used in today's electric vehicles, to 150 and 350kW. This future-proof charging technology will meet the needs of all electric vehicles available today and the advanced EVs expected as early as 2020. The Electrify America ultra-fast charging technology can deliver energy for up to 20 miles of range per minute, or seven times faster than today's 50kW DC chargers. This investment includes chargers for the bus and shuttle services, plus the Level 2 chargers for the car share program.

The services are expected to start launching as soon as the end of 2018. At which point, more details will be released about each of the programs.

Fred is the Editor in Chief and Main Writer at *Electrek*. He mainly covers electric vehicles, autonomous cars and ride-sharing platforms.

https://electrek.co/2018/06/14/vw-electrify-america-green-city-sacramento-ev-sharing/

Top Fuel Monsters Put on Notice: 5,000-hp Electric Dragster has Eight World Records in its Sights

"We're talking about enough potential power, mounted within a foot behind my head, to run a whole suburb of houses with lights and appliances switched on" (Credit: Top Ev Racing)

By Loz Blain

An Australian company is working from scratch to build the biggest, baddest electric powertrain ever hooked up to a set of wheels. Top EV Racing is aiming to violently end the dominance of fire-breathing Top Fuel cars at the drag strip, and smash acceleration and landspeed world records to boot.

By now, everyone's well aware of the monstrous performance potential of electric drivetrains. The first time you stomp the gas on a humble Nissan Leaf commuter is a real eye-opener – let alone the sheer force of a Zero SR, or Tesla Model S.

Neither of those are really designed as high performance machines, either. The Lightning LS-218 electric superbike is, and that thing accelerates fast enough to scare the hairs off the stoutest scrotum.

Top Fuel dragsters: terrifying beasts (Credit: ANDRA)

Electric is no joke. But there are still heights to be scaled before the battery is crowned king over the combustion engine on the racetrack. When the flag drops, the bullshit stops and results speak for themselves.

The Ultimate Challenge

The quarter-mile drag strip is one of the purest tests of vehicle performance, and it's still ruled by the combustion engine; specifically, the Top Fuel class. These giant, mutant, 10,000-horsepower fire-breathers suck down more than 20 gallons of nitromethane fuel over the course of a pass. Their ear-splitting, 150-decibel, open exhaust

continued next page

headers are angled upward, and they push enough gas to give the car an extra 1,100 pounds worth of downforce to help with the almost-impossible task of sticking its giant rear tires to the drag strip.

Fearsome doesn't cover these things. Within 0.8 seconds of launch, they're doing more than 100 mph, and they run a quarter mile in 4.5 seconds, hitting up to 332 mph at the finish line. That's in Australia, which is the only place that still lets them run that far. The rest of the world decided years ago that top speeds were getting out of control, and only runs them about three quarters of that distance … keeping top speeds to a much safer 328.8 mph

These are among the most extreme machines on the planet, a hair's breadth from explosive destruction at any given second, and ultimately these are the Goliaths that will need to be defeated if electric is to truly take over in the pure performance stakes.

Electric drag racing is progressing fairly well, but it's nowhere near what the Top Fuel guys are doing. According to the National Electric Drag Racing Association, the current quarter-mile record for an electric dragster is 7.274 seconds @ 185 mph, set by the Swamp Rat team in Florida three years ago. That's crazy fast to you and me, but the 2.7 seconds between that and the Top Fuel record is an ocean of time in drag racing.

In order to cover that distance and relegate combustion to the history books, electric drag racing has to take a huge leap forward – a leap that will require the biggest, baddest, highest discharge, most powerful electric powertrain ever hooked up to a set of quivering tires.

Top Fuel dragsters: only allowed to run the full quarter mile in Australia (Credit: ANDRA)

Top Fuel dragsters: these extreme machines gain huge amounts of downforce from their exhaust gas (Credit: ANDRA)

Top Fuel dragsters: fire breathing, 4.5 second quarter-mile monsters (Credit: ANDRA)

This is an excerpt of an article that continues with an interview and background of the Australian company behind these powerful machines. Read more below.

https://newatlas.com/top-ev-electric-drag-racing-top-fuel/50741/

Ensuring Battery Pack Longevity for Your New EV

By Ron Freund, CE Staff

New EV drivers are often blissfully unaware of unforeseen consequences when they embrace new technology. Recently, while speaking with new EV drivers, some described behavior which could silently introduce deterioration and risk premature failure in their vehicle. For some of us who have in the past replicated such behavior with our vehicles – the result cost us dearly, in terms of potentially shortening lifespan and later needing to pour additional money into the vehicle with a full battery replacement

This article will underscore the consequences of:

- *Deep discharge – what it means and why it's bad.*
- *Hard acceleration at deep states of discharge – those short, strong bursts.*
- *Performance testing (0-60 testing) – the conditions under which to do it.*

Before we talk about the consequences above (A modicum of techno-talk will be needed to explain them. Sorry, it's what engineers do), let's address a few facts and examine some scenarios you may have already encountered.

BACKGROUND

Driving your car at a deeply discharged state of battery means you've depleted the charge in your pack and its nominal voltage has now sagged from its starting level (which presumably was fully charged). When driving an EV (emptying a battery), watching the battery discharge voltage over time produces a curve over time that doesn't follow a straight line. It droops at different points depending on how much charge is left.

Steady driving is clearly the best to maximize driving range. When you press the "go pedal" you draw current out of this storage "vessel", but it doesn't plot linearly. Near the end of the range capability, the voltage can change rapidly. Low voltage is worse, because when requesting power to speed up, or to climb a hill – that power is the product of two important quantities, one of which goes down while the other has to climb.

The numerical value of those multiplied quantities (the value of the voltage of the pack, and the value of the current being drawn out of it) represents power which is measured in watts. It takes power to change your speed when you're already rolling along (e.g., going from 40 to 60 mph). A very powerful motor can make that change quickly. To do that, it draws current from the battery, depending on how far down you have pressed your foot on the accelerator (the 'go' pedal). But because a battery that is almost completely discharged delivers a lower voltage value – when you press hard, you are now creating a larger than normal demand for current to deliver the same amount of power from a full battery.

A good motor speed controller in the car may warn you of excessive current being drawn from the battery with a sound, a visual indication, or both. In any case – doing this at a low state of charge is painful for the battery. When done repeatedly, the battery pack will suffer in the long term. You may not notice them immediately, but the likelihood of issues later in life, down the road so to speak, loom larger.

LOCATION, LOCATION ...

Over time, all cells in the battery don't necessarily age in the same manner. The ones directly exposed to the cool surfaces may suffer less than ones in the toasty center of the pack.

Adequate cooling is essential for longevity, and OEMs are realizing that with improved designs that are being presented. For example – looking at my log book which I have kept in my car since it was new – I see that I often drove to very low states of charge (2-4%) frequently during the first 5 years. Now, at 16 years, that battery pack is showing its age, especially when being asked to perform as it once did.

At low states of charge, it can no longer deliver the power to accelerate as it once did. I also see larger than desired differences between the highest module voltage values and the lowest values. I see that the modules furthest away from the cooling inlets are deteriorating the fastest, with higher internal resistance readings. The spread between good and weak is widening.

Yes, my car still goes, just a bit less quickly. To minimize that "computerized complaining" from the Battery Management System (BMS) and concurrent "turtle" dash light from appearing, I have employed another technique.

This car has a "snow mode" switch, which when activated, limits the initial current that can be delivered to the motor. This is meant to not break wheel adhesion on the road surface, if it's too slippery. That's how to get a car out of a slippery situation, gently accelerate!

So for the past 15,000 miles, I have been driving around "full time" with this switch enabled. I still can go the distance, just not as quickly. This is the fact of life for old aged batteries. I see the voltage differences growing over

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time between the strong batteries and those sequestered ones which never got adequate cooling when accelerating.

Eventually, under heavy load, one battery module will have a cell that goes below the minimum recommended level, and the process of destruction begins. Then multiple modules begin to suffer that fate. At this point, the car will neither charge fully, nor be able to deliver needed power when requested, as a result of that "weak link in the chain".

That weak cell causes the module to discharge faster, recharge faster, and ultimately causes it to overcharge. This shuts the whole charging process down prematurely before all modules have been fully replenished. No balancing can take place, an ultimately cell reversal results and the car electronics will prevent driving or charging. A "spent" pack may only charge to 80% full and then stop there.

At this point, it's difficult to keep things going. One cannot simply replace the bad module with a new one (even if it were available) because mixing "new" with "old" doesn't work. (The "new" one operates so efficiently, it does most of the "heavy lifting" and thereby destroys itself by overworking. That, in short order, puts you back to "square one." Evaluating a candidate module for substitution is non-trivial. Sometime there is very little recourse.

Now, lets address the consequences of the bullets at the beginning of the article.

DEEP DISCHARGE

You've just taken delivery on your brand-new car and are heading out on a long road trip with a fully charged pack. You're jazzed with the anticipation of arriving at that distant destination. You've roughly mapped the course and everything is set. The trip is X miles. Your car has approximately that same stated range. What could go wrong? Slam-dunk, right?

When planning the trip, did you include compensation for elevation changes; for colder weather (denser air requires more energy to get through); for the impact of rain (less traction, meaning more energy per mile)? These details will lay the groundwork for a successful trip

Another think it is important to know is that arriving with nearly zero charge left will stress the batteries. If that's unavoidable, just don't accelerate hard when at a low state of charge (a nearly "empty tank"). The car may still deliver that giddy performance silently, but the cells will eventually misbehave if done repeatedly.

Tip: So leave a 15-20% buffer in your range; leave a bit of margin for rain, for colder than expected weather, for those hills you decided to race up, etc. Don't cut it too close, so that arrival is on the meager edge. Consider having your navigator investigate getting a boost charge along the way. Just a few extra minutes can make all the difference.

HARD ACCELERATION

Pressing the accelerator in an EV is instantly rewarded with that forward rush. A strong burst versus a steady, sustained drawdown of the battery's stored energy will do two things. It heats the batteries and when done from a standstill — will shorten the life of your tires. Full throttle accelerations are what I'm referring to.

A sharp poke of the accelerator may impress your passengers repeatedly, but battery demand is elevated too. That's being somewhat careless, considering the batteries are the most expensive part of the car to replace. If you must, try not to do this at those deeply discharged conditions, because the electronics (motor drive inverter) may not tolerate the increased current loads. (Explanation above.) Transistors are not very forgiving, and their protection electronics may not be able to save the situation.

PERFORMANCE TESTING

Why do this and when? Perhaps you have a brand-new factory fresh car and want to understand (benchmark) it's capabilities. Perhaps you're a performance fan – and want to optimize your ride in every way possible. Maybe you just want to characterize the "new" behavior for your record.

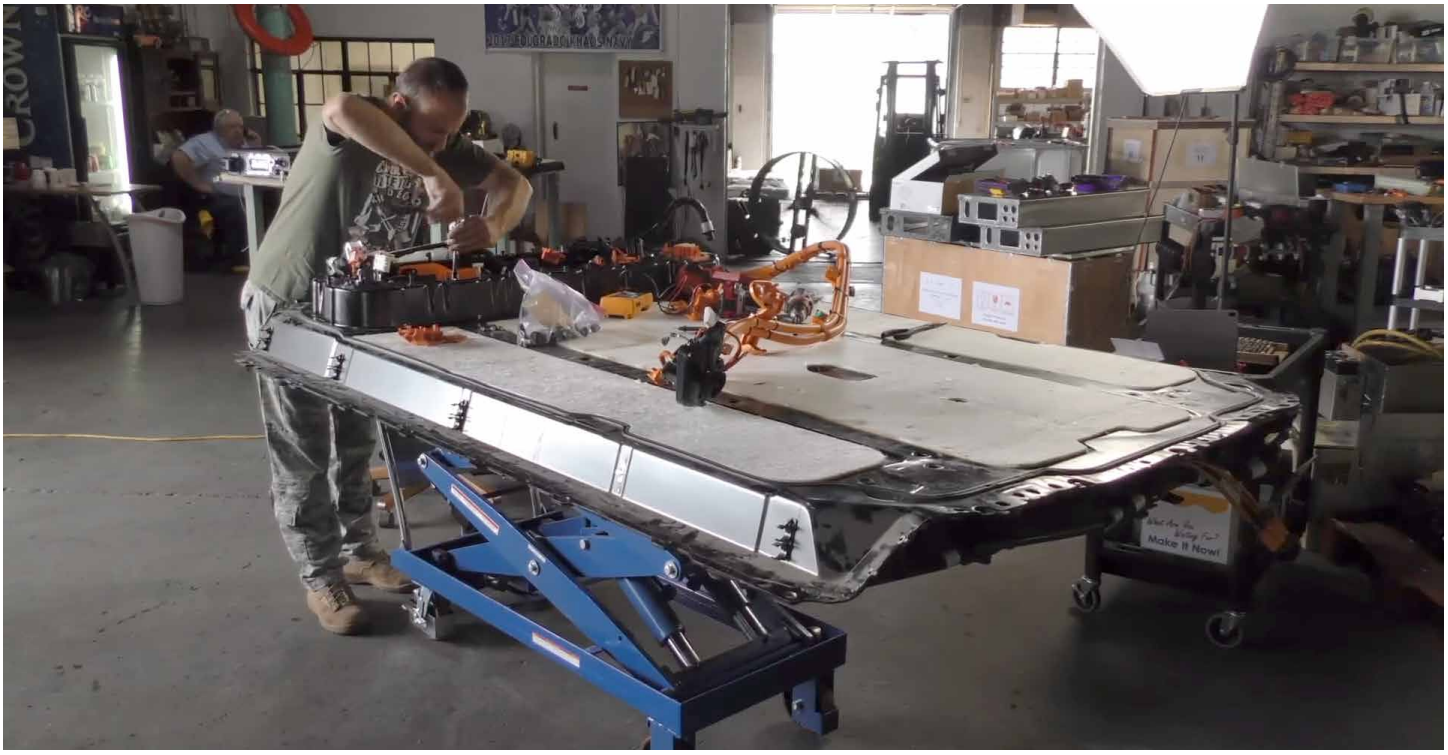
To be able to compare things fairly, conditions need to be repeatable. At a drag strip, on that private airport taxi way. (I won't suggest Main Street, after hours…) In a nut shell, always do this with a fully charged pack, and perhaps do it annually, so as to "gauge" loss of range. The loss of range can be accelerated if you repeatedly do tire-smoking burnouts, without traction control, as can loss of bank assets. YMMV.

CONCLUSION

Don't expect the same performance delivered near the end of a trip, or at low battery states of charge. Modern EV designs generally won't allow you to destroy a battery with overly deep discharges, or excessively high current requests when near the end of your range. But if you built your own EV, chances are very good that you either skipped adding a BMS or felt there was little justification for the expense and complexity involved.

Today's OEM EVs are generally well built and can tolerate a fair amount of abuse. Ask yourself: is maximizing your battery life more important than making it to the next traffic light faster than the guy next to you in his ICE? Tough questions. Just remember that everything has consequences and costs as you enjoy your EV!

What Makes The Tesla Model 3 Battery Pack So Light? (The first of two articles)



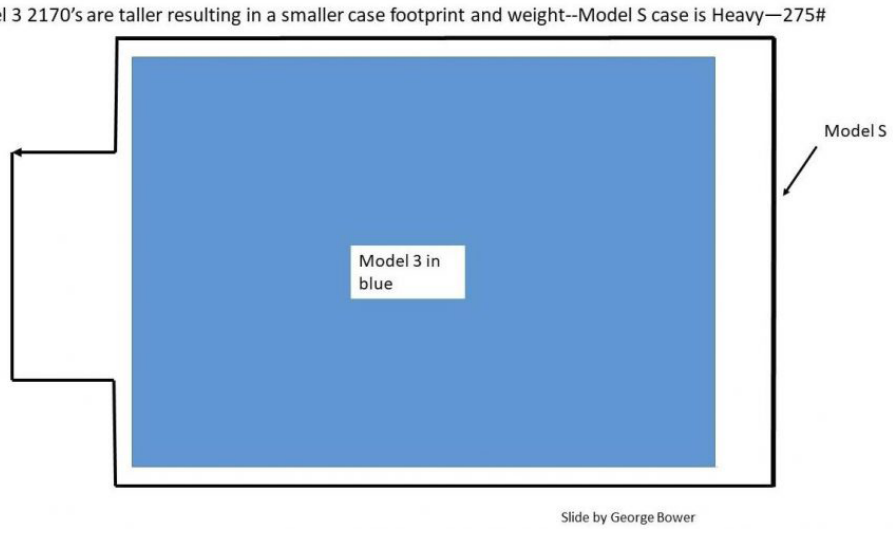
By George Bower, InsideEVs

It's not just the new 2170 cells. Major changes to the battery pack structure have been made as well.

The Tesla Model 3 pack weight (lb/kWh) is 15% lighter than the original Model S 85 kWh battery and

6% lighter than Tesla's most advanced battery in the P100D.*

Of course, the new 2170 cells are a big part of the weight savings. Musk divulged that Tesla has quietly increased the nickel content of their cells which should decrease the weight of the pack.



Also, the new 2170's result in a smaller pack footprint because the cells are taller and this lowers the pack footprint and therefore the weight of the pack case. According to Jason Hughes, the Model S battery case is a whopping 275 lbs, which is over 20% of the pack weight so reducing the protective case weight is a big deal.

See: Tesla Panasonic Quietly Outmaneuver All Lithium Battery Manufacturers
https://insideevs.com/tesla-panasonic-quietly-outmaneuvers-all-lithium-battery-manufacturers/

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Major changes have been made to the Model 3 pack structure. These changes were revealed in an EVTV video we shared at Inside Evs. (Click on the url below)

See: Watch As Tesla Model 3 Battery Is Removed And Disassembled
https://insideevs.com/watch-as-tesla-model-3-battery-is-removed-and-disassembled/

In this video, Jack Rickard spent over an hour disassembling the Model 3 pack. Lots of interesting things about the pack were discussed: some fairly common knowledge and some not.

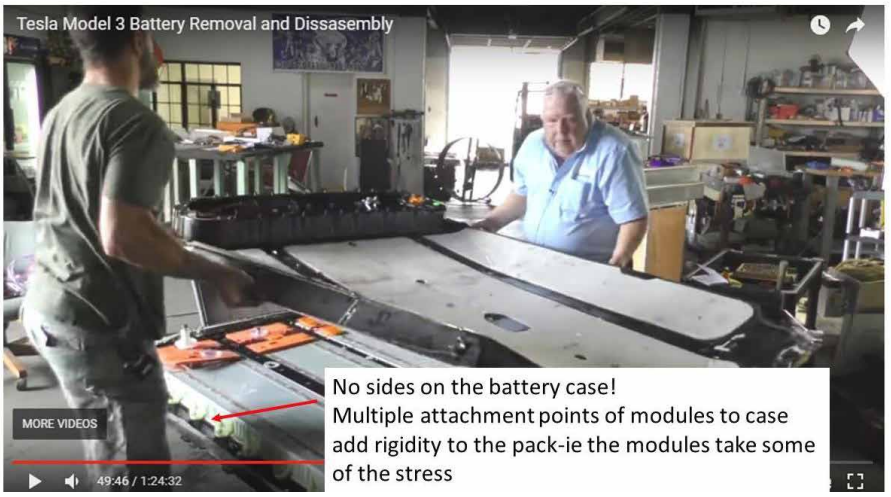
Tesla has now consolidated all the power electronics into the pack itself. The AC charger and the DC-DC converter are now integral with the pack. In model S, these units were scattered about the car. Total wiring length has been drastically reduced, and here's another interesting tidbit: Tesla has combined both the AC charger AND the DC-DC converter into one smaller and lighter unit (39:25 into the video).

All well and good but the structural changes were a bit more subtle and were not revealed until Jack removed the battery pack lid.

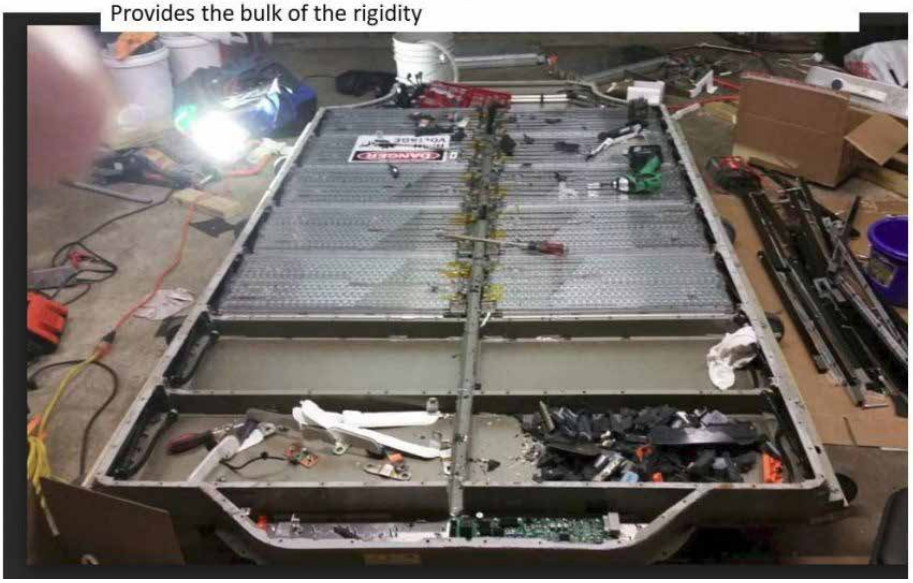
You can see in the screenshot that the lid is flexible and would offer little crash protection for the pack. Now the surprise. There are no sides on the battery pack. Other than the flimsy pack cover, the battery modules are completely exposed. That is totally opposite the Model S and Model X pack. In Model S, the battery case is thick and heavy to protect the cells and to provide rigidity to the car. The case in model S is solid metal ¼" thick. (See above photo on the right).

The lack of sides is shown again in the screenshot at the bottom right.

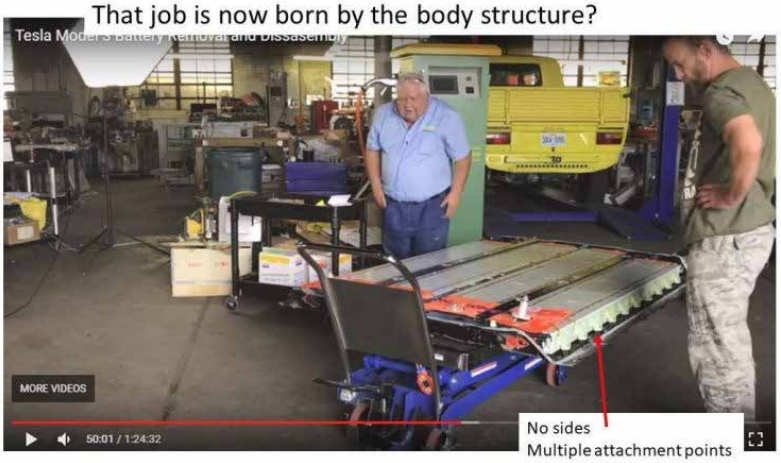
f2 Model 3-light and flexible battery cover removed exposing the battery case without sides



f3 Model S has a beefy 275# case that protects the sides of the modules and Provides the bulk of the rigidity



f4 Model 3 Battery case has no sides to protect the battery from side impact That job is now born by the body structure?



continued on page 28

Battery Pack

continued from page 27

Also, notice the multiple attachment points of the modules to the case bottom. The modules themselves are adding rigidity to the pack as well. (This is the bottom photo on the previous page.)

What do we conclude from the fact that there are no sides to the pack? Has Tesla moved crash protection from the battery case to the body structure?

Consider the following figures from Tesla's emergency response guide.

In the Model S, the heavy battery case provides the crash protection for the battery with minimal high strength steel. (Above right).

Has Tesla transferred case structure weight and battery protection from the battery case (Model S) to the body? This makes total sense because Tesla has to transport completed battery packs from the Gigafactory in Nevada to the assembly plant in Fremont. There's less weight to haul.

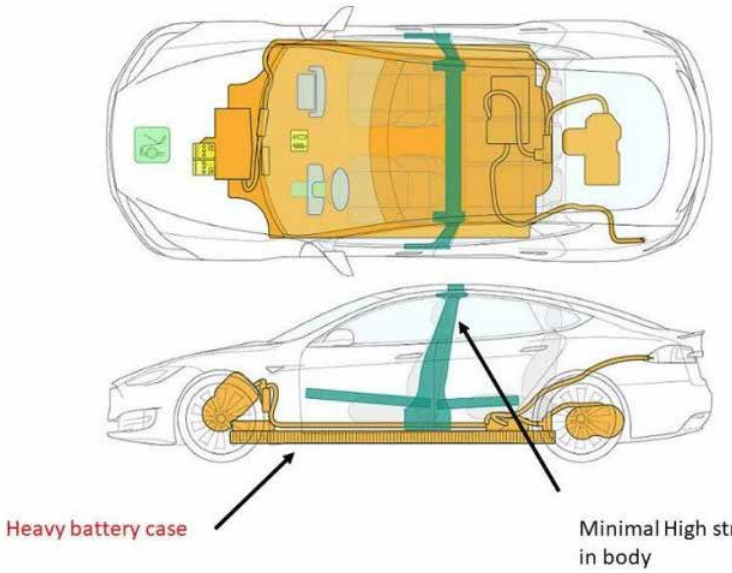
Makes sense to us.

What do you think? Maybe the flammability issues with Tesla's battery have been dealt with in another way? Perhaps the intumescent goo been resurrected? Let us know in the comment section.

*P100D and Model S85 pack weights adjusted upwards to include AC charger and DC-DC converter since M3 pack weight includes those items.

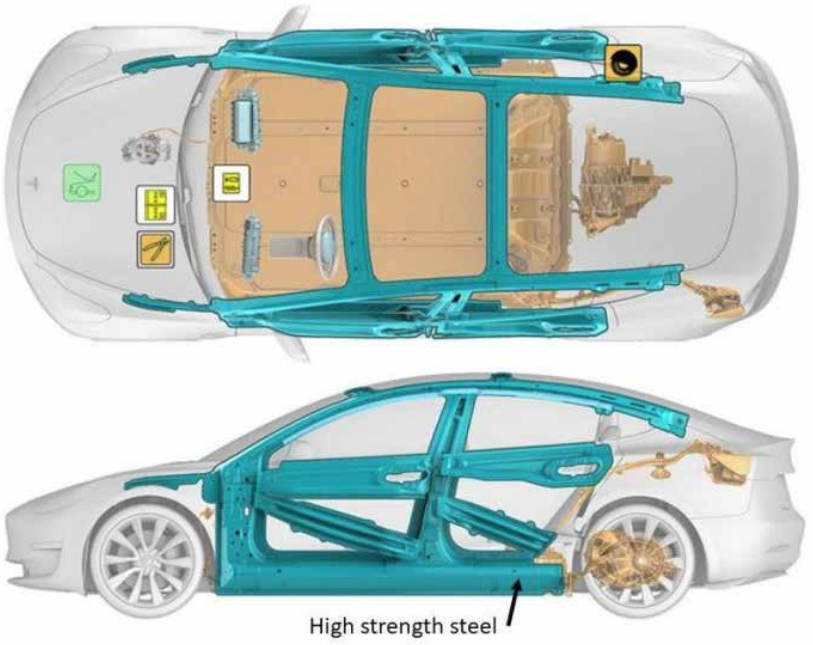
In Model S- The battery case protects the battery from impact

Photo courtesy
Tesla emergency response guide



Now check out Model 3 below. Lots of high strength steel around the pack.

In Model 3 High strength steel in the body protects the pack from impact



The second article begins on the next page (page 29).

https://insideevs.com/what-makes-the-tesla-model-3-battery-pack-so-light/

New Tesla Model 3 Battery Details, Images & Video Released

It's the most energy dense pack in the industry. We do the math to confirm.

By George Bower

"All the technology in the Model 3 is very next generation with nothing familiar from Model S in any way shape or form. I haven't seen anything even vaguely Model S or Model X in this vehicle. Nothing. No DNA found. The improvement is not at all incremental. It's like from another planet."

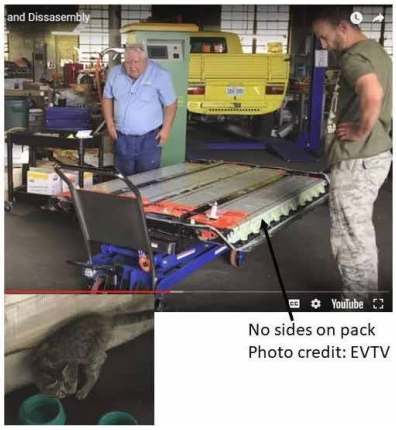
– Jack Rickard

1. Photos and video of the underside of Model 3 showing beefy structure surrounding the pack.

In the article on the previous page *https://insideevs.com/what-makes-the-tesla-model-3-battery-pack-so-light/* it was noted that the model 3 battery pack was 15% lighter than the old P85 Model S pack and 6% lighter than Tesla's most advanced pack in the P100D.

We based our theory on the fact that the Model 3 battery case has no protective sides and that the battery case is surrounded by high strength steel

f1



No sides on pack
Photo credit: EVTV

High strength steel surrounds the pack

In that article, and based on EVTV's teardown video we speculated that Tesla has saved weight in the battery pack by moving the battery protection duties from the battery case to the body structure. This was partly conjecture just because there are no protective sides on the Model 3 pack (unlike Model S) and also because Tesla appears to have surrounded the Model 3 pack in high strength steel used in the body ... in other words letting the body serve a dual purpose.

continued on page 30

Battery Details

continued from page 29

Photos from EVTV support the theory that the body structure now provides side impact battery protection.

Substantial box beam in body next to battery case

Additional steel body structure outside box beam

Titanium foreign object deflector used in Model S is gone.

The photos of the box beam and additional steel structure that surrounds the Model 3 pack are shown right.

Steel Box Beam Protects Model 3 battery from side collision

Bottom view of steel box beam and additional structure protecting battery from side collision

2. Weight and Energy density

Jack measured the module weight and the battery case weight and the dimensions. Note that the Model 3 case (tray) weight is significantly lighter than Model S.

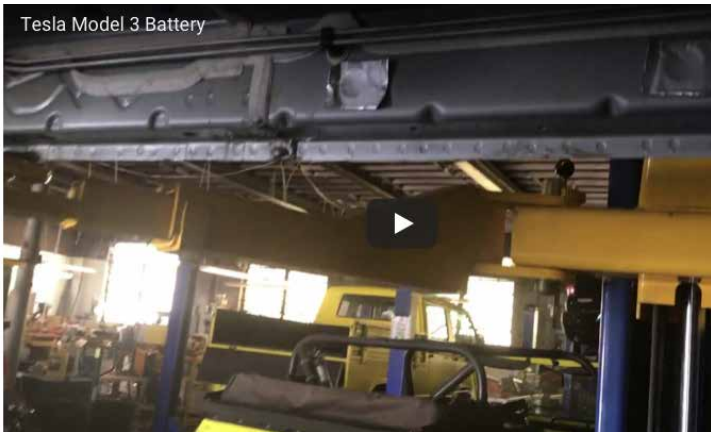
Tesla Model 3 LR Module Weight and dimensions plus Battery case weight data

Credit: EVTV, Jack Rickard

Module Config	Module Wt Lbs	Module Dimensions LXWXH, inches
46P25S	207	73X11.5X3.5
46P23S	191	67.5X11.5X3.5

Battery case base plate weight 135 lbs (versus 275# for Model S)
Battery case base plate dimensions=84.5X58 inches

We took it upon ourselves to calculate the energy density in both wh/kg and lbs/kwh. As Elon said, the cells used in the Model 3 are highest energy density cells used in any electric vehicle. This is the kind of energy density other manufacturers are promising in 2020 time frame and Tesla already has it in production today.



... and a video clip of the underside of the Model 3

continued on next page

Model 3, P100D, BoltEV Module weight and energy density summary compared

"Cells used in Model 3 are the highest energy density cells used in any electric vehicle."

-Elon Musk

	Model 3	P100D	BoltEV
Weight, lb/kwh	9.87	10.3	11.3
Energy density, wh/kg	222	214	195
Delta % wt	base	+4.4%	+14%

Slide by George Bower based on weights by EVTV

If you wish to look at the detailed calculations, they are shown below.

f8 Model 3 Module vs P100D Module energy density calculation

	P100D	Model 3	BoltEV
Module wt, lb	66 (Jason Hughes)	207 (EVTV-Jack Rickard)	69 (John Kelley)
Module energy, nom kwh	6.40 (102.4/16)	20.96 (80.5 kwh ratio'd by cell count)	6.25 (60 kwh ratio'd by cell count)
Module wt, lb/kwh	10.3	9.87	11.3 (69+2)/6.25
Module energy density, Wh/kg	214	222 wh/kg	195 wh/kg
#Cells in pack		4416	288
# cells in module		1150	30

Notes: nominal (not usable) pack energy for model 3 pack=80.5 kwh (Tesla/EPA doc)
Usable pack energy for model 3 pack = 78.3 kwh (Tesla/EPA doc)
Nominal pack kwh for P100D pack=102.4 kwh (Jason Hughes)
Module weight for P100D= 66# (Jason Hughes)
BoltEV module weight and energy density based on "GM Versus Tesla: Bolt EV And Model 3 Battery Packs Compared" And " Jaguar and Chevy have LG in common." Electricrevs JeffN
BoltEV module wt adjusted up by 2 lbs to account for cooling plate

Slide by George Bower

"This battery is glued together like no one would believe." Munroe and Associates

Sil gel

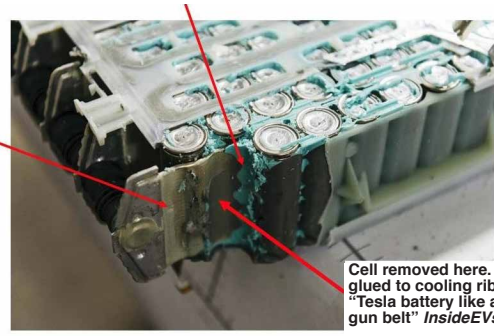
Photo courtesy Munroe and Associates

3. The whole module is held together with "sil gel"

The whole pack appears to be filled with some sort of "sil gel" (term used by Munroe and associates) and not designed to be taken apart. Model S modules were not designed to be taken apart either. They were held together with a clear epoxy at the top and bottom of the cells but the epoxy did not permeate the whole pack as it does in Model 3. The color of the sil gel is different as well. The sil gel in model 3 is a greenish blue color while the sil gel in Model S is clear. We don't know if this is an "intumescent flame retardant" or not. Jack suspects it is but we have no word from Tesla on it and no data as to the substance's properties to verify.

Is this intumenscent flame retardant??

Cooling ribbon



Cell removed here. Cells glued to cooling ribbon. See "Tesla battery like a machine gun belt" *InsideEVs*

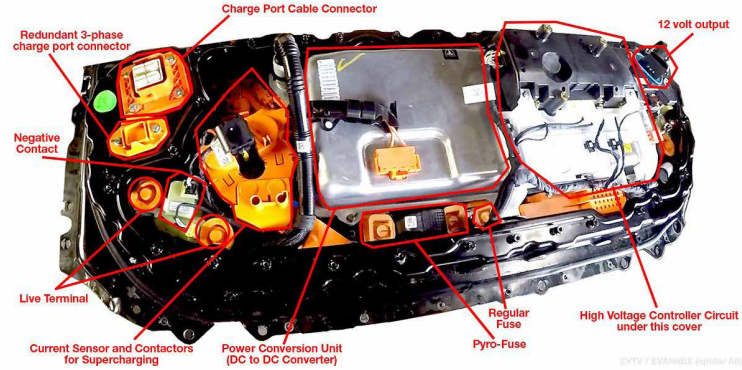
Photo courtesy Munroe and Associates

Maybe the intumescent goo has been resurrected and is providing additional fire protection above and beyond the structure?

Be sure to check this article carefully for other details and watch the videos that are included..
https://insideevs.com/new-tesla-model-3-battery-details-images-released/

Battery Expert: Tesla Model 3 Has 'Most Advanced Large Scale Lithium Battery Ever Produced' [Video]

After reading the two previous articles, go to the url below for one more perspective of Jack Rickard's research and how the Model 3 is actually assembled.

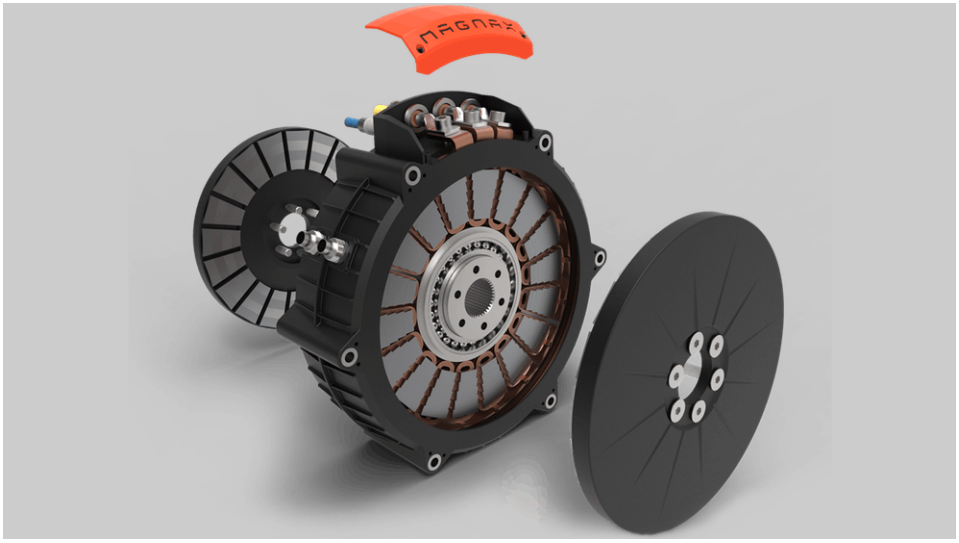


https://evannex.com/blogs/news/tesla-s-battery-pack-is-both-mysterious-and-alluring-work-in-progress

Magnax Prepares to Manufacture Radically High-Powered, Compact Axial Flux Electric Motor

By Loz Blain

After nearly a decade in development, Belgian startup Magnax claims it has developed an ultra-high power, lightweight, compact axial flux electric motor with performance figures that blow away everything in the conventional radial flux world. Crucially, it says it's worked out how to manufacture them too.

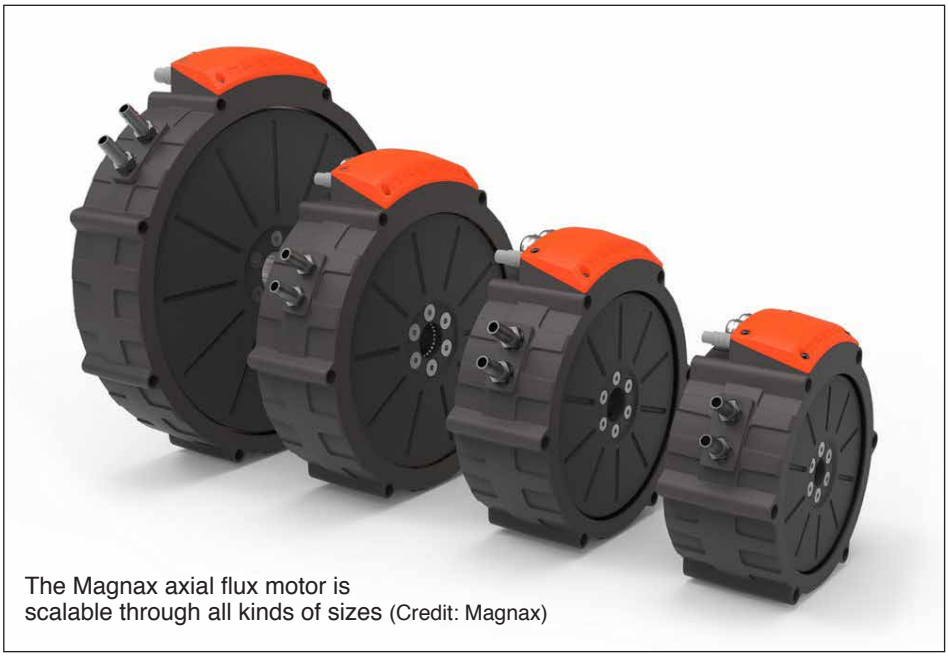


The Magnax yokeless axial-flux electric motor offers incredible power densities in what the manufacturer describes as a reliable, manufacturable and low-maintenance package (Credit: Magnax)

It might not have the romance of combustion engine tuning, but it seems a bit of a battle is brewing to develop the kinds of high-performance motors that will power the electric cars, motorcycles, aircraft and industrial equipment of the future.

A week ago we wrote about Equipmake's spoke motor design, which allows it to pump out some 9 kilowatts per kilogram with exceptional cooling and continuous power production ability.

To put that kind of power production in perspective, the ludicrously fast 193-horsepower BMW S1000RR superbike of 2011 – a power-to-weight beast that would slay just about anything in the automotive world – has a lightweight motor that makes a puny 2.4 kilowatts per kilogram. So 9 kW/kg is no joke.



The Magnax axial flux motor is scalable through all kinds of sizes (Credit: Magnax)

Which makes this axial flux, direct drive motor from Belgian company Magnax a real eyebrow-raiser. Magnax claims it makes a peak power no less than 15 kW/kg, with the ability to produce sustained power at around 7.5 kW/kg. To bring that back to the motorcycle example, if you built a Magnax motor that weighed as much as the BMW superbike's engine, you'd have yourself a 603-horse powertrain that could produce bursts of up to 1206 horsepower for short periods before overheating and needing to take it easy for a bit.

Obviously, that's a silly example, but these kinds of ultra-lightweight motors could do significant work towards offsetting the large weight figures of today's heavy lithium battery packs in

continued next page

electric vehicles. And until automotive-grade battery density takes a significant leap forward as it's been promising to for several years now, weight will continue to be a serious issue for e-mobility.

Benefits and drawbacks of Axial Flux Designs

While the vast majority of electric motors currently in circulation are radial flux designs, Magnax claims the key to the high power density it's achieving is the direct drive axial flux design used in all its motors, which uses a stator disc sandwiched between two rotor discs with small air gaps in between. Yokeless axial flux motors, the company claims, have a number of advantages if implemented properly. The flux path is shorter, and the magnets further away from the axis, leading to greater efficiency and leverage around the central axis.

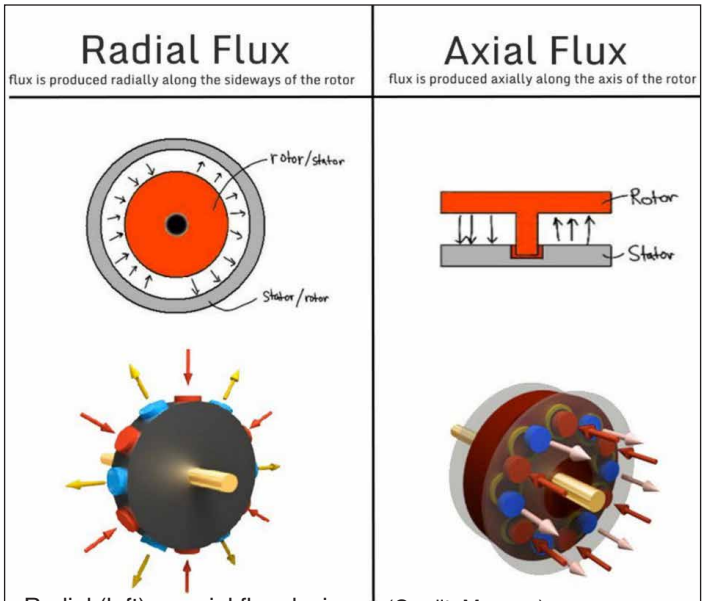
What's more, the axial flux design allows Magnax to waste very little copper on overhanging loops on the windings. Magnax's motors have zero overhang; 100 percent of the windings are active, where the company claims radial flux motors can sometimes have up to 50 percent of their copper inactive, adding extra resistance and causing heat build-up. Magnax uses a rectangular-section copper wire in its windings to give the highest possible density. And the motors are much thinner than radial flux machines, meaning that you can stack them easily to work in parallel.

There are, of course, difficulties when it comes to building axial flux motors – otherwise everyone would be making them. Powerful magnetic forces acting between the rotor and stator discs tend to make it very difficult to keep the air gap between them uniform. If they start to wobble or bend, the discs can start rubbing against one another, leading to bearing damage at best, and rapid, spectacular unscheduled disassembly at worst.

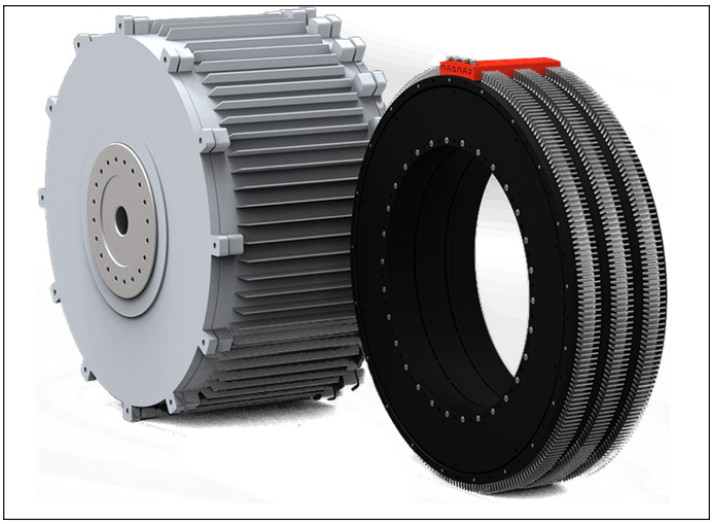
Magnax claims it addresses this in its yokeless axial flux design by having two rotor discs that constantly put equal and opposing forces onto the stator disc. The rotors are connected directly to one another via a shaft ring, so the magnetic forces cancel each other out, and the internal bearing doesn't have to deal with them.

Cooling is key with any high powered electric motor that's expected to do consistent work, and axial flux designs tend to suffer in this regard, since their stator windings are sandwiched between the rotor discs, making it hard to get

continued on page 34



Radial (left) vs axial flux designs (Credit: Magnax)



Size advantage: on the left, a standard 300-kilowatt radial flux direct drive generator. On the right, three stacked 100-kilowatt Magnax motors offering superior efficiency (Credit: Magnax)

Lightweight and compact, the Magnax motor should be terrific in electric motorcycles where weight is paramount (Credit: Magnax)

Magnax Motor

continued from page 33

heat out. Magnax claims its motor designs cool well, as the windings are in direct contact with the outer aluminum casing, allowing decent heat transfer.

It seems to be working. Continuous power figures for the Magnax motor come out at 50 percent of what it can make at its peak, which is pretty decent but not in the realm of the best-cooled radial flux motors. The Equipmake motor, for example, can continuously make nearly 70 percent of its peak power, suggesting superior cooling.

One further challenge comes with manufacturing, as the stator discs can be particularly hard to get right, and even harder to build in an automated high volume process. So when they do get built, they're hand-made and highly expensive as a result. Magnax claims to have cracked this problem too, with a number of "proprietary solutions" that allow it to scale and build these things cost-effectively.

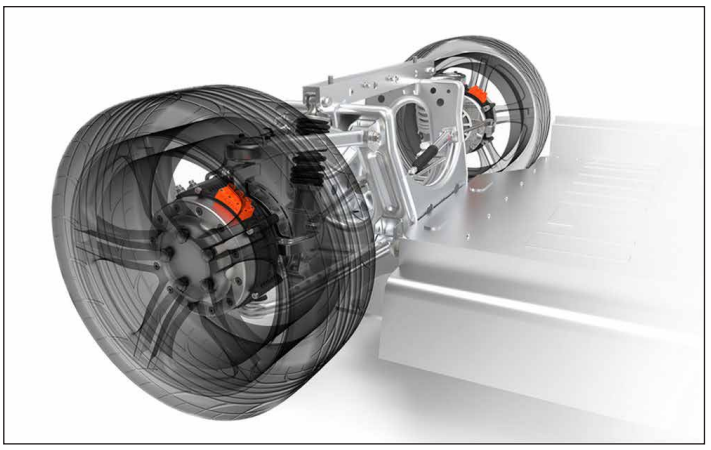
Applications

The Magnax motor is highly scalable, ranging in size from 15 centimetres (~6 inches) right up to discs 5.4 metres (~13 feet) in diameter and beyond. They can be slotted in next to one another to run in parallel, and they can run either as direct drive or through a gearbox if you're willing to accept the efficiency losses involved.

Magnax is pitching them at electric cars and motorcycles, aircraft rotors, and as large-diameter, high torque, low RPM solutions for wind power, hydroelectric and wave power generation.

At the end of the day, field testing in the automotive and industrial worlds will be the proof of this pudding, but if this is truly a high-power, long-life, well-cooled, high-efficiency, low-maintenance axial flux motor, Magnax could be poised to make some serious waves.

The company has spent some nine years getting its tech together after a proof of concept was originally built at the University of Ghent in 2009. Now, it claims to have working prototypes and a manufacturing methodology sorted out. With a bit of luck, the rubber will hit the road soon and we can see if this truly is the electric motor of the future.
Click on the url below to see other photos and videos.



Because of these motors' extreme light weight, high power and thin profile, they're ideal for direct drive hub motor applications (Credit: Magnax)

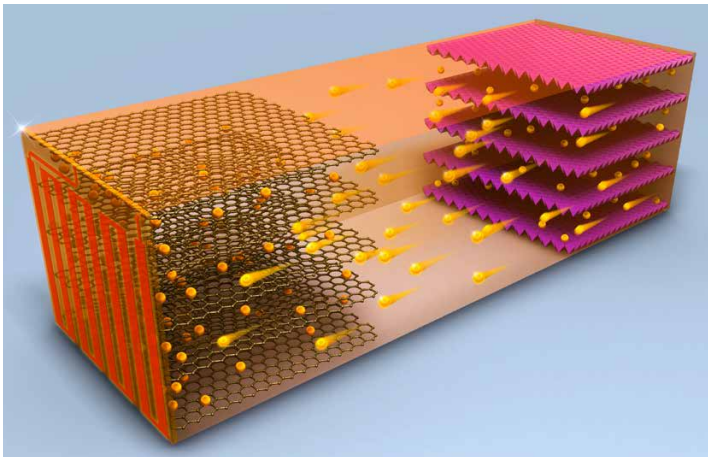
Large diameter, high torque, low RPM versions can be manufactured up to 5.4 meters in diameter and beyond (Credit: Magnax)

Large industrial-sized prototype on the test bench (Credit: Magnax)

https://newatlas.com/magnax-axial-flux-electric-motor/54821/

Self-heating, Fast-charging Battery Makes Electric Vehicles Climate-immune

Californians do not purchase electric vehicles because they are cool, they buy EVs because they live in a warm climate. Conventional lithium-ion batteries cannot be rapidly charged at temperatures below 50 degrees Fahrenheit, but now a team of Penn State engineers has created a battery that can self-heat, allowing rapid charging regardless of the outside chill.



"Electric vehicles are popular on the west coast because the weather is conducive," said Xiao-Guang Yang, assistant research professor in mechanical engineering, Penn State. "Once you move them to the east coast or Canada, then there is a tremendous issue. We demonstrated that the batteries can be rapidly charged independently of outside temperature."

When owners can recharge car batteries in 15 minutes at a charging station, electric vehicle refueling becomes nearly equivalent to gasoline refueling in the time it takes. Assuming that charging stations are liberally placed, drivers can lose their "range anxiety" and drive long distances without worries.

Previously, the researchers developed a battery that could self-heat to avoid below-freezing power drain. Now, the same principle is being applied to batteries to allow 15-minute rapid charging at all temperatures, even as low as minus 45° F.

The self-heating battery uses a thin nickel foil with one end attached to the negative terminal and the other extending outside the cell to create a third terminal. A temperature sensor attached to a switch causes electrons to flow through the nickel foil to complete the circuit when the temperature is below room temperature. This rapidly heats up the nickel foil through resistance heating and warms the inside of the battery. Once the battery's internal temperature is above room temperature, the switch turns opens and the electric current flows into the battery to rapidly charge it.

"One unique feature of our cell is that it will do the heating and then switch to charging automatically," said Chao-Yang Wang, William E. Diefenderfer, Chair of mechanical engineering, professor of chemical engineering and professor of materials science and engineering, and director of the Electrochemical Engine Center. "Also, the stations already out there do not have to be changed. Control off heating and charging is within the battery, not the chargers."

The researchers report the results of their prototype testing in this week's edition of the Proceedings of the National Academy of Sciences. They found that their self-heating battery could withstand 4,500 cycles of 15-minute charging at 32° F with only a 20-percent capacity loss. This provides approximately 280,000 miles of driving and a lifetime of 12.5 years, longer than most warranties.

A conventional battery tested under the same conditions lost 20-percent capacity in 50 charging cycles.

Lithium-ion batteries degrade when rapidly charged under 50 degrees F because, rather than the lithium ions smoothly integrating with the carbon anodes, the lithium deposits in spikes on the anode surface. This lithium plating reduces cell capacity, but also can cause electrical spikes and unsafe battery conditions. Currently, long, slow charging is the only way to avoid lithium plating under 50° F.

Batteries heated above the lithium plating threshold, whether by ambient temperature or by internal heating, will not exhibit lithium plating and will not lose capacity.

"This ubiquitous fast-charging method will also allow manufacturers to use smaller batteries that are lighter and also safer in a vehicle," said Wang.

https://techxplore.com/news/2018-06-self-heating-fast-charging-battery-electric-vehicles.html?utm_source=nwletter&utm_medium=email&utm_campaign=daily-nwletter

Keep Up on all Auto Shows & EV Related Conferences

US and International Events

PEBBLE BEACH CONCOURS D'ELEGANCE, CARMEL, CA
08/26/18 - 08/27/18

HANNOVER, GERMANY
NEW MOBILITY WORLD
9/20/2018 - 9/27/2018

HYDROGEN + FUEL CELLS NORTH AMERICA, ANAHEIM, CA USA
09/24/2018 - 09/27/2018

EEVCONVENTION, OSLO, NORWAY
9/25/2018

EVS 31 & EVTEC 2018
KOBE CONVENTION CENTER JAPAN
9/30/2018 - 10/3/2018

ANAHEIM, CA - ORANGE COUNTY AUTO SHOW 10/4/2018 - 10/7/2018

MUNICH, GERMANY
EMOVE 360° EUROPE 2018
10/16/2018 - 10/18/2018

SACRAMENTO INTERNATIONAL AUTO SHOW 10/19/18 - 10/21/18

ALBANY, NY AUTO SHOW
11/02/18 - 11/04/18

CONNECTICUT INTERNATIONAL AUTO SHOW 11/16/18 - 11/18/18

SAN FRANCISCO INTERNATIONAL AUTO SHOW 11/21/18 - 11/25/18

PHOENIX, AZ AUTO SHOW
THANKSGIVING WEEKEND 11-22-25

LOS ANGELES AUTO SHOW
11/30/18 - 12/09/18

SAN DIEGO INTERNATIONAL AUTO SHOW 12/27/18 - 12/30/18

NEW ENGLAND INTERNATIONAL AUTO SHOW 01/17/19 - 01/21/19

PENNSYLVANIA AUTO SHOW
01/24/19 - 01/27/19

PHILADELPHIA INTERNATIONAL AUTO SHOW 02/02/19 - 02/10/19

MOTOR TREND INTERNATIONAL AUTO SHOW - BALTIMORE
02/07/19 - 02/10/19

NORTHEAST INTERNATIONAL AUTO SHOW 02/08/19 - 02/10/19

PITTSBURGH INTERNATIONAL AUTO SHOW 02/15/19 - 02/18/19

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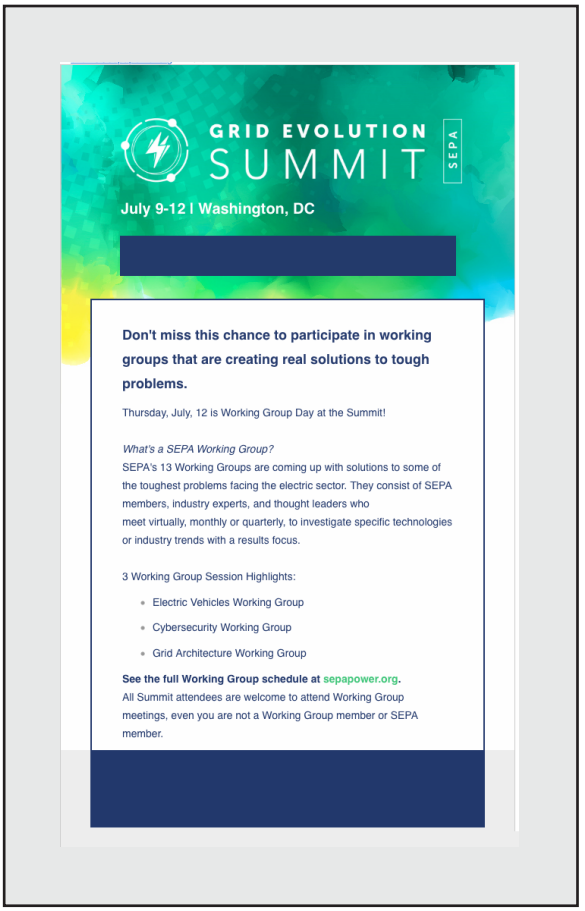
Save the Date...

EVS 31 & EVTeC 2018

The 31st International Electric Vehicle Symposium & Exhibition & International Electric Vehicle Technology Conference 2018

http://www.evs31.org



https://sepapower.org/event-complex/grid-evolution-summit-national-town-meeting/

Don't Miss These...

From time to time there are articles and videos we would like to bring to your attention but are not able to reproduce in this newsletter. The Electric Vehicle is continuing to be newsworthy on many different levels so when we find interesting items we will share them with you.

Videos & Articles of Interest

Volkswagen I.D. R Pikes Peak – record run, helicopter footage

Volkswagon really has shown the world that they are serious about full electrification of their products with this years victory in Colorado. The 2018 run of the PPIHC, with it's 156 turns ending up at 14,110 ft ASL! They set a new overall record for the first time in the event's history. Frenchman Romain Dumas completed the course with a time of 7:57.148.
https://www.youtube.com/watch?v=CwZbvPY_4aE&feature=youtu.be

Skeleton Ultra Capacitors | Fully Charged

Skeleton Technologies in Tallinn, Estonia (a former Russian republic) makes curved graphene-based ultra capacitors used in heavy electric transit buses. This video underscores the capability (and limitation) of capacitors versus batteries in future EVs. A good discussion ensues, and alludes to a future combination of the two when this technology advances to the point where the volumetric size constraints fade away. Images of their fabrication facility are also included, with limitations outlined in the dialog thereafter.

At one point they capture the discharge of 100 kilowatts of power into a heavy wire load. The video shows the large parallel cables lying in place and suddenly thrust apart by the electro-motive force creating a strong field during the discharge. (Robert ends with four minutes of some of their history and rapid maturation since 1991. The country today hosts the fastest broadband access of anyplace in the world, and is proud home of the creation of Skype!)
https://youtu.be/KQ2Eo6wl5r0?t=1

What's inside a Tesla Key?

Have you seen those novel key fob's that Tesla Model S and X owners have? Ever wonder what's inside? Here is an expose, done by a father and son team. Cue it up to around 6:30 for a screen shot of the guts, the printed circuit board exposed. You may need to advance it back and forth to find a clear view.
https://www.youtube.com/watch?v=gwtZ5XQMb00

Videos & Articles of Interest (cont.)

General Motors, Honda & Others Sign U.S. Electrification Accord

By Domenick Yoney

One finger can not lift a pebble.

"The future is electric" is a great catchphrase, and a small but growing number have been working at making it a reality for the past couple of decades. Over the years, arguments against changing transportation from being dependent on burning fossil fuels to a more sustainable system have raised a number of issues which would need to be worked out: a strengthening of the grid and ubiquitous charging facilities, are two examples. Now, a number of companies have all signed up to an agreement to work on these and other issues.

Called the "Transportation Electrification Accord," it calls for organizations across various industries to work together toward a common goal. So far, the two biggest vehicle manufacturers involved are Honda and General Motors, but others such as BYD, Proterra, and Zero Motorcycles have also signed on. Utilities are represented by PG&E, Commonwealth Edison, and National Grid, to name a few. Environmental groups and advocacy organizations, including Plug In America, the Sierra Club, and the Union of Concerned Scientists are also onboard.

The effort enumerates its guiding principles on its website, theevaccord.com, and invites other organizations to join the syndicate (sorry, it's not open to individuals). Reading through the list of aims, there is an emphasis on developing charging infrastructure. It's not just about installing charging points, of course, but also developing an intelligent support system behind it, and encouraging open standards to speed adoption.

2018 Honda Clarity Electric

To that last point, it's interesting to note that one EV pioneering automaker guided by the same " to accelerate the advent of sustainable transport" aim is not as yet involved (yes, we're talking Tesla). Though it is a leader in building a charging infrastructure for its customers, it has insisted on using its own charging standard in North America, at least, while inviting, fruitlessly, other OEMs to join it.

Read the complete context and guiding principles of the Electrification Accord at the url below:
https://insideevs.com/gm-honda-sign-electrification-accord/

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Electric Auto Association is a 501 3(c) non-profit organization.

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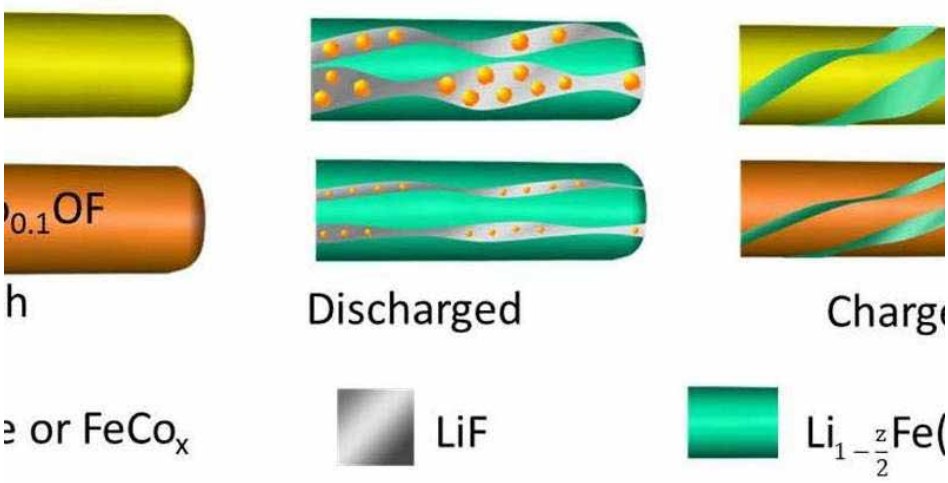
Don't Miss These (cont.)

Tripling the Energy Storage of Lithium-ion Batteries

As the demand for smartphones, electric vehicles, and renewable energy continues to rise, scientists are searching for ways to improve lithium-ion batteries—the most common type of battery found in home electronics and a promising solution for grid-scale energy storage. Increasing the energy density of lithium-ion batteries could facilitate the development of advanced technologies with long-lasting batteries, as well as the widespread use of wind and solar energy. Now, researchers have made significant progress toward achieving that goal.



Substituting the cathode material with oxygen and cobalt prevents lithium from breaking chemical bonds and preserves the material's structure. Credit: Brookhaven National Laboratory

A collaboration led by scientists at the University of Maryland (UMD), the U.S. Department of Energy's (DOE) Brookhaven National Laboratory, and the U.S. Army Research Lab have developed and studied a new cathode material that could triple the energy density of lithium-ion battery electrodes. Their research was published on June 13 in Nature Communications.

"Lithium-ion batteries consist of an anode and a cathode," said Xiulin Fan, a scientist at UMD and one of the lead authors of the paper. "Compared to the large capacity of the commercial graphite anodes used in lithium-ion batteries, the capacity of the cathodes is far more limited. Cathode materials are always the bottleneck for further improving the energy density of lithium-ion batteries."

Scientists at UMD synthesized a new cathode material, a modified and engineered form of iron trifluoride (FeF3), which is composed of cost-effective and environmentally benign elements — iron and fluorine. Researchers have been interested in using chemical compounds like FeF3 in lithium-ion batteries because they offer inherently higher capacities than traditional cathode materials.

Read the rest of the article at:
https://techxplore.com/news/2018-06-tripling-energy-storage-lithium-ion-batteries.html

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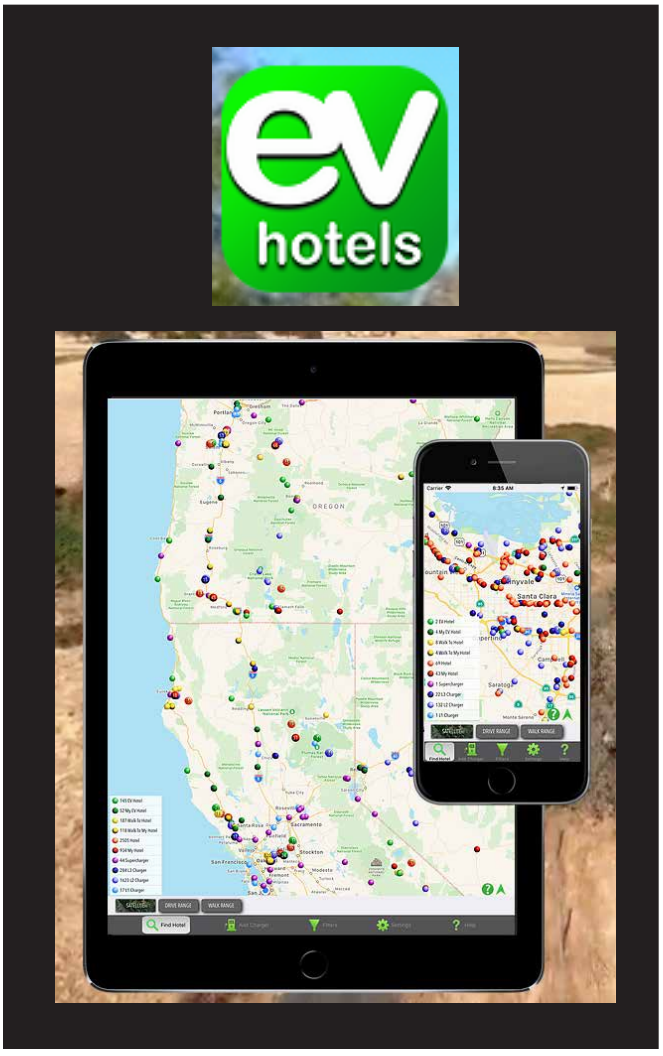
iPhone EV Apps

Two iPhone (only) apps that are of interest. Download from the App Store for iOS devices.

The TezLab App is a companion app for EVs. You can track every trip you take, compete against your friends on various metrics like distance traveled or efficiency. Control your car's climate, maximum charge level, etc. It's the app your EV deserves.
https://tezlabapp.com



The EV Hotels.org App allows you to find and reserve hotels with EV Charging facilities. Considered practical for real life EV drivers and those on tour. Several convenient filters allow fast map searching and identification of "EV Hotels."
https://www.evhotels.org

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