

Electric Auto Association



Current **EV**ents

April 2019 Promoting the use of electric vehicles since 1967 Vol. 5 | No. 4

TAYCAN DEBUT



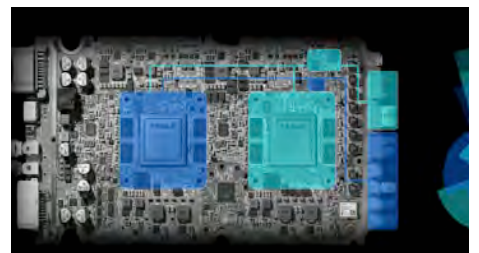
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Current Events Back Issues

The EAA has put most of its issues from 2001 to 2019 on its website.

Please visit

<http://electricauto.org/> and from the home page, click on "Documents" in the top navigation bar. You will see the document library. Click on that to reveal 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.

Welcome Wasatch!

Electric Auto Association launches Wasatch Electric Vehicle Association (WEVA) Chapter

Did you know?

That pollution in the Salt Lake Basin often reaches dangerous levels of PM 2.5, especially during January and August, causing serious public health problems. Recently, inversions are more common and residents would like to take action to clean them up. Salt Lake's morning news often asks mothers to keep children inside during these days. Concern for public health has spurred a very active group of physicians who have banded together in a non-profit, Utah Physicians for a Healthy Environment. [www.uphe.org]

At Electric Auto we know we have a big part of the answer. Clean-fueled transportation. If only public awareness and education about electric vehicles were even more widespread.

EAA's Board of Directors is committed to increasing our numbers of chapters in several states. Utah is one of them. Our goal is 5 chapters this year. We will intensify our efforts in the large population areas of **Los Angeles County and the New York/New Jersey/Connecticut Metro areas**. Watch for invitations to "Meet the President" and "Meet the Director" gatherings in these areas.

What does it take to start a new chapter?

It's easy. It takes EV enthusiasts who want to lead other EV enthusiasts in public engagement and EV education. Two officers, five paid members; you have 4 months to get this together. We can provide some funding for a feather flag, banner and some outreach collateral. To be considered for new chapter financial assistance, contact Director Simon Freedman who heads up the Donations Giving Committee at simonF@roadrunner.com.

Who are the new leaders, what do they do? Officers might be referred to as "intrapreneurs." We can guide you towards organizing roles for your volunteers. At



Raejean Fellows

national, we want you to make your chapter what you want it to be. You and your team create the vision.

How does the chapter work?

Quite simply, EAA does the back office/banking/tax returns, leaving you free to do ride and drives, public talks, school events . . . you plan the events you want to do. We help by providing the organizational tools, the website, your event calendar, volunteer management tools, webinars, your data base management and emailing. Your chapter location comes under EAA's non-profit status.

We can't do it without you.

EAA is member-supported from dues and member donations. We would like to step this up in order to do more. Please consider increasing your membership level and/or making a donation to the newly created fund: "[Adopt a Chapter.](#)" Click on Donations/Special Fund/Adopt a Chapter.

Electric Auto is growing . . .with your help.

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Thank you to our Supporting Members

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EV Tax Credit Extension Gets Bipartisan Juice in Senate

By Eric C. Evarts

Despite President Trump's efforts to torpedo electric-car tax credits, extending them has become a bipartisan effort in the Senate.

In the face of the tax credits winding down first for automakers who've sold hundreds of thousands of electric cars, several Democrats and Republicans proposed a bipartisan bill Wednesday that would extend tax credits to all automakers.

The Driving America Forward Act counts among its key sponsors Michigan Democrats Debbie Stabenow and Gary Peters, Tennessee establishment-Republican Lamar Alexander and Maine Republican-centrist Susan Collins. Michigan Democratic Rep. Dan Kildee signaled his support in the House as well. Automakers including General Motors, Fiat Chrysler Automobiles, Tesla, Honda, Toyota, Ford, Nissan, and Volkswagen have supported the effort.

"We have a cap that's got to go up," Stabenow said last week, according to Reuters. "I want to get this done as soon as possible."

Unlike partisan Democratic proposals that would simply extend the tax credit for 10 years for all automakers, before ending them abruptly, the Driving America Forward Act would boost all automakers' available credits from 200,000 (which Tesla and GM have already surpassed) to 600,000, but lower the amount on the last 400,000 credits to \$7,000, rather than \$7,500.

Tesla saw a dramatic drop in sales in the first quarter of 2019 after the tax credits on its cars was cut in half, despite lowering prices.

It would also shorten the wind down time after automakers reach those new limits from 15 months to nine months. EVs from new manufacturers, such as new startup electric-car makers or new Chinese automakers (or other imports) entering the U.S., could be eligible. It would not put a cap on the potential costs of the tax credits, but estimates that it will cost tax-payers \$11.4 billion over 10 years. (The proposal would also extend the current \$7,500 tax credit on fuel-cell vehicles through 2028.)

With both Republican and Democratic support in the Senate, the proposal may face headwinds in Congress from dissenting members as well as an administration that has favored ending electric-car tax credits completely.

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https://www2.greencarreports.com/news/1122547_ev-tax-credit-extension-gets-bipartisan-juice-in-senate

<https://www.congress.gov/bill/116th-congress/senate-bill/1094/text>



Where will your EV take you on your next vacation?

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Whatever you choose, remember to ask about Barn Gallery Specials only for EV

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<http://www.oex.club>

Chapter Highlight



This report will feature short activity summaries from our various chapters to foster knowledge transfer. Such sharing can be powerful for planning new startup activities, special meetings, or just reinvigorating established groups as we grow into our second 50 years of pioneering e-mobility.

A Wild Time with Wasatch EVA at the Zoo!

Drive Electric Earth Day at the Hogle Zoo, Salt Lake City, Utah
Wasatch Electric Vehicle's (WEVA's) first event

Typically 8,000 weekend visitors frequent the zoo. Benefiting from a beautiful sunny 75 degree day, with stunning mountain backdrop, the EV curious approached our table to engage with our EV Owner/Educators. We enjoyed showcasing WEVA member, Parker's Model 3. With lots of

good education and engagement, President Brian Flock was beaming. Take a look at what the wise owl thought about the Model 3, a real "head turner." The Meerkat had a special experience too!

continued next page



Above: Tesla Model 3, WEVA's table, new Feather Flag



Above: Parker Despain educating the public



Left: Hogle Zoo, Salt Lake City



Above: Meerkats love EVs!



Above: Owl says, "This EV is a real head turner!"



Left: Mike Rhodes (left) WEVA founding member, Brian Flock, WEVA President



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- Use as EVSE cord or J1772 Extension
- 10AWG Power and Ground

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Feb 2019

Ford's Mustang-Inspired Electric Crossover Range Claim: 370 Miles



Ford Also Teases New Puma Compact Crossover

By Sven Gustafson

Ford has dropped a juicy detail about its much-anticipated but still-unnamed Mustang-inspired electric crossover, saying it will boast a driving range of 370 miles when it hits in 2020.

That certainly sounds impressive, but keep in mind those figures are based on the European WTLP cycle and still preliminary. Official numbers will come closer to the on-sale date, and the numbers could well be lower in the U.S. based on EPA testing. The company has previously said it's targeting a range of 300 miles.

Ford spilled the beans about the forthcoming performance electric CUV as part of an event in Amsterdam where the automaker unveiled 16 electrified

models for the continent, most under the new Ford Hybrid brand. The company earlier this year announced that all of its future nameplates there would include electrified variants.

The newest nameplate is called the Puma, a compact crossover that Ford teased in a photo Wednesday. Shrouded in a display of laser beams, we can see an athletic, high-riding compact crossover wearing what Ford calls wing-top mounted headlights. It's the same Fiesta-based crossover we showed you in camouflaged mule form earlier this year, meant to slot in-between the Kuga, Ford's Euro version of the Escape, and the EcoSport, with the Edge and the full-size Explorer PHEV rounding out the SUV lineup.

The Puma will use the same belt-driven integrated starter/generator as Ford is debuting in its European Fiesta Hybrid and Focus Hybrid to recover energy from braking and coasting and store it in a 48-volt air-cooled battery. Like those other models, the system integrates with a low-friction, 1.0-liter three-cylinder EcoBoost engine to deliver instant torque and bring output to around 153 horsepower. Ford also touts the 'ute's flexible rear luggage space of 16.1 cubic feet.

It'll be built at Ford's Craiova Assembly Plant in Romania. There's no immediate word on any plans to bring it to the U.S., but given that compact crossovers are all the rage, it's not out of the realm of possibility. 

<https://insideevs.com/ford-electric-mustang-suv-tesla-model-y/>

New Details Emerge On Ford's Long-Range Electric Crossover

It's coming for 2021 and it could look something like this

By C Smith

Ford recently announced its new Escape for 2020, but the launch event in Amsterdam contained additional information that most decidedly has our interest. The Blue Oval started touting an all-electric Mustang-based crossover vehicle over a year ago, but nestled in the Escape's launch were some fresh details on the project. They were so interesting that we took it upon ourselves to commission the rendering you see above. This interpretation is based on recent information, rumors, and tips from people who've allegedly seen the real design.



What did Ford let slip in Amsterdam? For starters, Mustang-based is the key term here. It will be built on a dedicated platform with dimensions similar – but not identical – to the current-generation Mustang. Nor will it be called Mustang, or rather, we don't think Ford will make that leap. We've been told it doesn't have an official name yet, and Ford backpedaled on its original plan to revive the storied Mach 1 nameplate for this car. With the Falcon officially retired in Australia, this could be the perfect time to bring the moniker back. Or, since this is a fully electric vehicle, perhaps a recasting of the Lightning name is in order?

Power or performance isn't known yet, but we're told it will offer two range options with the largest being 600 kilometers (373 miles) WLTP estimate. Similar to Tesla, the Blue Oval EV will feature a digital cockpit inside with a big center touchscreen and over-the-air software updates.

Ford has other electric projects in the works as well, but details there are still muddled since they involve a possible collaboration with Volkswagen. The Mustang-based model, however, is

independent of that and we should see it hitting showrooms sometime in 2021.

Ford has promised us more information on the crossover this November.

<https://insideevs.com/details-ford-long-range-electric-crossover/>

Ford Says Mustang-Inspired Electric SUV Will Get Performance Variant

By Chris Bruce

There will be a new, "affordable" Ford model available at dealers by 2022, but the company won't offer any specifics about the vehicle yet. Jim Baumbick, the Blue Oval's VP of enterprise product line management, announced the new mystery product during a speech at the Bank of America Merrill Lynch 2019 Auto Summit in New York, according to *Automotive News*.

"It's an example of how we're moving faster, working together differently and leveraging our five all-new flexible vehicle architectures. We came up with the concept in just 12 weeks using our new product creation process. Previous all-new vehicles could have taken years of research before receiving approval," the company said in a statement about the upcoming model to *Automotive News*.

In addition, the upcoming Ford Mustang-inspired electric crossover will have a high-performance variant, according to Baumbick. He didn't offer any further info about what the company was planning for this more hardcore version, though.

The latest info about the Mustang-inspired crossover tells us that the EV rides on a dedicated platform with similar dimensions to the current 'Stang. Customers can choose between two range options, and the top one would offer a driving distance of around 373 miles (600 kilometers). Look for the crossover to arrive in late 2020 or 2021. Ford promises to release more details about the EV in November.

(Note: the image at the top of this post is a speculative render of what it could look like.)

<https://insideevs.com/ford-mustang-electric-suv-performance/>



See a map of events at:

<https://driveelectricearthday.org/events.php>

Events Happen All This Month Across the US



what car you'll bring if you already own an EV, and see a little information about what's planned for each event and what cars might be showing up. Registration gives you a chance to win \$250, so definitely sign up!

You can expect to see an assortment of publicly-available EVs at these events, including Teslas, the BMW i3, the Nissan Leaf, Chevy Bolt, and so on, and possibly some electric motorcycles as well. But events in the

By Jameson Dow

The annual Drive Electric Week celebration, a week of events where the public can see and drive a variety of electric cars and talk to current owners about their experiences, has been expanded this year with an event that covers the whole month of April. Drive Electric Earth Day runs all the way from April 1-30 and has events scheduled throughout the US, and a few in other countries as well.

Most states have at least one event, with coastal high-population areas hosting several. You can find a map of all the events on Drive Electric Earth Day's website.

Drive Electric Earth Day is a bit of a misnomer, as the events aren't just on Earth Day weekend, but spread throughout the month. There are events scheduled as early as tomorrow and all the way through April 30.

Plug in America, the Sierra Club and the Electric Auto Association have been organizing Drive Electric Week since 2011. The celebration started nationally and soon went international, holding 321 separate local events last year.

Events vary from place to place, but all of them include local owners who bring out their EVs to let the public look and ask questions, some include owners who provide test rides to curious members of the public, and some include dealership or manufacturer support giving test drives or showing off new concept cars. Events often include food, raffles and games, support from other organizations or businesses related to clean energy, and free "swag" from these vendors.

If you have a look at the event list, you can click through to each event to register your interest, including

past have included lesser-known cars like Corbin Sparrows and one-off DIY builds like a triple-motor Ferrari 308 EV conversion and a converted Geo Metro with a small solar panel strapped to the hood (to charge the 12V, not as a range extender).

Drive Electric Week will still happen this year, but that's at the end of summer. That week is scheduled for September 14-22, and you can find a list of already-registered events here. That list will expand over time and will probably cover more regions than Drive Electric Earth Day does, so if you don't see any events in your area this time around, keep your eyes peeled and something might happen come September. *Electrek* will report on it again when we get closer to September.

Photo: *Electrek*



<https://electrek.co/2019/04/03/drive-electric-earth-day-events-happen-all-this-month-across-the-us/>

First Annual Drive Electric Earth Day Celebrates Electric Vehicles

Contact:

Larisa Manescu, larisa.manescu@sierraclub.org
 Noah Barnes, *Plug In America*,
nbarnes@pluginamerica.org

Nationwide:

This April, the first annual Drive Electric Earth Day is being held, with over 150 events across the United States, as well as Canada, New Zealand, and the Dominican Republic, celebrating the significant and wide-ranging benefits of electric vehicles (EVs). EVs reduce emissions from transportation — currently the leading sector contributing to carbon pollution — in addition to improving public health and providing fuel and maintenance savings for consumers.

Building upon the success of the National Drive Electric Week [<https://driveelectricweek.org>], an annual event held every September for the past eight years, Plug In America, the Sierra Club, and Electric Auto Association are partnering again to give communities across the U.S. more first-hand opportunities to hear and learn about zero emission vehicles through local Earth Day events. Community organizations, businesses, utilities and government entities will incorporate EV test drives, showcases and speakers. FLO is the exclusive national charging sponsor of Drive Electric Earth Day. Audi of America and the Clean Vehicle Rebate Project are national silver level sponsors.

Over 1.1 million EVs have been sold in the U.S. and there are now approximately 50 models of EVs

available, many with longer ranges at lower prices than in previous years.

“Each year, more Americans are discovering that plug-in vehicles are convenient, affordable, and better for the environment,” said **Joel Levin, executive director of Plug In America**.

“We are excited for communities to come together to celebrate Earth Day and the many benefits of electric vehicles.”

“We’re looking forward to communities across the country having another opportunity to help accelerate EV adoption. In this rapidly emerging industry, the public needs opportunities to learn about and enjoy EVs and their cost-savings and climate benefits. Drive Electric Earth Day is a hands-on opportunity for people from all walks of life to experience and learn more about EVs in a fun and educational setting,” said **Hieu Le, a campaign representative with Sierra Club’s Clean Transportation for All campaign**.

“Electric vehicles at Earth Day events are where green meets fun, where clean air saves money, and where quiet brings performance,” said **Guy Hall, Director of the Electric Auto Association**. “The excitement of EVs is here now and 2019 is the year of the long-range EVs.”

“We are pleased to partner with Plug In America, and many other organizations and individuals working to inspire communities across the country to connect with and celebrate nature,” said **Fabien Fayard, vice-president, marketing at FLO**. “What better way

than to help spread the word to highlight the benefits of all-electric and plug-in hybrid-electric vehicles as a greener way to get around. Together, we can all play a part in accelerating the shift to clean-powered electric vehicles and contribute to make Earth Day every day!”

“At Audi, we want consumers to go electric with confidence. That confidence starts with initiatives like Drive Electric Earth Day that work to bring awareness surrounding the benefits of electric vehicles — like the Audi e-tron, our fully electric five-passenger SUV — to communities across the U.S.,” said **Filip Brabec, vice president, product management, Audi of America**. “With one in three of our U.S. customers choosing to drive an electric vehicle by 2025, we know it’s critical to support customer-centric programs like this now,” added Brabec.

“Consumer interest in cleaner vehicles continues to grow and boost EV sales, not only in California, but nationwide. With the variety of EV models now available, it is a great time for any car shopper to explore an EV option—particularly when you consider the significant savings offered by programs such as the Clean Vehicle Rebate Project,” said **Jonathan Changus, senior manager for clean transportation, at the Center for Sustainable Energy**.

To learn more about Drive Electric Earth Day or attend/volunteer at an event in your community, visit DriveElectricEarthDay.org.



<https://www.sierraclub.org/press-releases/2019/04/first-annual-drive-electric-earth-day-celebrates-electric-vehicles>

Zero's SR/F Electric Motorcycle is Quicker and Now More Connected



By Roberto Baldwin

My riding companions ask me what type of ride I want to go on.

“Aggressive or casual?”

This is my first time on Zero's new SR/F motorcycle (starting at \$18,995). It's a new design for the company. The motor is new. The controller unit and operating system are new. Even the display is new. Plus, I'll be riding on roads I've never even seen. I reply “casual” but 20 minutes in, I wish I had said “aggressive.”

continued on page 14

An evolutionary leap for the company.

EV Educational Resources

for Individuals, Groups and Organizations

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INSIDER



EV Buyers Guide

Compare electric cars with comprehensive full page profiles



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Save thousands of dollars on EV purchases and leases



Educational Exhibits

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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

Zero Electric Motorcycle

continued from page 12

Zero has been building electric motorcycles for 13 years. In that time they've gone from putting out less-than-optimal vehicles with electric powertrains bolted in, to great bikes that just happen to be electrified.

In the past few years, the company has had a predictable roadmap. Every 12 months it would upgrade the motors and extend the range of its line up. The bikes continued to look about the same while the guts were improved. But the SR/F is something different and it's more than just its design.

While riding in the mountains above Santa Cruz, California I'm impressed by just how smooth the acceleration is. You twist the accelerator and it responds with the expected torque of an electric motor, but the system has been polished. It doesn't take away from the experience of riding an electric bike. If anything it makes it better.

That has to do with Zero's Cypher III operating system and Bosch's Motorcycle Stability Control. But it's more than just acceleration, it also controls how the bike reacts to different road surfaces and riding styles. It's taken its riding to another level. The motorcycle maker even added a Rain mode to the bike. A first for its lineup and a welcome sight for anyone that rides daily and has to deal with precipitation. During my tests with cornering, gravel, and a light smattering of rain, the bike tackled those obstacles and replied with grace.

What's great is that none of this takes away from the almost instant speed of riding a Zero motorcycle. The SR/F has 140-foot-pounds of torque and 110 horsepower. So when you twist that grip, you're moving fast. Very fast.

And that's what I wanted from my ride. After 20 minutes, I realized how quickly I was able to get a feel for it and I began to wonder while linking turns through the woods if it would seem weird to pass my companions. The seating position (31 inches) was a little low for someone of my height, but Zero plans on offering a seat that raises that about an inch. For shorter riders,

a seat will be available that lowers the height about three-quarters of an inch.

After a few hours on the SR/F, I was still ready for more riding and so was the bike. The motorcycle has a city range of 161 miles and highway range of 99 miles. Throw on the optional Power Pack and Zero says the bike will go up to 200 miles between charges.



continued next page

ZERO SR/F

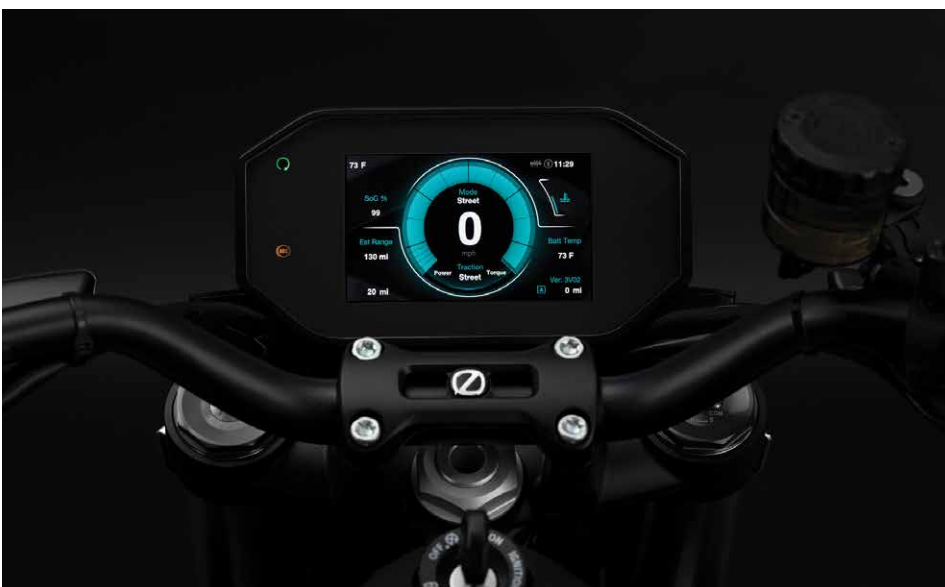
The SR/F is also the first Zero to come with a Level 2 charger standard. You know, the kind you find in electric cars. It'll support charging speeds up to 3kW standard and 6kW if you pony up for the Premium model that includes heated grips, aluminum bar ends and a fly screen starting at \$20,995.

Regardless of which model you ride, the bike comes with the new color 5-inch TFT LCD display. It's easier to read than the monochrome display on its other bikes and even in bright sunlight and with polarized sunglasses on, I had no trouble with visibility. In addition to looking better, the bike also has a wireless connection (free for the first two years). It supports over the air updates and can be used to find the bike and control the powertrain and stability control with the companion app.

Then we come to the design and frankly, it's a looker. The company has deviated from its previous design language with something outstanding. The design team wanted to highlight that it was an electric motorcycle going so far as accenting the motor. It's a "naked" bike that'll be at home next to Ducatis and Aprillas.

The SR/F looks great and rides even better. With that, the argument for electric bikes just got stronger. It's a more refined motorcycle from a company that continues to impress with its offerings. This new bike is an evolutionary jump in its history and hopefully next time I'm on it, I can get a bit more aggressive. 

Source: Zero Motorcycles
Photos pages 14 & 15: *Engadget*



<https://www.engadget.com/2019/04/13/zero-motorcycles-sfr-first-ride/>

2020 Porsche Taycan: Here's What We Know



Porsche's first all-electric car should arrive next year. Here's what to expect.

By Chris Perkins & Máté Petrány

This story will be continually updated as the authors learn more. See URL at the bottom of [page 20](#) for updates.

Porsche stunned the world two years ago with the debut of its all-electric Mission E sedan concept, later promising it'd go into production as the Taycan in 2020. The spy photos seen throughout this post provide an early look at a Taycan prototype testing in public near Porsche's development center in Weissach, Germany.

Porsche Is Aiming for a Sub-Eight Minute Nürburgring Lap

Porsche is letting loose a few more details as the months wind down until the Taycan is finally revealed. One that stuck out to us—the car should be capable of a sub-eight at the Nürburgring. Porsche hasn't done

It Can Slide!



it yet, but its simulations indicate that it's possible. For a fun comparison, the Porsche 911 GT3 made headlines 20 years ago when it ran a 7:56 on the track—faster than any production road

car yet. Progress is an electric luxury sedan being able to achieve the same feat.

continued next page

Over at *Roadshow*, Tim Stevens got to ride along in a near-production Taycan during winter testing way up north in Sweden [photo previous page]. There was some sideways action. The Taycan has a version of Porsche Stability Management (PSM, that allows for some yaw in PSM Sport mode, and a lot of yaw when it's switched off. Stevens also reports that the top-spec Taycan he was riding in had a two-speed transmission and a limited-slip differential at the rear, which should make sliding on low-grip surfaces easier.



It's Called the Taycan

At first, we thought Porsche would just call this car the "Mission E," but the company has announced that won't be the case. It'll be called the Taycan, pronounced tie-con. It's a Eurasian Turkish word that translates, roughly, to "lively young horse."

"Our new electric sports car is strong and dependable; it's a vehicle that can consistently cover long distances and that epitomizes freedom," Porsche CEO Oliver Blume said in a statement announcing the name.

It'll Be Priced Between the Cayenne and Panamera

Speaking to *Automotive News*, the model-line director for the Taycan, Rober Meier, said "we're expecting a price somewhere between a Cayenne and a Panamera," when asked how much the EV will cost. In the US, the Cayenne starts at just under \$66,000, while the Panamera starts at \$85,000. So perhaps the Taycan will start in the \$75,000 range.

Of course, there'll be model variants offering more performance, so consider \$75,000 a base price.

You can Put Down a Deposit Now



On Porsche's website, there's a form for those who want to register their interest in buying a Taycan. Once that form is filled out, a Porsche dealer will

contact those interested, who can then put a deposit down on the upcoming electric sedan. A Manhattan Porsche dealer told us the deposit is \$2500.

The Production Car Will Look Like the Concept



continued page 18

Taycan

continued from page 17

The Mission E concept combined futuristic looks with classic Porsche proportions to stunning effect, and thankfully the production car will too. Oliver Blume told *Car* magazine that the production car is “very close to what you saw two years ago at Frankfurt. It will be exciting but a bit different from the concept.” The folks over at <https://www.taycanforum.com/> previewed the design in the rendering of the red car you see on the previous page.

Don’t expect the suicide doors of the concept to make production, though.

Yes, Porsche already sells a sedan, the Panamera, but it’s not just modifying that car to create the Taycan. Instead, the Taycan will ride on its own bespoke platform, internally called J1, with its lithium-ion battery making up the floorpan between the its two axles, just as on a Tesla.

This platform will also underpin Audi Sport’s first EV, the upcoming e-Tron GT four-door. Bentley’s first EV will also ride on the J1 platform and there’s a rumor that Lamborghini is working on an electric car based off the Taycan, but we’ll believe that when we see it.

Porsche doesn’t just make one 911, and the same will be true for the Taycan. *Car* magazine spoke with Porsche boss Oliver Blume who confirmed that the car will likely follow Porsche’s model preexisting hierarchy—that means you can expect a Taycan S, or a Taycan GTS. Maybe not a Taycan Turbo, though, since it won’t actually have turbos.

Automobile Magazine got to drive an early Taycan prototype and reported the car will be initially offered with

It’s Not An Electric Panamera

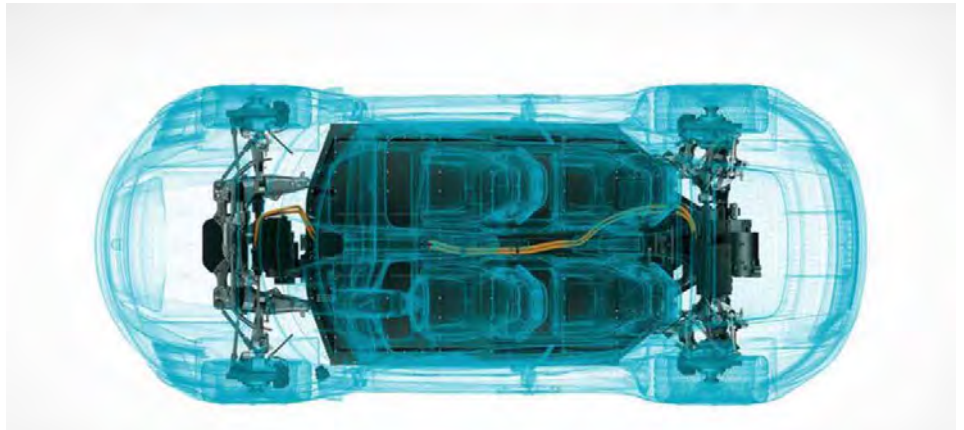


Don’t be fooled by those fake exhaust tips. This is an all-electric car.

There Will Be Model Variants, Possibly Including a Wagon



It’s Got a Clever Drivetrain



three power outputs 402 hp, 536 hp, and 670 hp. Like a Tesla Model S, the Taycan will have electric motors at the

front and rear axles for all-wheel drive, but Porsche might eventually sell an entry-level rear-drive version.

continued next page

Car magazine also got spy photos of what appears to be a Taycan wagon, or “Sport Turismo,” in Porsche speak. We’re praying this body style makes it into production.

The Mission E concept offers 605 hp from its all-electric drivetrain, which consists of two permanent-magnet synchronous motors at each axle. These are the same sort of motors used in the three-time LeMans-winning 919 LMP1 hybrid, and can recover heat energy from braking. With this setup, Porsche promises that the Mission E concept hits 60 mph in 3.5 seconds, 124 mph in under 12, and that it’ll run a sub-8:00 lap at the Nürburgring Nordschleife.

The production Taycan will likely get four-wheel steering and torque vectoring as well. Porsche boss Oliver Blume promised in 2015 that the production car would drive like a true Porsche. Typically, that means good things.

It’ll Have Two Battery Capacity Options

Car and Driver, which recently drove the Mission E Cross Turismo Concept, reports the production Taycan will be offered with a choice of battery packs—one offering around 80 kWh and another offering 95 kWh. If you want the most horsepower, you’ll need the biggest battery.

Stefan Weckbach, head of EV development at Porsche, also told *Car and Driver* the Taycan will have a battery cooling system. Porsche wants the Taycan to offer consistent, repeatable performance, and keeping the battery within an ideal operating temperature is essential for this.

At its Supercharger stations, Tesla uses 480-volt chargers that can provide its cars with around 170 miles of driving range in 30 minutes. Porsche is working

It’ll Offer 800-Volt Fast Charging, Granting 60 Miles of Charge in 4 Minutes



on an 800-volt system that can provide around 250 miles of range in just 15 minutes. Or, according to CEO Oliver Blume, over 60 miles of range in just four minutes!

Of course, these 800-volt chargers won’t be plentiful, so the Taycan will be able to be charged on a 400-volt system or a typical household plug.

Speaking to Automotive News, Porsche Cars North America CEO Klaus Zellmer said that the company will build a network of 500 fast chargers for the US. The chargers will be installed

at Porsche dealers and other highway locations across the country.

It’ll Get Carbon-Ceramic Brakes (Presumably as an Option)

Spy photos from <https://www.taycanforum.com/> show a Taycan prototype sporting big brakes with huge yellow-painted calipers. Those are almost assuredly carbon-ceramics, which Porsche offers as an option for all its cars. Some of the other cars pictured have white calipers and mirror-finish discs—most likely Porsche’s surface-coated brakes available on the Cayenne.

It’ll Be the First of Many Electric Porsches



The Porsche Mission E Cross Turismo concept

continued on page 20

Taycan

continued from page 19

The Taycan's platform is scalable, and Porsche is reportedly already working on a smaller version of the car. At the Geneva Motor Show in March, Porsche showed off the striking Mission E Cross Turismo concept, a lifted wagon that shows off what's possible with this platform. *Car and Driver* reports that Porsche is very seriously thinking about putting the Cross Turismo into production.

Porsche also announced that it will invest \$8 billion by 2022 in electrification, a large part of which will go towards developing the Taycan and cars based on its platform.

We should look at the Taycan as a preview of what's to come for Porsche. While the 911 will always have a flat-six behind its rear axle, it's entirely possible that future generations of the Panamera, Macan, and Cayenne

It'll Be On Sale By 2020

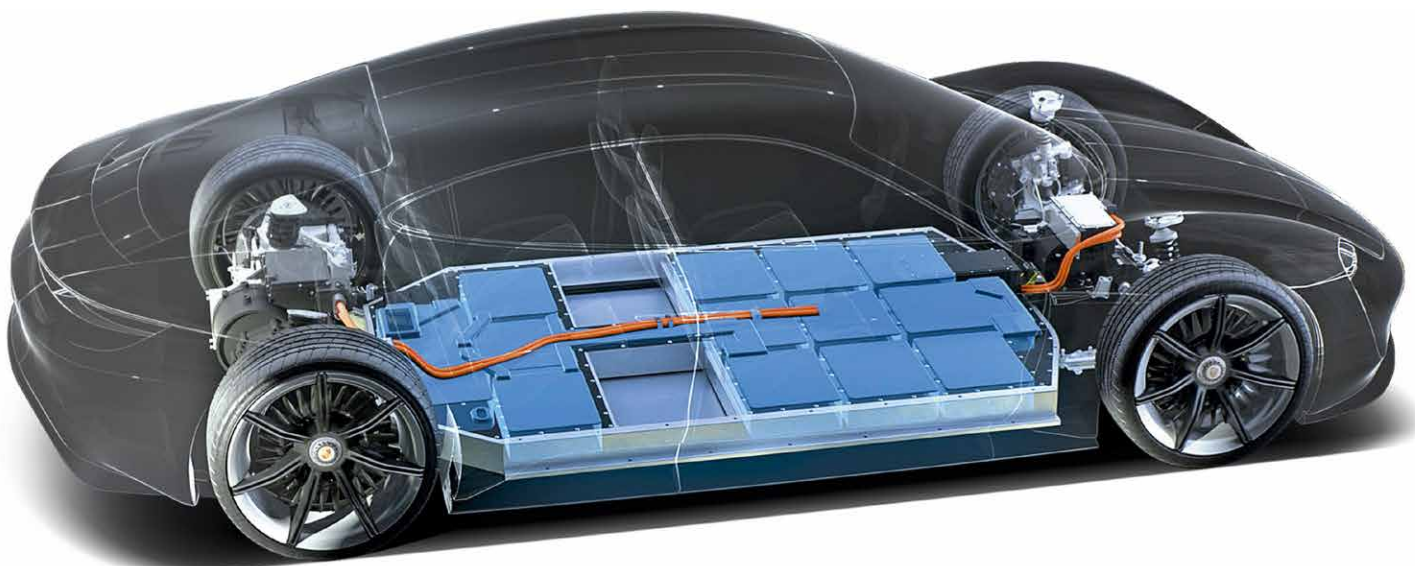


might be electric only. The Taycan is Porsche's first foray into all-electric cars, but it won't be its last.

Barring any delays, the Taycan should go on sale sometime before the end of 2019 as a 2020 model year car. We wouldn't be surprised to see it debut in production form at the Frankfurt Motor Show in 2019, the same place the concept debuted back in 2015.

The Taycan will break new ground for Porsche, and while that's scary, it's also incredibly exciting. We can't wait to drive it and see what the future holds for one of our favorite automakers. [Photos courtesy of Porsche.]

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<https://www.roadandtrack.com/new-cars/future-cars/a12778510/2020-porsche-mission-e-news-photos-price-release/>

Opinion: Tesla's Mega-Fast Model S Finally Has a Challenger: the Porsche Taycan

The German sports-car company plans to release its first all-electric vehicle at the end of this year, using Tesla's Model S as a benchmark

By Jurica Dujmovic

Tesla has shown there's massive potential in the electric-vehicle (EV) market. As a result, an increasing number of car manufacturers are taking the hint.

Tesla has surely taken heed of EV competition that will arrive over the next few years. Today, I want to take a closer look at one of the cars on that list: Porsche's Taycan (pronounced: tie-con). It means "lively young horse" in Turkish, and if you thought it has to do with Porsche's crest, you're right. The company invested 6 billion euros (\$6.7 billion) and hired 1,200 employees for the launch of this model alone.

In firmly committing to electric mobility, the German sports-car manufacturer is undergoing a major change. For Porsche (a unit of Volkswagen) Taycan is more than just a car; it is positioned to be a part of its core lineup.

Clean Design

Taycan is not the first EV made by Porsche; the company's Panamera sedan offers a plug-in hybrid. But that model won't be used as a foundation for the new car. Instead, Taycan will be built from scratch, atop of a custom platform that provides ample space for its bulky battery. The same platform will be used for the other versions of the car, including a wagon-like crossover.



The rest of this article can be read at the URL below.



An artist's rendering of Porsche's Taycan electric car.



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<https://www.marketwatch.com/story/teslas-mega-fast-model-s-finally-has-a-challenger-the-porsche-taycan-2019-04-02>

Trip Report: to Charleston, SC and Back in a Model 3

Long Range / Firmware 2019.8.5 / 9,819 Miles Driven

Contributed by

Alison & Tim Benford, Ohio, Drive Electric Dayton

Journey: Oakwood to Isle of Palms, adjacent to Charleston, SC. Google Maps on iPhone showed the map (on the right.) As we're retired and can take it easy, we decided to split the journey over two days, stopping at Knoxville's Hilton Garden Inn in each direction. Per Google Maps, the round trip was ~1,374.

DAY 1: March 30, Oakwood to Knoxville

Departed Oakwood, OH at 10:10am

Charged to: 315 miles

Weather: cold, pouring rain

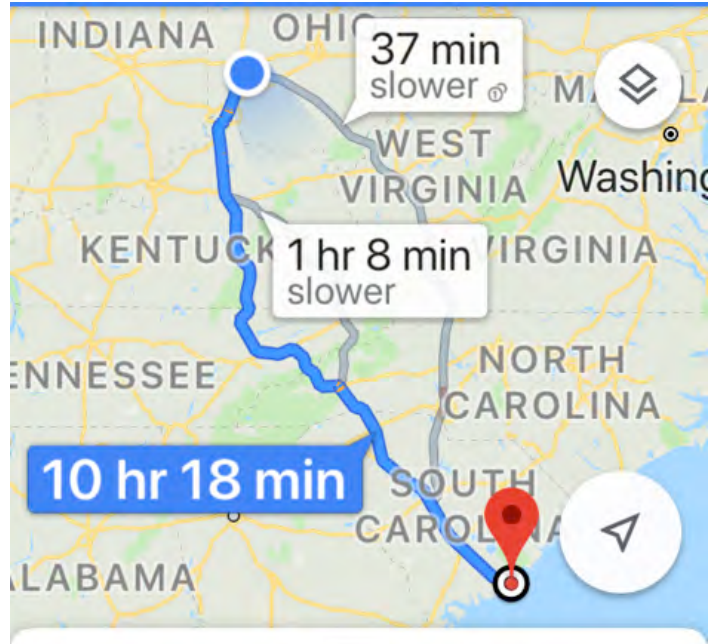
We hit a traffic jam at Austin Landing and decided to take the exit and a detour to the east of I-75. It took a while to get back on I-75 and we elected to Supercharge in Cincinnati. We were a little green on Day 1 about charging and didn't understand that using the onboard Energy Graph was the key to success.

Supercharge 1: Cincinnati, Meijer's on Marburg Avenue

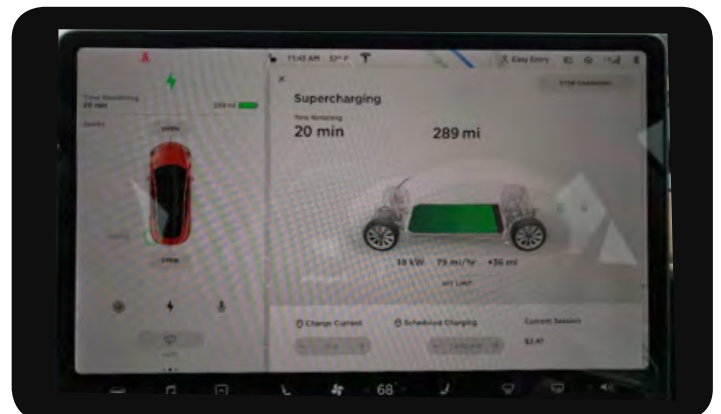
Arrived: 11:25am
 Departed: 11:45am
 Duration of stay: 20 minutes
 Charge Rate: ~110 miles/hr
 Charged From: 271 miles
 Charged To: 289 miles
 Cost: \$2.47 for 18 miles added
 Points of Interest: IHOP, Target, At Home, Meijer's.

Supercharge 2: Lexington, KY at 2155 Paul Jones Way

Arrived: 1:51pm
 Departed: 2:34pm
 Duration of stay: 43 minutes
 Charge Rate: ? miles/hr
 Charged From: 156 miles
 Charged To: 283 miles
 Cost: \$5.59 for 127 miles added
 Points of Interest: Steak & Shake (lunched), Meijer's.

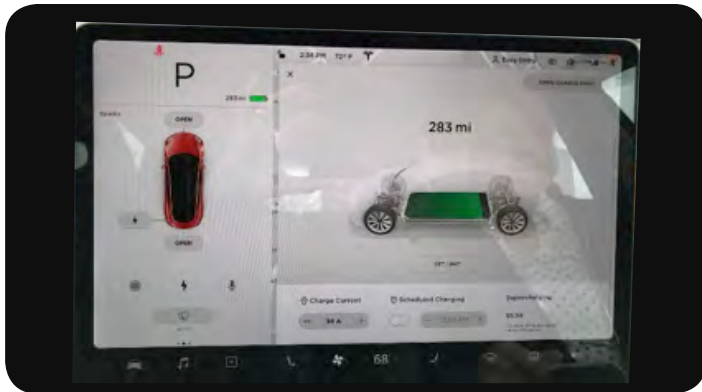


10 hr 18 min (687 mi)

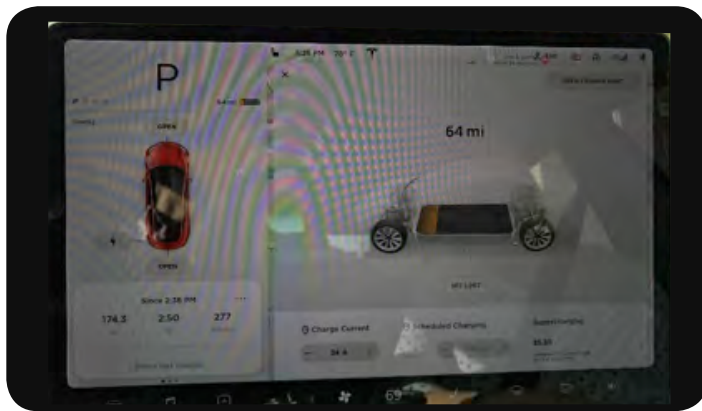


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CHARLESTON EV ROAD TRIP



Arrived Knoxville Hilton Garden Inn, TN at 5:26pm
Range Left: 64 miles

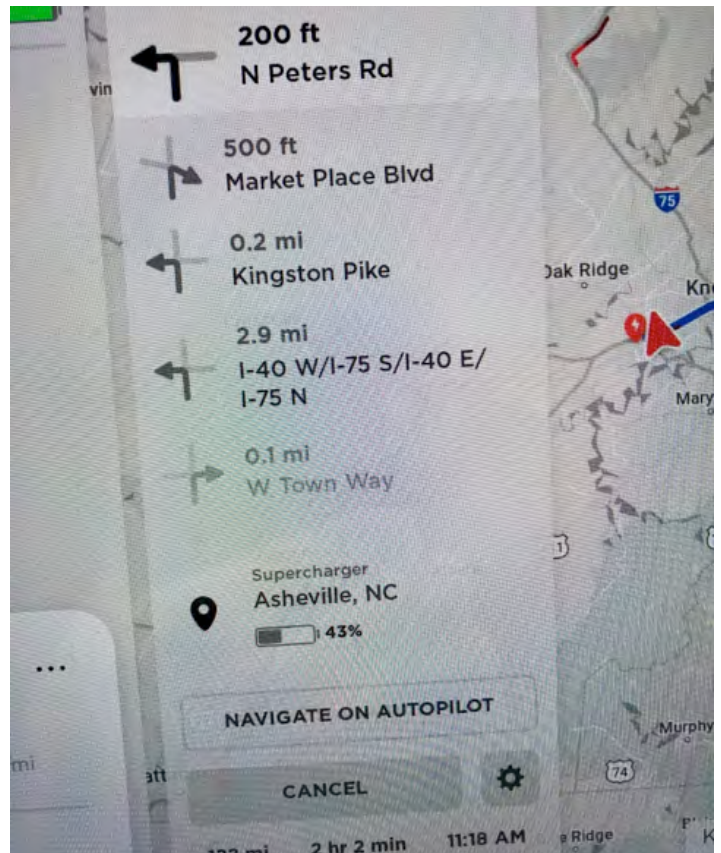


Supercharge 3: Knoxville, TN at 11038 Parkside Dr (3.2 miles from the hotel) Range Left: 62 miles

Arrived: 6:07pm
Departed: 7:23pm
Duration of stay: 1hr 16mins
Charge Rate: ~500 miles/hr
Charged From: 62 miles
Charged To: 315 miles
Cost: \$11.51 for 253 miles added
Points of Interest: O'Charley's (dined),
large shopping plaza.

DAY 1 SUMMARY:

281 wh/mile
92 kWh consumed
327 miles driven
\$19.57 in Supercharging costs
7 hrs 16 mins Oakwood to Knoxville Hotel



DAY 2: March 31st, Knoxville Hotel to Isle Of Palms, SC

Supercharge 1: Asheville Supercharger, 800 Brevard Rd, NC

Departed Knoxville: 9:16am with 293 miles range
Arrived Asheville: 11:28am
Departed: 12:19pm
Duration of Stay: 51 mins
Charge Rate: ~84 miles/hr
Charged From: 129 miles
Charged To: 292 miles
Cost: \$7.32 for 163 miles added
Points of Interest: Outlet mall, McDonalds,
Waffle House.



continued page 24

Trip Report

continued from page 23

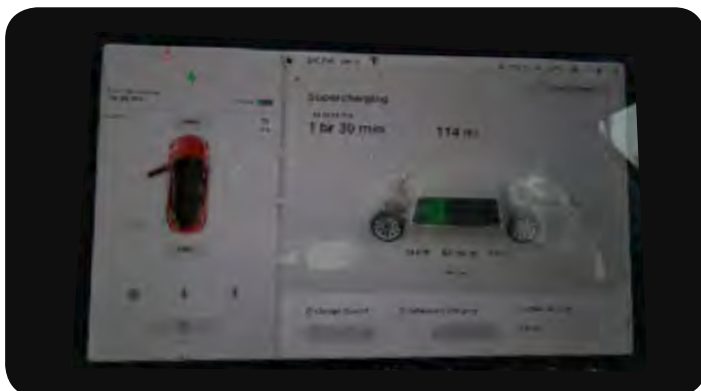
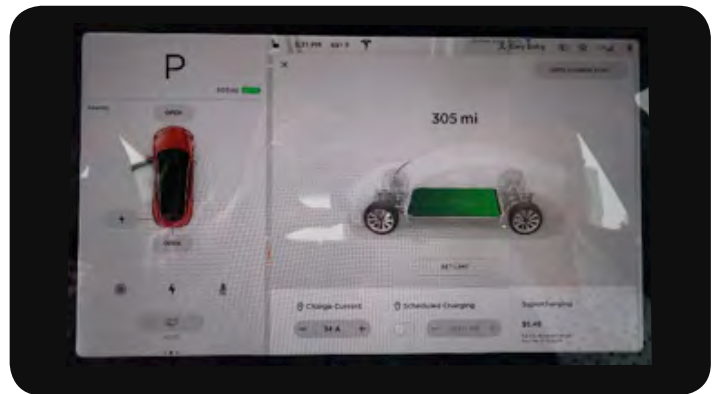
Points of Interest:

Located next to Clark's Inn Hotel.
Food Lion and McDonalds near by.
Did a Food Lion shop for the condo
while waiting to charge.



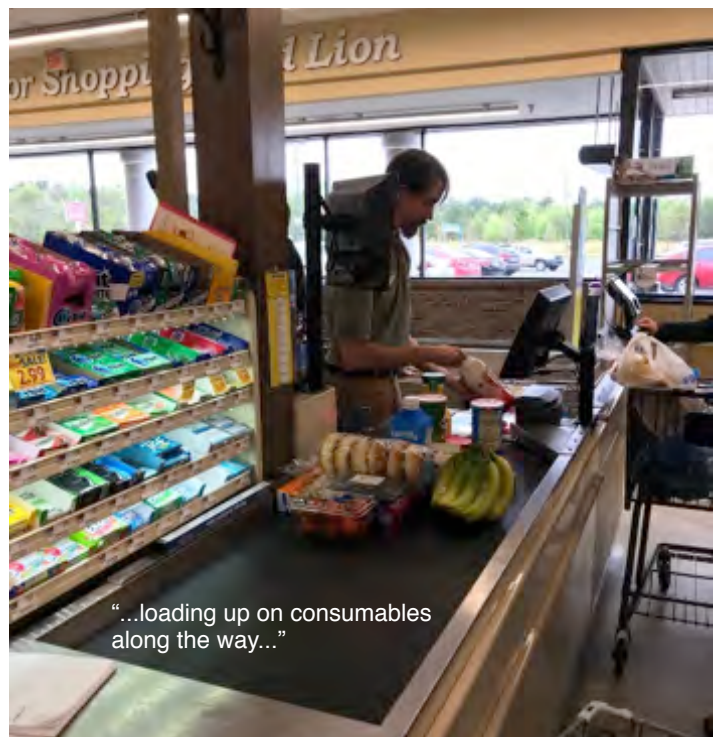
Supercharge 2: Columbia Supercharger, 8910 Farrow Rd., SC

Departed Asheville: 12:19pm with 292 miles range
Arrived Columbia: 2:41pm
Departed: 3:21pm
Duration of Stay: 40 mins
Charge Rate: ~135 miles/hr
Charged From: 114 miles
Charged To: 272 miles
Cost: \$6.62 for 158 miles added
Points of Interest: Located behind a Hilton Garden Inn. No restaurants.
Buy snacks in hotel.



Supercharge 3: Santee Supercharger, 114 Bradford Blvd., SC

Departed Columbia: 3:21pm with 272 miles range
Arrived Santee: 4:36pm
Departed: 5:31pm
Duration of Stay: 55 mins
Charge Rate: ~300 miles/hr
Charged From: 184 miles
Charged To: 305 miles
Cost: \$6.48 for 121 miles added



"...loading up on consumables
along the way..."

continued next page

CHARLESTON EV ROAD TRIP

Charge 4: Mt. Pleasant Destination Chargers, Towne Center., SC

Departed Santee: 5:31pm with 305 miles range
Arrived Mt. Pleasant: 6:42pm
Departed: 8:23pm
Duration of Stay: 91 mins
Charge Rate: ? miles/hr
Charged From: 214 miles
Charged To: 245 miles
Cost: \$0.00 for 31 miles added
POI: Had dinner at Burton's Grill

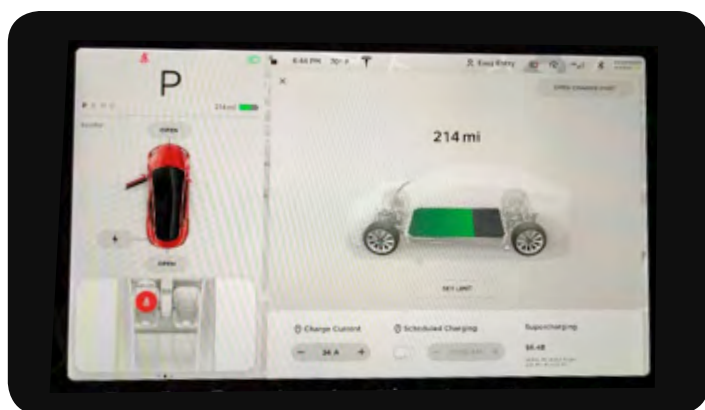


DAY 2 SUMMARY:

Supercharging costs: \$20.42
Door to door: 11hrs 50mins

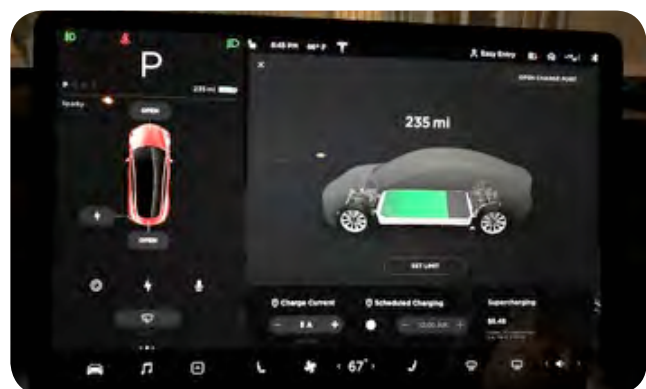
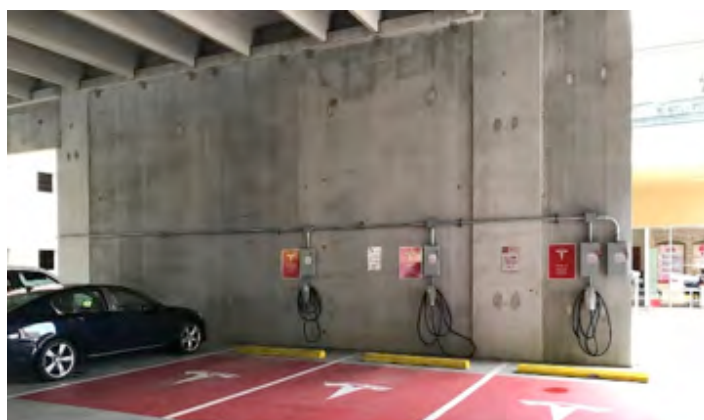
Charging In Charleston

No Supercharger in Charleston, although one is slated for 2019. We charged twice at Tesla Destination Chargers at the outdoor Towne Center shopping mall. Charging is free. We also lucked out that 1.3 miles from our condo was a Clipper Creek and a Tesla Destination Charger which we found using the <https://www.plugshare.com/> app. The Model 3 also knew about them. They were free too.



Isle of Palms, 9100 Palmetto Dr., SC, VRBO condo

Arrived: 8:55pm
State of Charge: 235 miles



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Trip Report

continued from page 25

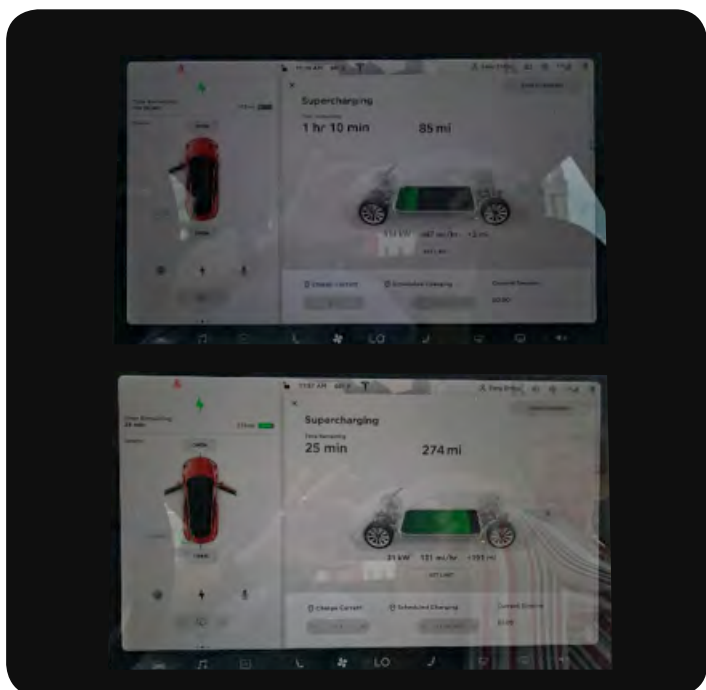


Return Journey: Isle of Palms, SC to Oakwood, OH

DAY 1: April 6th, Isle of Palms to Knoxville

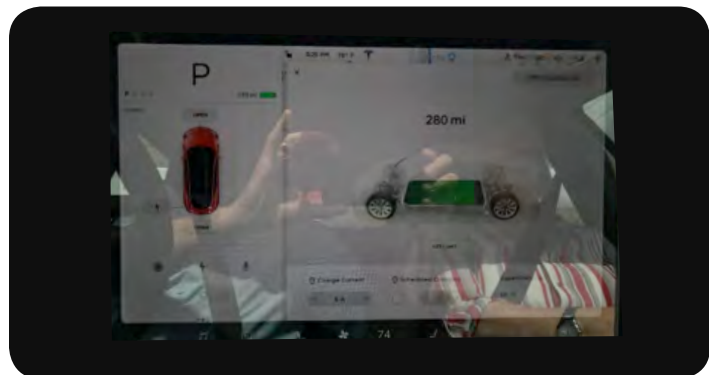
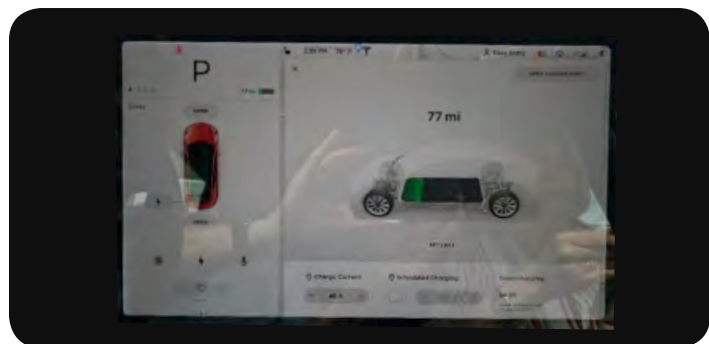
Supercharge 1: Isle of Palms to Santee Supercharger

Departed Isle of Palms: 9:55am
 Battery's Range: 184 miles
 Arrived Santee: 11:18am
 Duration of Stay: 39 minutes (had coffee and apple pie at nearby McDonalds).
 Departed: 11:57am
 Charge Rate: ~487 miles/hr
 Charged From: 83 miles
 Charged To: 274 miles
 Cost: \$7.09 for 191 miles added



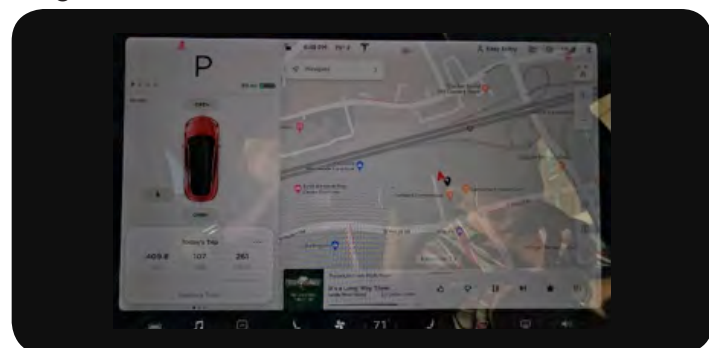
Supercharge 2: Santee to Greenville Supercharger, 108 Carolina Point Pkwy, SC

Departed Santee: 11:59am
 Battery's Range: 275 miles
 Arrived Greenville: 2:38pm
 Duration of Stay: 47 minutes (Had snacks purchased at co-located Hilton Garden Inn).
 Departed: 3:25pm
 Charge Rate: ~200 miles/hr
 Charged From: 77 miles
 Charged To: 279 miles
 Cost: \$6.72 for 202 miles added



Greenville to Knoxville Hilton Garden Inn

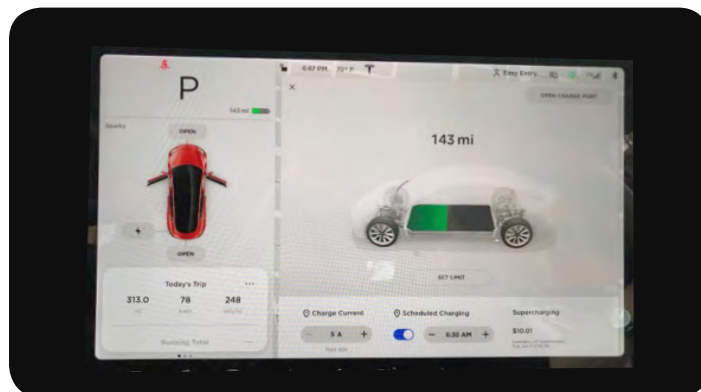
Departed Greenville: 3:25pm
 Battery's Range: 279 miles
 Arrived Hotel: 6:48pm
 Drive Time: 3hr 23min
 Duration of Stay: Overnight
 Range on Arrival: 80 miles



continued next page

Supercharge 3: Knoxville Supercharger, TN

Departed Hotel: 7 :20pm
 Battery's Range: 80 miles
 Arrived Supercharger: 7:35pm
 Duration of Stay: 55 minutes (Dinner at nearby Mimi's).
 Charge Rate: ~300 miles/hr
 Charged From: 73 miles
 Charged To: 314 miles
 Cost: \$10.91 for 241 miles added



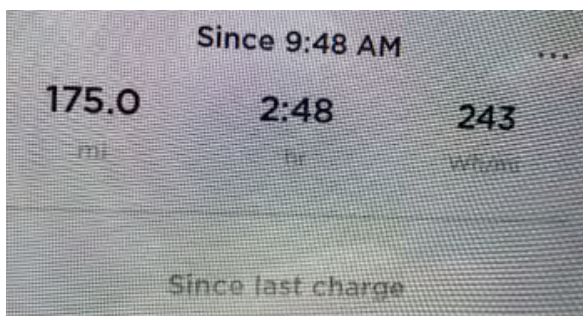
DAY 1 SUMMARY

Miles Driven today: 409.8
 Time Driving: 8hrs 55mins
 kWh: 107
 Wh/mi: 261
 Time Charging: 86 mins
 Supercharging Cost: \$22.73

DAY 2: April 7th, Knoxville to Oakwood, OH

Supercharge 1: Knoxville to Lexington, 2155 Paul Jones Way, KY

Departed Knoxville: 9:48am
 Battery's Range: 184 miles
 Arrived Lexington: 12:36pm
 Duration of Stay: 56 minutes (had lunch at nearby Fazoli's).
 Departed: 1:32pm
 Charge Rate: ~500 miles/hr
 Charged From: 102 miles
 Charged To: 301 miles
 Cost: \$9.10 for 200 miles added



Arrived Home in Oakwood, OH

Time: 4:46pm
 Journey Hotel to Home: 7hrs
 Range Left: 143 miles
 Miles Driven Today: 313
 kWh Today: 78
 Wh/mi Today: 248

Total Supercharging Cost:

Out: Day 1: \$19.57
 Out: Day 2: \$20.42
 Back: Day 1: \$22.73
 Back: Day 2: \$9.10
TOTAL: \$71.82

Note: Charging for travel while in the Charleston area was free on Tesla Destination Chargers.

Navigate on Autopilot

We used NOA as much as we could and found it to be mostly very reliable. Just a few instances where I thought I needed to take over. It certainly helps with understanding which lane to be in as you approach a transition to a new interstate or an off- or on-ramp. Automatic lane changes is very helpful (with the need to approve each lane change), but if you set the top speed much higher than the speed of vehicles in your current lane, Autopilot will drive you crazy as it asks to move to a faster lane and then to move you back into the right hand lane again. It is easy to cancel the lane change offer by touching the screen, but it is slightly annoying. The secret is to lower the top speed set using the right scroll wheel and then stay with your lane of traffic. If you want to be a speed demon, set the speed to the approximate speed of vehicles in the fast lane and accept that NOA will keep moving you into the fastest lane.

The best advantage of using NOA is that at the end of the driving day, you feel much less tired than you would if you had had to be focused on every turn of the wheel and press of the accelerator and brake all day.

Vehicle Maintenance

For our first 12 months of ownership, we have only had one maintenance event: a tire rotation for \$48 performed by Tesla Mobile Service in our driveway.

Alison & Tim Benford



Why Toyota Doesn't Really Sell Electric Vehicles

By David Linklater

Pure-EVs are a small part of NZ's electrified vehicle fleet – but there's still a lot of choice.

Everybody's talking about electric vehicles (EVs) in New Zealand at the moment and it seems like almost every major carmaker is focused on EV power in some way.

NZ is theoretically the ideal environment for EVs, with over 80 per cent renewable electricity.

So you might think it strange that Toyota, NZ's number one car brand and



DAVID LINKLATER

Pure-EVs are a small part of NZ's electrified vehicle fleet - but there's still a lot of choice.



Prius Prime is only Toyota plug-in sold new in NZ... or anywhere really.

a pioneer of alternative eco-power with its hybrid engines, doesn't have any pure EVs and only one plug-in of any kind: the rather niche Prius Prime.

In fact, contrast Toyota's global approach with Volkswagen Group and the Renault-Nissan Alliance (together they are the world's three largest passenger-car producers).

continued next page



Toyota NZ CEO Alistair Davis: will take EVs a while to catch up to Toyota's hybrid CO₂ reduction contribution.

None of this is strange at all says Alistair Davis, chief executive and managing director of Toyota NZ.

Toyota argues its volume-selling petrol-electric hybrid technology (which saves about 30 per cent in fuel consumption compared with conventional petrol power) is doing more to address climate change than the brand could achieve with a much smaller number of costly plug-in vehicles.

“We don’t sell EVs of any kind to any extent around the world,” says Davis. “We’ve been a bit resistant to going back into EVs – you’ll remember we used to be into them heavily in the 1990s with the EV RAV, which was pushed strongly in California.



Toyota RAV EV from the 1990s: been there, done that?

“Part of it is that we haven’t got the cost structure right to be effective in making a real difference to climate change.

“The reason for EVs is principally to do with carbon footprints and climate change. But the only countries selling large volumes of EVs have heavy government subsidies... and basing a business on government incentive is slightly risky.

“There’s also the problematic issue that there’s not much point producing EVs if the electricity comes from burning coal. All you’re doing is moving the fossil fuel problem from the car to the electricity company.”



Hybrid theory: smaller eco-gains than EVs, but on many, many more vehicles.

Davis acknowledges that NZ is uniquely suited to EVs with its renewable electricity, but also reminds that we’re an exception rather than the global rule. And while local power is 80 per cent renewable, it’s only 50-60 per cent carbon free: hydro and wind qualify, geothermal does not.

Davis argues hybrids still allow more people to make more of a collective difference to climate change right here and now, because the automotive industry is still a long way off making EVs truly affordable and practical.

“Some of the spending that big car companies have put into EVs is just astronomical. They’re all searching for how to get energy density into batteries to get [good] range, but nobody’s really got a breakthrough.



Prius generations three (2009-15), two (2003-09) and one (1997-2001).

“Remember that 80-90 million cars are sold each year and only one million of them are EVs. The costs of development are being spread over a tiny number of vehicles. When we

continued page 30

Toyota Sales

continued from page 29

get millions being sold, then we'll have economies of scale."

Davis says that the 14,000 electrified vehicles Toyota has sold new in NZ over the past decade save about 12,000 metric tonnes of CO₂ each year.

"Most of those 14,000 vehicles are still on the road. If you assume a hybrid will last about 20 years - an EV will be a little bit less because of the batteries - then the carpark we already have is going to save about 250,000 tons of CO₂ over that time.



Prius (left) and Mirai hydrogen car (right): together soon on Kiwi roads?



Hybrid power is key to the all-new RAV4. This is the top-line Limited model.

"It's a big contribution towards CO₂ reduction. It's going to take pure-electric cars some time to match that."

Toyota NZ has seen a surge in sales of hybrid models in the last year: Toyota/Lexus totalled 2090 in 2018, up 50 per cent over the previous year. It also sold 690 used-import hybrids: mostly Aqua (known as Prius C in NZ), but also the regular Prius, both conventional and previous-generation PHV (Plug-in Hybrid Vehicle) models.

Hybrid power has spread from Prius and Camry to a greater variety of Corolla models and has now reached the RAV4 SUV for the first time – where it is expected to account for at least half of sales.

Toyota says its entire model lineup will be hybridised by 2025.

Toyota hasn't totally shunned the concept of plug-in cars. It's been in a joint venture with Mazda (another

company that's not super-keen on EVs) since 2017 to develop a shared plug-in platform, which will result in a variety of EVs (both pure-electric and hybrid) for suitable markets – perhaps as early as this year.

You could also argue that Toyota has simply leapfrogged the plug-in revolution in favour of hydrogen power. It claims to have spent a decade developing the Mirai sedan (just as it did the original Prius), which is still an electric car but runs on hydrogen. No plug required and it has similar refuelling time and range to a conventional petrol car.

Mirai is still a relatively exclusive, hand-built model only available in select markets where hydrogen refuelling infrastructure exists. But over 5000 have been sold in the United States, Japan and Europe.

It's likely Kiwis will get a chance to see Mirai in action soon. It's possible Toyota NZ will demonstrate a handful of the vehicles on local roads by the end of this year – possibly with a hydrogen tanker to refuel them.

<https://www.stuff.co.nz/motoring/111836499/why-toyota-doesnt-really-sell-electric-vehicles>

In Norway, Electric Cars Outsell Traditional Ones for the First Time

EVs were nearly 60% of sales in March



A Model S electric car leaves a Tesla service center in Oslo, Norway, in July 2018.

The perks, however, are to be phased out in 2021.

Norway's Parliament has voted to require that all new cars sold in the Scandinavian country be electric by 2025.

Countries around the world are trying to encourage more people to buy electric cars as part of the effort to reduce carbon emissions and fight climate change. China, the world's biggest auto market, has also provided big incentives as it tries to clean up the country's air pollution problem and gain a lead in new technologies.

By Associated Press

COPENHAGEN, Denmark — In a symbolic first, electric cars outsold fossil fuel-powered ones in Norway last month.

Christina Bu, the Norwegian Electric Vehicle Association's general secretary, said Monday that 58.4% of new cars sold in the country in March were battery-powered, calling it "historically high."

Tesla Inc.'s TSLA, +0.75% delivery ramp-up of Model 3 sedans contributed to the March surge.

Bu added that electric cars' share of the market in the first three months of 2019 was 48.4% and is expected to hover around 50% for the whole year.

"Norway shows the whole world that the electric car can replace cars powered by gasoline and diesel and be an important contribution in the fight to reduce CO₂ emissions," Bu said in a statement.

Norway, a wealthy European nation of 5.3 million, has provided big incentives to boost electric car sales. It waived hefty vehicle import duties and registration and sales taxes for buyers of electric cars to boost sales. Owners don't pay road tolls and use bus lanes in congested city centers.



In this Nov. 26, 2014 file photo electric cars queue in the bus lane, left, on the main road into Oslo, Norway. In a symbolic first, electric cars outsold fossil fuel-powered ones in Norway in March 2019. Christina Bu, the Norwegian Electric Vehicle Association's general secretary, says sales figures show 58.4 percent of new cars sold in the country in March were battery-powered, calling it "historically high." (Lise Aserud/NTB Scanpix via AP, File)

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<https://www.marketwatch.com/story/in-norway-electric-cars-outsell-traditional-ones-for-the-first-time-2019-04-01>

Here Are C-Hr and Izoa, the First Fully Electric Toyotas for China



Toyota C-HR Electric Toyota C-HR Electric Image Credit: Toyota

Toyota has officially unveiled its C-HR-based electric crossovers for the Chinese market. The GAC Toyota-built electric C-HR and the FAW counterpart, IZOA, appeared at the Shanghai Auto Show today. The models are the first fully electric Toyotas for China, and sales begin next year.

No figures have been released for the electric twins, nothing about the attainable range, available power or performance, but more information is sure to be made available later. The C-HR rides on the same TNGA platform as the new Corolla, so the BEV-ization of the Corolla is surely just a matter of time, and it's not unreasonable to expect a global fully electric variant of both the Corolla and C-HR in the near future if the Chinese endeavor is anything to go by. Still, as recently as late 2017, a Toyota executive said that “long

range” battery electric cars were not part of the plan because of the time it takes to charge them, but that a new quicker-charging solid state battery was in the works for early next decade.

Toyota declared that “more than 10” battery electric vehicles will debut in the early 2020s, and the plan is to sell more than 5.5 million electrified vehicles per year globally by 2030 — that includes hybrids. Since 1997, Toyota has sold almost 13 million electrified vehicles.

For the Chinese market, the Shanghai show's Toyota stand also features hybrid models of the RAV4 and the Alphard/Vellfire, and plug-in hybrid versions of the Corolla and Levin.

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<https://www.autoblog.com/2019/04/16/toyota-electric-c-hr-china-shanghai/?ncid=edlinkusauto00000021&yprtr=yahoo>

Volkswagen to Premiere 7-Seat Electric SUV Concept Car In Shanghai

German carmaker Volkswagen has officially presented the “ID. ROOMZZ” at the 2019 Auto Shanghai motor show in China. It is slated to be an all-electric SUV and is to be initially launched in the Chinese market in 2021.

The ID. ROOMZZ is a five-metre multivariable electric SUV which is aimed at family as well as business sectors. It is designed to follow the clear, homogenous lines of the rest of the ID. Family. The chief designer at the Volkswagen brand, Klaus Bischoff states, “This SUV is a monolith, appearing to be seamlessly

machined from one solid block. The battery-powered ID. ROOMZZ moves effortlessly – silently and without emissions.”

The SUV is equipped with Volkswagen’s latest IQ. DRIVE systems which make it a level 4 autonomous vehicle. Using the ID. Pilot mode, the ID. ROOMZZ can effortlessly navigate through traffic without driver input. It is also built around the variable interior concept, which offers a great degree of seating configurations to

the occupants. This can not only be adapted as per the passenger’s personal wishes but also according to the respective driving mode.

It is powered by a pair of electric motors, which can continuously drive both axles with a system output of 225 kW or 306 PS of maximum power. This can accelerate the SUV to a 100 km/h from a standstill in 6.6 seconds, with an electronically regulated top speed of 180 km/h.



<https://news.yahoo.com/volkswagen-premiere-7-seat-electric-suv-concept-car-120326430.html>

Are Tesla Cars Easier to Repair Than a Traditional Car?

By Clara Smith, former System Engineer at Motorola Solutions (1989-2005)

How should I attempt to answer this question? Easier for whom? A certified Tesla mechanic? An independent mechanic? The owner of the car? Easier to repair what? The body after a collision? The drive train? All of the above?

As an owner of a Tesla Model 3, I am not particularly concerned about the possibility of needing repairs. When I think back to the repairs I've needed on all the traditional vehicles I've owned, the things that stand out are drive train related. Except for wheel bearings, axles, brakes, and tires, the things that broke or wore out on other cars are not present in the Model 3. The need for repairs, the types of repairs, and the cost of repairs for a Tesla car are much different than for internal combustion automobiles.

Is it easier to replace the electric motor in a Model 3 than to replace the engine in a fossil fueled car? Absolutely! This is a photo (from Engineerix) of the rear motor of a Model 3. The entire rear drive train, motor, differential, and wheels can be disconnected from the battery, cooling, and electrical systems and dropped out of the car in minutes, making it relatively easy to swap out the electric motor, differential, and inverter.

Compare that to what is involved in replacing this Honda Civic engine (see the two photos top right).

The traction battery of the Tesla Model S can be replaced by unbolting it from below (not the case for the Model 3 which is bolted from inside the cabin).

What distinguishes cars today from those 50 years ago is the use of electronics. Few modern cars can be repaired by the owner when it involves the large numbers of microprocessors built into cars today.

Here, again, Tesla has other cars beat hands down. You would think that the electronics in a Tesla are far more complicated, and, therefore, more difficult to repair than in a modern ICEV, but you would be wrong. The electronics in a Model 3 are neatly integrated into just a few centralized microprocessor boards (inverter, battery management, screen computer, a right and left vehicle controller, and Autopilot), which can be diagnosed and reprogrammed remotely. For many problems, the owner doesn't even have to take the car into a service center.



Of course, there are many other things in a Tesla that can break. The ease of repair often comes down to accessibility. How easy is it to get to the faulty component for replacement. Here, again, due to the simplicity of the Model 3 design, it's much easier to replace components. This photo shows the front trunk compartment after removing the luggage liner. It's a mechanics dream to work on.

<https://www.quora.com/Are-Tesla-cars-easier-to-repair-than-a-traditional-car>

ALTERNATING CURRENTS

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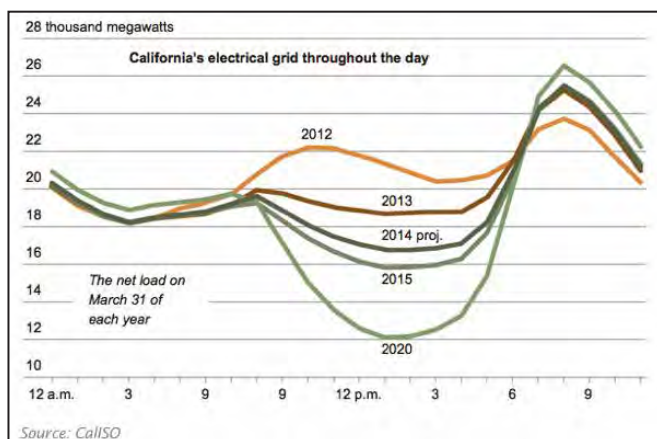
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Will EVs Make the Grid Fail?

By Bruce Westlake, Michigan
Electric Auto Association &
SalineBeGreen

One of the questions that come up all the time for EV owners is 'Won't the grid fail if we start charging a lot of EV's?' The answer to that is maybe it will falter if not managed properly. California and Norway have a head start on the rest of North America and can show what can happen as more EVs and solar generation are added to the grid and how we can manage the load.



set by the increased use of LED lighting.)

The trick is to move the solar generation to offset EV charging or move EV charging to mid day. There are several ways to accomplish this.

1. Power companies can incentivize their customers to charge EVs during solar generation hours,
2. EV owners who have solar generation can be incentivized to use their solar power to charge their EVs.

First, let us start with some grid terms that are important. Grid load balancing is how power companies maintain the grid voltage at the level we all want to have delivered to our houses without overloading the transformers in the system. The grid is controlled by Ohm's Law $P=IE$ or Power (in watts) equals I (or current in amps) times E (Voltage in volts.) As you can see, any one of these rising or falling will affect the other two.

Power companies balance the grid by controlling the two they have direct control over – voltage and current and in some rare instances ask their customers to control their power draw. They are constantly adjusting the voltage to deliver the correct voltage after the last transformer in the grid and adding or taking away generation as needed to match the loads it sees on the grid.

There are two different types of generation plants needed to supply constant power to the grid base load that is on all the time and 'peaker plants' that can start up quickly and modulate power as needed. As the load (I) increases either the voltage (E) has to drop or the Generation (P) has to increase to balance the formula out.

Customers don't use power at a constant level so the load curve varies during the day. The resulting load curve looks like a duck so it has become known as the duck curve. Two things will have a dramatic effect on the duck curve in the future: solar energy and EV charging. The chart from California below shows the dip mid day from solar generation increasing (reducing the load) and the load from EV charging increasing in the evening (partially off-

3. EVs can be fitted with bi-directional charger to feed back power to the grid when needed. This is called V2G, for Vehicle to Grid.
4. Solar generation can be stored and added to the grid during peak times using batteries or mechanical storage such as moving water to the top of water tanks or hills and generating as the water leaves the pool or tower.
5. Refining gas from crude oil uses on average seven kWh of electricity per gallon refined*. Moving that seven kWh of power generation from refineries to customers' EV chargers will supply enough energy to power the average EV for 24 miles or about how far the average ICE car travels on a gallon of gas. This illustrates that the grid is currently capable of powering all the EV's we need to replace ICE cars, we just have to move where the power is delivered.

How active and effective our power generation companies are will determine how healthy the grid will be in the future. EV batteries represent six times the storage capability when compared to stationary batteries so utilizing that resource as storage or changing when these batteries are charged is critical. However, many power companies still use outdated time of day incentives to move charging to evening hours and spend their efforts discouraging private solar installations.

* Ed: This number was once promulgated by Nissan, then quickly "pulled back" and vanquished because it varies all over the map. This speaks volumes to the veracity of the claim. The thermal energy utilized in the processes in BTU/hour sometimes comes from burning other petroleum products and depends on a variety of factors.



Tesla Presents Autonomy Day

By CE Staff

Tesla has showcased a deep-dive background and progress update to investors and other interested parties on their fully-custom silicon chip and their AI-based software, trained by more than 400,000 Tesla vehicles. The unveiling of this project revealed a highly specialized computer to handle the demands of driving car under computer control. Creating such was never before done, and many have tried. In the early days, DARPA has funded projects for visual navigation over terrain and roadways (See: <https://apps.dtic.mil/dtic/tr/fulltext/u2/a160642.pdf>), with much research effort poured into making it a reality. Here is a spectacular competition they enabled https://en.wikipedia.org/wiki/DARPA_Grand_Challenge.

Alas, back then, on-board computing power was always lacking. The competitors loaded trucks with fancy computers and liquid-fueled electric generators producing power to run them. Fast forward less than a decade: we see a continual shrinkage of device geometry and increasing computing power on chips, (Moore's Law) coupled with better/smaller sensors – and the goal getting tantalizingly closer.

All Tesla cars made since October 2016 have 77 GHz fog-penetrating radar, optical cameras and short-range ultrasonic sensors so that vehicle surroundings can be digitized and acted upon. Using commercial off the shelf (COTS) graphics processing units (GPU), specialized computers good at crunching images — Tesla had reached their limits. They recognized this over three years ago, and embarked on an ambitious next task: to create a specialized computer, *dedicated to only the task of self-driving their cars*. No competing chip could do the job, from Nvidia, Intel, AMD, TI or anyone else. They were too “general purpose”, and included some instructions that just never would be used for any task. Hence — a special purpose dedicated piece of silicon was born. The numbers are astonishing: the complexity, the bandwidth of the internal buses, the gate count, the transistor count, the power levels it dissipated while running. This herculean effort delivers performance that Nvidia admits “has raised the bar for autonomous driving”.

The video of the event is available on YouTube, spanning nearly four hours. However, *CleanTechnica* has supplied a shortened version with opening image recycling for 1:05

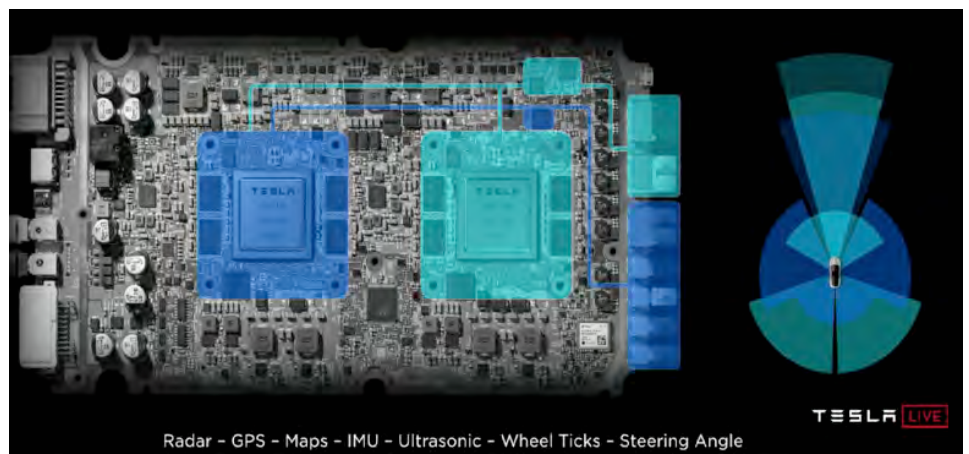
trimmed off! For those interested in learning about this computer hardware architecture, the software behind the processing and the system integration effort — it's a highly involved, yet very dry presentation, as are most engineering presentations! https://youtu.be/nou8ZTsf4_c It is over 2-½ hours long.

Here is our summary with some notes here from Zach Shahan's synopsis of the presentation, and our comments interspersed.

Tesla's VP of Silicon Engineering, Pete Bannon in 2016 asked Elon Musk if he was really willing to spend the money needed to create a custom silicon system. Elon asked, “Well, will we win?” To which Pete answered “Of course!” So after 18 months of architecting and designing, they released it to a fab house in Texas. First article bring-up went smoothly and worked as expected. (That alone is a testament to the verification tools and effort expended by the team. Such a task is considered not just hard, but very hard.)

The Full Self Driving (FSD) computer board shown here fits between the glovebox and firewall in the front of the car. A dual-redundant fault tolerant system, with many features included (cryptographic security, safety failovers, etc.) so if one half fails, the car can continue. The inputs to this board are listed at the bottom of the slide, and the sensor coverage is depicted on the right side surrounding the little car.

The two blue squares with the Tesla label are the packaged

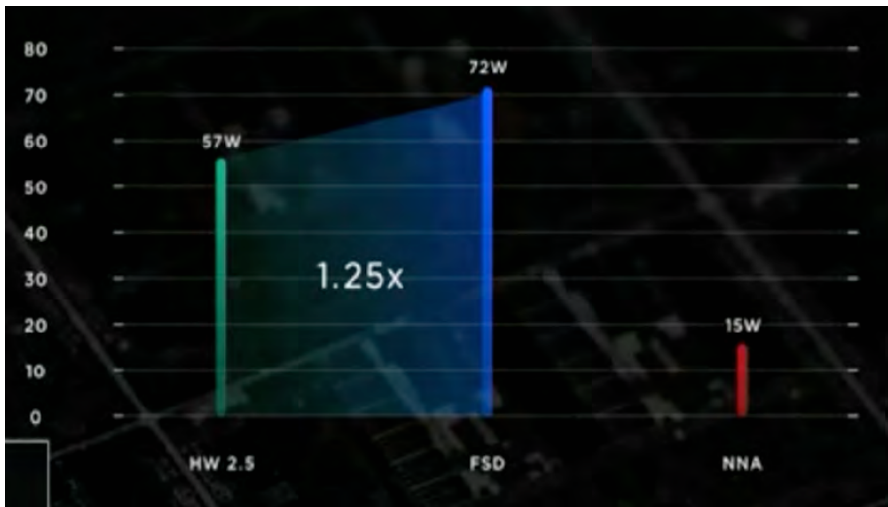


FSD computer chip. In the video, the layers are peeled back and the massive interconnect to the board exposed, and here is a photo of the die itself. Subsequent slides reveal astonishing specifications, on the right side of the chip floorplan images, for those who want to see the major building blocks.

continued next page

The repetition of some internal structures makes for a pattern resembling a farmer's field, all housed on a thin slice of silicon the size of your big toe!

In an EV, power wasted is lost driving range. Tesla has learned to wring out every last milliwatt from their cars, and thru successive over-the-air (OTA) updates, reduced the parasitic losses (sometimes called a "vampire load") to the point that the car typically loses only a few miles overnight when not used. A 25% increase in load was put on their system by the new FSD computer, very acceptable considering the huge performance boost achieved! This chart shows a modest increase in power as compared to the latest Autopilot hardware (version H/W 2.5), and that Neural Network Accelerator (NNA) only contributed 15 watts of that total drawn. They expect this foundation will enable them to make their vehicles fully autonomous (subject to regulatory approvals) through over-the-air software updates. They then can, with their customers use the Tesla ride-hailing network fleet (each called a robotaxi) to generate income. Elon stated that "The power of the system has a massive impact on city range, which is where we think most of the robotaxi market will be." Tesla is estimating a 12% cost savings compared to their previous NVIDIA system. Amortized over the next million vehicles they will build, that's nothing to sneeze at.



Stanford educated Dr. Andrej Karpathy discussed their FSD software, the neural network accelerator which the FSD chip includes, and provided insight into how their machine learning is done. The fleet collection of images is ongoing, even when autopilot is not enabled, just so that database can be further populated and refined. He introduced how various things function. Using that accumulated database of live real-world cases, the way Tesla actively searches for edge cases is actually remarkable. When a vehicle approaches an edge case which Tesla is searching for — they ship it back

for further "training". Such iteration refines the boundary conditions so that they are no longer fluid. That ability to automatically extend car training data from such a huge and growing fleet is holy grail of machine learning. So, Tesla has solved one of the biggest problems in machine learning.

Explaining how FSD works, how the neural net architecture works, how the entire Tesla fleet is learning, and how a handful of edge cases shows convincingly why you need real-world data, not simulated case injection. The constant review and re-issuing of data "qualifying filters" allows the software team to collect all important real world situations which no simulator would be able to capture. A strong case for the approach being taken was made, that would persuade even the most stubborn of viewers. This is overlooked by many pundits, yet Tesla has applied some serious effort and talent to this product.

We also learned that Tesla's early testing of this new FSD hardware produced a 21 times improvement in image processing capability or about 2,300 images per second..

Elon notes that Tesla had finished this design nearly two years ago and the architects have already started on the next system design. Of course, they are mum about it, but he claims that they're about halfway through it.

During the video, someone asked Elon about the use of Lidar. He responded emphatically, "Lidar is a fool's errand. And anyone relying on Lidar is doomed." We covered this topic in the September 2018 issue of *Current EVents* Volume 50 No. 9 on page 29. Elon stated flatly, "they're all going to dump Lidar, mark my words. ... In cars, it's freakin' stupid. It's expensive and unnecessary, and as Andrej was saying, once you solve vision, it's worthless". A bit later he muses "If you're gonna use active photon generation, (Ed: Lidar projects a laser beam and watches for its reflection) don't use [a]

visible wavelength, because with passive optical, you've taken care of all visible wavelength stuff. You wanna use a wavelength that's occlusion-penetrating, like radar. Lidar is just active photon generation in the visible spectrum." [Ed: Radar has a much longer wavelength. For the visible portion, the Tesla cars have a plethora of cameras.]

To further bolster his claim, Elon explained that SpaceX developed its own Lidar to dock to the space station, and he personally led that project. He offered that he doesn't

continued on page 47

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 of Interest

Ben Rich - Electric Biker: 1000 Miles in a Tesla Model 3 in One Day



This is Rich Benswing in his new Tesla Model 3 mid-range battery pack going from NJ to Florida in one day.

This video shows how straight-forward cross-country driving in a Tesla Model 3 is, with the Traffic Aware Cruise Control, the self steering, and the convenience of Supercharging.

His shortest “boost time” was 13 minutes, his longest 22 minutes. Covering more than 1094 miles with 8 charging stops, about every 2-3 hours, he surely arrived more relaxed and less frazzled than driving a noisy (fatiguing) ICE powered car.

That trip cost him only for electricity since he doesn't have unlimited driving like the older cars sold by Tesla. But he shows lots of



hands free driving, and speaks of the need to pay attention.

He started with temperatures in the 50's from NJ to VA, then 60's from NC to FL. It didn't cost him anything – \$0 cost to boost at the Superchargers for him (which would cost ~\$75 according to Tesla's website.)

From home he drove – 162 mi
1-Maryland House (Aberdeen) 130 mi
2-Fredericksburg, VA – 171 mi
3-Rocky Mount, NC – 120 mi
4-Lumberton, NC – 123 mi

5-Santee, SC – 110 mi
6-Savannah, GA – 103 mi
7-Kingsland, GA – 131 mi
8-Port Orange, FL – 44 mi
Titusville, FL

<https://www.youtube.com/watch?v=8Aq5qI87SrA>

Car Tech 101: How to charge an electric car while demystifying the tech – Cooley On Cars



This is a summary of the concepts involved in charging your EV, for the uninitiated. Called “Car Tech 101: How to charge an electric



car while demystifying the tech”, the Roadshow video narrator Brian Cooley covers just the basics of conductive and wireless charging and mentions the insurmountable issue with battery swapping. (Experienced EV drivers can just skip over this — but remember to tell those wanna' be EV drivers about this, it's good for them!) <https://www.youtube.com/watch?v=TBBpU7uPCJA>

Don't Miss These ...(cont.)

Toyota Shows Off Electric Vehicle Concept Car That Only Has One Front Seat



The Rhombus is a concept car for a battery-powered electric vehicle targeted at consumers born after 1990. Toyota 7203. T-JP brought a crop of hybrid and fully electric vehicles to the Shanghai Auto show this year. The Rhombus, pictured, is a concept car for a battery-powered electric vehicle targeted at consumers born after 1990, according to a release. 

<https://www.techchannels.com/toyota-shows-off-electric-vehicle-concept-car-that-only-has-one-front-seat/>

Aston Martin DB6 Volante mk2 classic electric conversion | Fully Charged



Flashback to one of the most loved classic British cars – a Bond car. For a variety of reasons, owners may soon be able turn to alternate power plants for their classic rides. Here Johnny, from FullyCharged, shows what the classic car OEM manufacturer plans to do with an Aston Martin DB6 Volante mk2 – an EV conversion! Mimicking the removed 4-liter six cylinder engine, with the same weight distribution, top speed, range, etc. we can call it a ‘heart transplant’. The discussion centers on the concept prototype and how their goals have evolved. (Spoiler alert: no images of the inner workings are released!) 

<https://www.youtube.com/watch?v=PREftlfZuXA>

The Qiantu K50 Is China's First Electric Supercar Coming To The US



Qiantu Motors is an automotive manufacturer from China. It has partnered with Mullen Technologies to bring the K50 electric supercar to US roads in 2020. This car seems to take many cues from Teslas, Corvettes and other American high performance products. Qiantu displayed the K50 at the 2019 New York International Auto Show. An estimated 40 battery-electric vehicles are on display at the NYIAS, and contrary to their popular image as slow and stodgy, many of them put an emphasis on performance, including the new Qiantu K50 by Mullen.

<https://www.youtube.com/watch?v=mGDZYJ9vHdU> 

Power2drive Europe — International Exhibition for Charging Infrastructure and E-Mobility, May 15–17, 2019

The exhibition Power2Drive showcases charging solutions and technologies for electric vehicles and reflects the interaction between electric vehicles and a sustainable and environmentally friendly energy supply. It is an industry hotspot for suppliers, manufacturers, distributors and start-ups in the emerging field of electric mobility and transportation. Our goal is to help companies to develop and distribute technologies and business in the field of traction batteries, charging infrastructure and electric vehicles and to push forward a sustainable future mobility. 

<http://archive.newsletter2go.com/?n2g=imz489mr-oi461m43-l57>

What Tesla Knows About You!



With a title of “What Tesla Knows About You!” presents an interesting (and humorous) episode of Rich Benoit’s Youtube channel “RichRebuilds” exploring what Tesla vehicle architecture has been collecting for the past few years, since on-board cameras have been helping the owners with their tasks. Starting at 1:49, we learn that buried deep in their famous central display console are memory cards which when removed, can reveal remarkable content. For the paranoid owners, maybe you shouldn’t be going to places you are...(?) The car is just like your cell phone – collecting your “preferences data” too! But extraction and examination of this vehicle data is beyond what most of us can do. The point of this is that privacy is far from assured in today’s connected world. He does make a sound recommendation showing how to clear this data ensemble at the very end. Enjoy the zaniness of this interesting nearly 12 minute chuckle!

https://www.youtube.com/watch?v=Kv_y7J9ROxk

The Hidden Features Tesla Will NOT Tell You About!



Kim (of the YouTube channel “Like Tesla”) quickly goes over a list of features in just about eight minutes which many Model 3 owners will enjoy. Some of these are subtle but useful and quite powerful. Included are the parking brake (yes, it’s there), tips on HVAC and radio settings, placing in neutral, preferred selection swipes, quick directional cancellation, cancelling explicit content on streaming music, a broken signal notification on the avatar, etc. https://www.youtube.com/watch?v=_Cnifd78q3Y

Another note: the “Summon” mode enhancement now in “beta-release” allows the car to be brought across a busy parking lot with multiple turns and corners, as opposed to the current “full release” version available today (which does only straight line movement).

<https://youtu.be/QZdnM3F6ydw>

Nikola Rolls Out Trucks for Zero-Emissions Future



Nikola introduced a hydrogen fuel cell Class 8 prototype Dec. 1, 2016, in Salt Lake City, its former headquarters. It is now based in Phoenix.

The day after the presentations here, Nikola offered the public a first look at the trucks as well as two zero-emissions power sport vehicles and another one designed for special forces operations, which included the ability to be operated remotely like a drone.



An interior view of the Tre cab. (Nikola Motor Co./YouTube)

Nikola Motor Co. CEO Trevor Milton, 28 months after unveiling a prototype Class 8 sleeper, recently presented to about 2,000 attendees and a global audience watching online two heavy-duty trucks and three other specialty vehicles he said are ready to spark a zero-emissions future.

The heavy-duty trucks that drove out from behind the curtains one at a time, amid swirling lights and loud music as people put their cellphones on video, were the stars of the event.

As a bright red Nikola Two day cab took center stage, Milton said, "This is a real truck. This is a real [hydrogen] fuel cell," seeming to speak to those who doubted the emerging truck maker would ever get this far.

"We want to transform everything about the transportation industry. With Nikola's vision, the world will be cleaner, safer and healthier," Milton said.

[Read the rest of the article at the URL below]

<https://www.ttnews.com/articles/photos-video-nikola-two-nikola-tre-unveiled>

Nikola World Recap: Five New Vehicles in Two Days



Here is a short forward looking video by Sean Mitchell on the newest Nikola offerings, which reveals new product directions. The discussion explains that their hydrogen refueling stations will be developed with their Swedish partner NEL <https://nelhydrogen.com> at existing US diesel truck stops. There are many speculative statements which are interesting as this is a 'snapshot' in time we can reference again in the future, down the road... It is a very aggressive announcement with huge implications, with some curious items. In their quest to reduce diesel usage, they mention the eye-popping military cost per gallon of diesel, but that is a "delivered cost, to wherever"! So - will these ever become real products? Will this company win a piece of the market? Have a look and you decide!

<https://www.youtube.com/watch?v=5zHPf8mImoo>

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Video and Articles of Interest

First Look At an UNRELEASED Version of a Self-Driving TESLA

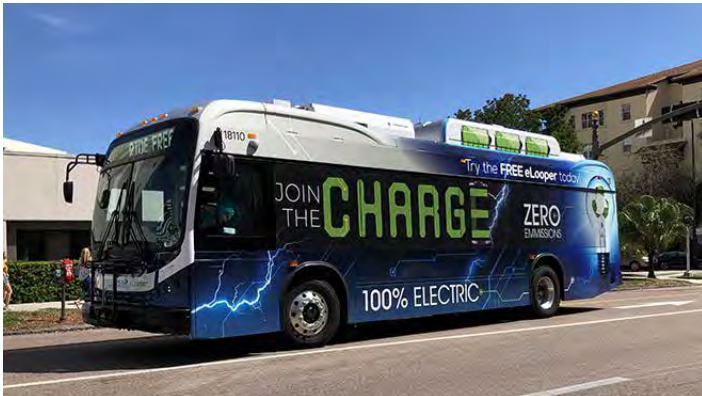


This video titled “First Look At an UNRELEASED Version of a Self-Driving TESLA” shows the new version of Tesla’s “Summon” mode, whereby the car can actually be brought to a predefined location in a parking lot, within a small radius. In earlier versions from the recent past, it could only go in pretty much straight lines, not steer around obstacles. Also demonstrated is an “obstacle” where the Youtube channel owner stands bravely in the way of the vehicle which has been requested to go to the corner (...for bad behavior?). This means you can bring your car over to you instead of crossing a parking lot in a downpour. This video exemplifies parts of what the future holds.

<https://www.youtube.com/watch?v=QZdnM3F6ydw>



America’s Biggest Cities Could Save Up to 60% On Fuel by Electrifying Buses



America’s largest metropolitan areas could save an average of 37 percent on fuel costs by electrifying buses and light-duty fleet vehicles, according to a report by EV charging company AMPLY Power. The report also found that charging regimes focused on off-peak hours can save up to 60 percent compared to internal combustion engine (ICE) vehicles and unmanaged EV fleets.

To conduct the analysis, AMPLY compiled public data to create a dollar-per-gallon equivalent (DPGe) rating, which the company says offers a direct comparison between the

price of electricity and gas or diesel. A white paper provides a price comparison of electric-to-gasoline for the 25 largest cities in the US.

To calculate DPGe, AMPLY incorporates region-specific electricity rates, charging strategies, and vehicle class efficiencies into a single metric. The cities with the highest estimated savings from electrifying buses are Portland, Oregon (82 percent), Tampa, Florida (79 percent), and Seattle (78 percent). The city with the lowest savings is Detroit (12 percent).

AMPLY also found that 19 of the 25 cities could decrease fuel costs by electrifying light-duty fleets. The cities with the highest savings include Portland, Oregon (69 percent), Seattle (63 percent), and San Francisco/Oakland (62 percent).

Vic Shao, AMPLY CEO, said, “Optimizing fleet electrification programs to maximize fuel savings requires planning and due diligence based on a fleet’s location and other factors. While this may seem complex, we challenge fleet operators to embrace these intricacies, and realize the real economic value in switching to electric.”



<https://chargedevs.com/newswire/americas-biggest-cities-could-save-up-to-60-on-fuel-by-electrifying-buses/>



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movie

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The Other Electric Bus

By: Nicolas Pocard

Sponsored By Ballard

Around the world, electric buses are providing a smooth and quiet passenger experience with zero emissions at the tailpipe. As governments and cities take the lead in placing increasingly strict regulations and restrictions on internal combustion engines, transit agencies and operators are looking at electric buses as the best option to transition their fleets to zero emissions, without affecting service levels.

Varying Electric Bus Technologies

There are several different electric bus technologies. The principal difference is how the electricity is delivered to the motor— whether through 100% battery power, or through a hybrid battery -fuel cell power train with an onboard hydrogen fuel cell “charger” as power generator — referred to as a fuel cell electric bus or FCEB.

The most popular electric bus option is currently the 100% battery bus. This electric bus option recharges batteries using either roadside fast chargers or depot overnight chargers. However, as these systems are implemented at larger scale, challenges have arisen. The challenges occur with range, route flexibility, and electric infrastructure complexity.

The fuel cell electric bus, however, addresses these challenges while also retaining the advantages of the comfortable, smooth, near-silent, zero emissions ride synonymous with an electric bus.

What is a Fuel Cell Electric Bus?

The fuel cell electric bus is a 100% electric bus with a hybrid battery-fuel cell power train. The fuel cell system acts as an onboard battery charger, using hydrogen as a high-density energy source. The fuel cell provides electricity to the electric drive and maintains the bus battery at an optimum charging level. In California, 50 fuel cell electric buses will be in operation in 2019. Today, several bus manufacturers such as New Flyer and Eldorado currently offer 40ft and 60ft fuel cell electric buses, powered by Ballard systems, as a standard option for their electric bus platform. Such buses have passed Altoona FTA testing.

Hydrogen as a Fuel Source

Hydrogen stores twice the energy of a standard bus battery at a fraction of the weight. As a means of storing and transporting low-carbon fuel, hydrogen is an effective alternative to the electric grid. When produced from renewable energy,



hydrogen is a true zero emission fuel that also enables grid-balancing and large-scale, long-term energy storage.

Fuel cell electric buses provide the operator with zero emission transit without compromise. Some of the benefits of fuel cell electric buses include:

- Up to a 330 mile range before refueling
- Consistent power delivery during duty cycle
- Eliminated need for roadside charging infrastructure, just as with CNG
- Fast refueling — less than 10 minutes of refueling delivers 18 hours of continuous service
- Compact central fueling infrastructure at depots
- 1-to-1 replacement to conventional buses

Building an electric charging infrastructure often requires additional, unpredictable costs for upgrading power grids and facilities. Hydrogen technology, however, delivers scalable infrastructure with minimum changes to the electrical grid infrastructure and multiple, competitive options for long supply agreement.

What to Know Before Going Electric

Around the world, transit systems are “going electric” and the trend is irreversible. Electric buses are the proven option for true zero emissions at tailpipe. The choice that cities and transit authorities now face, though, is how to recharge their electric buses. Should transit agencies install a roadside-opportunity charging infrastructure? A system of overnight depot chargers? Or a centralized hydrogen refueling facility?

Ultimately, cities must make these decisions based on their unique operational requirements, geography, and climate, as well as the availability and price of electricity and hydrogen and local constraints. Many cities will choose a combination of battery buses and fuel cell electric buses, which provide effective emission reduction along with fast refueling, extended range, and route flexibility for transit agencies worldwide.



<https://www.act-news.com/news/the-other-electric-bus/>

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Tesla Autonomy

continued from page 37

have a fundamental prejudice against Lidar or lack of experience with it — he just thinks ‘it’s stupid to use in cars.’ Besides, Lidar hardware is huge, thereby killing your aerodynamics, and finally, is still very expensive today. As we emphasized in CE last fall, radar cuts through fog, dust, and snow. Lidar just can’t. We couldn’t agree more.

“The [consumed] power of the system has a massive impact on city range, which is where we think most of [our eventual] robotaxi market will be.”

The final presentation came from Stuart Bowers, VP of Engineering. He explained how the hardware with the neural network acceleration has learned to handle vehicles cutting in front of a FSD car, how all cars benefit from that exposure and learning. He states “Navigate on Autopilot [Ed: which today will transport passengers from freeway exit to freeway exit] provides lane changes without confirmation. “You can sit there, relax, put your hand on the wheel and just oversee what the car is doing. [Ed: Since enabling qualifying filters on the NNA system, the system has learned well, and has nearly perfected things.] We’re actually seeing over 100,000 automated lane changes per day on the highway system.” Give it a few months, and we would suggest that is the solution for that one driving action.

In order to have a truly self-driving car or robotaxi, you really need redundancy throughout the vehicle on the hardware level. Elon spoke about the future plan for Tesla to collect their lease car returns, and deploy them in city centers without drivers at all. [Our]... “whole system, from a hardware standpoint, has been designed to be a robotaxi since basically October 2016, when we rolled out Autopilot 2. Next year, we’ll expand the product line with Model Y and Semi and we expect to have the first operating robotaxis, *with no one in them*. Any customer will be able to add or remove their car to the Tesla Network. We expect this to operate ... [as a] sort of a combination

of an Uber and an AirBNB model, and Tesla would take 25 or 30% of the revenue. And in places where there aren’t enough customer cars, we would just have dedicated Tesla vehicles.” Highlighting how suddenly this will all materialize, Elon said, “The fleet wakes up with an over-the-air update. You’d be able to summon the car from the parking lot and just get in and go for a drive. [Ed: this capability has already been demonstrated in beta-version Summon today.] ... The fundamental utility of the vehicle increases by a factor of five.”

Elon sees the attempted use of lidar and HD maps as false solutions that will just slow down progress. “If you need a geofenced area, you don’t have real self-driving.” Looking ahead, he believes that Tesla will favor production of cars with somewhat smaller battery packs in order to maximize the fleet size and miles/km driven, to gather more data.

During the rest of the presentation, Musk painted his vision of the future. Tesla is designing cars for a million-mile life, like commercial semi-trucks. The drive units today are designed, validated, and tested for 1,000,000 miles of operation. Shedding some light on the current cost of a Model 3, he stated that a robotaxi is less than \$38,000 and that they expected that number to improve over time. The current battery pack is [good for] about maybe 300,000-500,000 miles. The new battery pack that is probably going into production next year is designed for 1,000,000 miles of operation with minimal maintenance. “We’ll actually be adjusting tire design and really optimizing the car for a hyper-efficient robotaxi.” “At some point, you won’t need steering wheels or pedals and we’ll just delete those. As these things become less and less important, we’ll just delete parts.”

Thereafter the discussion was in a visionary cloud, presuming that many regulations not yet in place would come to fruition. Viewers can watch the rest of the presentation but we know there are many potential pitfalls. The wrap up emphasized that customers considering a new car would be insane not to consider a Tesla.





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