Electric Auto Association

CURRENTEVENTS

September 2018 Promoting the use of electric vehicles since 1967 Vol. 50 No. 9

The WEST COAST Electric Highway

West Coast Electric Highway Now Complete With Thousands of Chargers in Operation.

Intro: Marc Geller

The West Coast Electric Highway—one of the longest electrified corridors in the world—is demonstrating that electric vehicles are here for the long haul. The West Coast states of California, Oregon, Washington and the province of British Columbia laid out a shared vision in two 2008 agreements for an alternative fuel corridor along I-5 and Highway 99 to promote the use of biofuels, hybrids, electric or zero-emission vehicles, and hydrogen-fueled vehicles. Now boasting thousands of chargers, the West Coast Electric Highway makes it possible for an intrepid zero emissions vehicle (ZEV) driver to drive from Baja California to British Columbia, charging as needed at stations spaced every 25-50 miles along the highway.

The now-completed corridor supports both ZEV commuters in urban areas and long-distance road-trippers. Other segments of highway branching off from the main north-

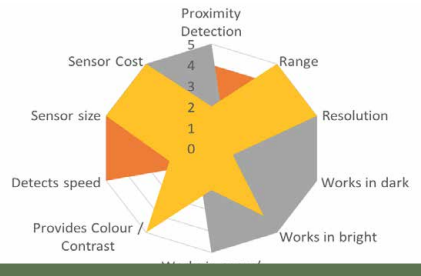
continued on page 4

Northeastern US DC-FC Corridors

... page 10

EVSE Install Photo Essay

... page 25



Lidar vs Radar in EVs

... page 29

Articles

Columns

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Current EVents Back Issues

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

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

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

There are Obstacles . . . But the Future is Bright

What are the big obstacles to EV adoption?

Just to name a few . . .

1) **Public awareness.** Myths abound, including, "EVs still too expensive", irrational concerns about the current status of battery technology, lack of knowledge about incentives.
2) **Charging infrastructure.** While many installations are planned, it's slow and there are still gaps, especially a lack of DC fast charging for non-Tesla vehicles along major highways.
3) **Ineffective Sales Channel.** Automakers and dealers are still not fully engaged. They simply do not market EVs the way they do gas cars. They rarely advertise and are slow to come out with new longer range BEVs. When they are released, some limit the quantities. For example, rumor has it that only 250 of the new Hyundai Kona BEV SUV with approximately 250 mile range will be initially released this Fall in California.
4) **Danger of Losing Incentives.** With the Federal Tax credit at risk of phase out, it will be absolutely essential to pass legislation to "lift the cap" for automakers on numbers of EVs sold in order to keep EVs' prices on par with gas cars, until battery prices come down (estimated 2025).
5) **Time is not on our side.** Without an aggressive movement towards clean fuel, vehicles, our children can end up in a dystopian world. Our parents did not recognize the potential harm coming our way, but we do. If when our children note that we knew about Global Warming and ask us, "What did you do to protect our future?"

Raejean Fellows

How is the future bright?

Since we know that new technologies are sold best by word of mouth, Electric Auto Association, Plug In America and Sierra club are strong organizations poised to get the word out, most notably recently with over 300 NDEW events. Our events get better and stronger every year reaching hundreds of thousands across the U. S.

It is the strength of our grass roots chapters and volunteers that make a difference. What is your interest in helping out? What can your chapter do to work locally with politicians to save our Federal Tax Credit Incentives? EAA Director and **Legislative Chair John Higham**, is spearheading EAA support for this bill after the midterm elections to ensure this legislation passes. Want to know what EAA and Plug In America are supporting/opposing? Do you need a template letter of support/oppose for your chapter? Need a *Plug In America Legislation Policy Toolkit*? Contact **John at ev.policy@electricauto.org** to see how your chapter can help with this and other important legislative bills.

Are you interested in increasing charging infrastructure in your town? As for public awareness, who in your chapter will speak with the Chamber of Commerce, Lions Clubs, Rotary to get the word out? EAA has some PowerPoint presentations to get you started. Contact **Director Guy. Hall@Sacev.org or 916-717-9158**.

While all of us are inundated with emails and often unsubscribe or block contact, understand that this can prevent you from seeing important cries for help. Do you sign petitions that come your way to help EV legislative efforts? It just takes a few seconds to sign a petition. Politicians do pay attention to the numbers, after all they need your vote!

There are many individual actions that can make a huge difference, Some actions are as easy as holding an EV Tailgate Party in your neighborhood (see *http://www.pluginamerica.org*). If you are already deeply engaged, thank you! If you feel you could do a little bit more, please jump in. Working successfully together, our grandchildren will have the legacy of a beautiful planet earth . . . a bright future.

WCEH update

continued from page 1

south route are now being built out. Charging stations on the highway are all within a mile of the major roads, often at private businesses such as shopping malls or gas stations where drivers can access bathrooms, food and other amenities. On the road, signs and a smartphone app direct drivers to the nearest charging station. A driver pulls in, plugs in, and in about 30 minutes can be back on the road. In 2011 when the first charging station of the West Coast Electric Highway was installed, the Department of Energy counted 687 charging stations throughout the United States. As of July 1018, there are now about 52,000 public charging stations and outlets. To put it in perspective, that's more than one-third the number of gasoline stations— about 150,000—in the entire country. [The following is a follow-on article coming from *Yes Magazine!*]

The West Coast Electric Highway Enables Zero Emission Road Trips

Thousands of charging stations flank the roadway, which stretches from British Columbia to Mexico. Now, the alternative fuel corridor needs to grow.

By Erika Lundahl

The West Coast Electric Highway—one of the longest electrified corridors in the world—is demonstrating that electric vehicles are here for the long haul.

In 2008, the West Coast states of California, Oregon, Washington and the province of British Columbia all recognized a simple, but alarming fact: western North America was experiencing significant population growth. That meant tens of thousands more vehicles on the road, producing more climate change-causing greenhouse gases and lowering air quality across the whole region.

To prepare for that outcome, they laid out a shared vision in two 2008 agreements for an alternative fuel corridor along I-5 and Highway 99 to promote the use of biofuels, hybrids, electric or zero-emission vehicles, and hydrogen-fueled vehicles. Federal funding from The EV Project [*https://www.energy.gov/eere/vehicles/avta-ev-project*] helped kickstart the effort and the first charging station on the West Coast Electric Highway was opened in 2011.

"The focus is to give electric vehicle drivers a unique and consistent driving experience," says Tonia Buell, a project development manager with the Washington State Department of Transportation.

Now boasting thousands of chargers, the West Coast Electric Highway makes it possible for an intrepid

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zero emissions vehicle (ZEV) driver to drive from Baja California to British Columbia, charging as needed at stations spaced every 25-50 miles along the highway.

Buell, a proud ZEV driver, has been a part of the West Coast Electric Highway project since its earliest days. She identifies new station locations, forms partnerships with utilities and private companies, and creates unified branding and signage up and down the West Coast. Buell dreams of the highway system becoming the Route 66 of electric infrastructure—an iconic road for fossil-fuel free travelers.

The now completed corridor supports both ZEV commuters in metropolitan areas and long-distance road-trippers. Now other segments of highway branching off from the main north-south route are being built out.

Annette Pitts, a Wenatchee, Washington, resident and the executive director of a small tourism nonprofit called the Cascade Loop Association, is happily surprised not just by the number of electric vehicles she's begun to see on a 440-mile electrified stretch of highways in eastern Washington that was finished in 2014, but also by the number of different state license plates.

"It used to just be Washington state, people probably within Seattle. Now I see people driving down from Canada, people from California, people from Texas, and the Midwest even," Pitts says.

Charging stations on the highway are all within a mile of the major roads, often at private businesses such as shopping malls or gas stations where drivers can access bathrooms, food and other amenities. On the road, signs and a smartphone app direct drivers to the nearest charging station. A driver pulls in, plugs in, and in about 30 minutes can be back on the road.

An economic choice

Electric cars still make up only a small percentage of all vehicles on the road in the U.S.—just over one percent nationally, compared with about five percent in China and a whopping 39 percent in Norway. But that number is on the rise.

continued on page 6

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WCEH update

continued from page 5

At the end of 2017, 27,858 plug-in electric vehicles were registered in Washington, a more than 150 percent increase over the previous 18 months. The state has a goal of registering 50,000 such vehicles by 2020. It's a goal that Buell is confident will be exceeded, especially with the introduction of a new wave of more affordable high-mileage electric vehicles such as the Nissan Leaf and Chevrolet Bolt, which can travel 150 and 238 miles, respectively, on a single charge.

The cost of charging a ZEV also is typically 60 percent cheaper than filling a gas tank, according to the U.S. Department of Energy [1], which uses "eGallons" to compare the cost of charging up a vehicle to that of filling a similar model up with gasoline. As of July 19, an eGallon cost an average of $1.17, versus $2.84 [2] for regular gasoline. In Washington, where the cost per eGallon is the lowest in the country, the fuel cost savings is the highest in the nation, 74 percent, partly because of the state's use of hydroelectric power in its energy grid.

Electric car owners also can expect to pay less in repairs over the life cycle of their vehicle. On a macro-economic level, this means that money is spent on other things that benefit the economy, and it insulates states and communities from the impacts of an oil price spike.

California is even further along in the electrification process than Washington. Zero-emission vehicles make up almost five percent of the California market, with more than 410,000 on the road at the end of 2017. To keep pace with the state's carbon reduction goals, Gov. Jerry Brown announced $2.5 billion in investments over the next eight years [3] and a target of putting five million ZEVs on the road by 2030.

Multiple funding sources

The West Coast Electric Highway is funded by private-public partnerships and fees on vehicle registration and eGallons.

But it's likely to become more expensive as strategic charging corridors get upgraded to keep up with the next wave of even-faster-charging electric cars.

Most charging stations in use now are 50-kilowatt systems, but the next wave of vehicles will be able to take advantage of 100-kilowatt to 150-kilowatt stations, reducing charging times to 15 minutes or less.

Electric Vehicle charging station in Port Orford, Oregon.

Photo courtesy of Erika Lundahl.

"Everyone's pointing to each other, asking who's going to pay for those power upgrades," says Zach Henkin, deputy director of Forth Mobility, a trade organization for the electric vehicle industry.

Henkin also believes that with the wide variety of vehicles that will be hitting the road shortly, charging technology is now evolving faster than utilities can adapt, creating a misalignment in their business models.

Buell says challenges faced in developing cohesive electric infrastructure are similar to the challenges faced when automobiles first came into use at the beginning of the 20th century, when "filling stations" were installed in or just outside of major city centers, often with wholesalers supplying fuel in horse-drawn tank trucks. Seattle got its first gas station in 1907, and in 1914, a chain of 34 stations was opened along the West Coast by Standard Oil of California. The development of functional Interstate corridors was a long collaborative process involving both private and public funding sources.

That is what it will take to keep electric highways advancing both in capability and geographic spread.

In 2011 when the first charging station of the West Coast Electric Highway was installed, the Department of Energy counted 687 charging stations throughout the United States. As of July 1018, there are now about 52,000 public charging stations [4] and outlets. To put it in perspective,

continued next page

Electric Vehicle charging station in Port Orford, Oregon.

Photo courtesy of Erika Lundahl.

Erika Lundahl wrote this article for YES! Magazine. Erika is a musician and a freelance writer who just completed a 2000-mile tour of the West Coast Electric Highway in her electric vehicle. Follow her on Twitter @erikalundahl and find more of her music and writing at erikalundahl.com or on her Patreon.

that's more than one-third the number of gasoline stations—about 150,000—in the entire country.

Many electric charging stations received government grants and help from private investment and utilities to get set up. Others, like the brand-new charging stations in Washington's Tri-Cities area and the city of Ellensburg, were financed by the state's annual $150 electric vehicle fee.

While the landscape of funding an electrical overhaul on automobile transportation is certainly still in flux, one of the largest, and most unexpected funding sources for electric infrastructure has been Volkswagen's settlement funds, after the company was caught fraudulently reporting its diesel vehicles' carbon emissions in 2016. Volkswagen is required to pay $2 billion [5] over the next 10 years to fund zero emission vehicle infrastructure, which includes prioritizing charging infrastructure in low-income and disadvantaged communities. Those funds are being distributed across all 50 states through Electrify America,[6] the program created to help manage those funds. In Washington, Buell believes the settlement could cover 10-20 percent of the state's electric infrastructure needs over the next decade.

Buell now spends much of her time talking to governments and private companies around the world, from the East Coast of the U.S. to Europe and India.

One day not too far from now, she says, these other electric highways will connect up to the West Coast Electric Highway.

"We are planning our highway charging for the masses and we need a lot more chargers and a lot more funding,"

References

1 *https://www.energy.gov/eere/vehicles/articles/fotw-1033-june-11-2018-washington-state-has-greatest-fuel-cost-savings*
2 *https://www.energy.gov/articles/egallon-how-much-cheaper-it-drive-electricity*
3 *https://www.electricvehiclesresearch.com/articles/13645/five-million-electric-vehicles-for-california-by-2030*
4 *https://www.afdc.energy.gov/fuels/stations_counts.html*
5 *https://www.reuters.com/article/us-autos-california-electric/california-gives-volkswagen-green-light-for-clean-vehicle-infrastructure-plan-idUSKBN1AD01W*
6 *https://www.electrifyamerica.com/our-plan*

Entire article below:
https://www.yesmagazine.org/planet/the-west-coast-electric-highway-enables-zero-emission-road-trips-20180720/

Porsche Unveils Fast, Low-cost 'Pit Stop' EV Charging Stations

The Modular Design Could Bring Quick Charging Stations To More Places.

By Jon Fingas

Fast charging stations promise to end the long wait to top up electric cars, but the technology is expensive, bulky and a little intimidating. Thankfully, Porsche might have solved all three problems in one go. It just unveiled an "electric pit stop" whose design promises to make the company's 800V charging more accessible. Rather than load everything a charging station needs into a single cabinet, Porsche splits things into modular "FlexBoxes" that can offload some of the work and stay far from the customer -- you might only see the charging pole itself.

A typical system includes a transformer, a PowerBox (to convert the transformer's AC power into DC) and a CoolingBox (to liquid cool multiple charging stations), all of which include components that would normally have to be included in every pole. Smaller charging areas can get ComboBoxes that include both components. And if the local electrical grid isn't powerful enough, ChargeBoxes include a 70kWh battery (with one 160kW station) or 140kWh (with two stations) that can replenish themselves in between fast charging sessions. That last option will only help in situations where a charger only sees occasional use, but it could beat forcing drivers to endure a glacially slow charge while they're at the store.

The modular approach boosts efficiency to about 95 percent for the full system, Porsche said, lowering costs for charging station hosts. And since the system can sit up to 200 meters (656 feet) away, a provider could tuck the modules out of sight.

Porsche hasn't said when it would make the "pit stop" design available, although it's planning a network of 500 fast charging stations by the end of 2019. It could theoretically use this for some installations. As it is, there's no rush to install the stations until 800V-friendly cars like the Taycan are on the road.

https://www.engadget.com/2018/09/17/porsche-unveils-lower-cost-station/?yptr=yahoo

EV Educational Resources

for Individuals, Groups and Organizations

Electric Car INSIDER

EV Buyers Guide

Compare electric cars with comprehensive full page profiles

Discount Pricing Guide App

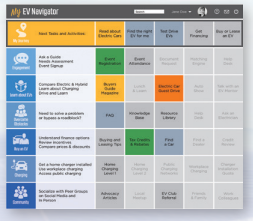
Save thousands of dollars on EV purchases and leases

Educational Exhibits

Large scale interactive exhibits for indoor and outoor events

Electric Car Guest Drive

Test drive the latest EVs and learn from EV owners

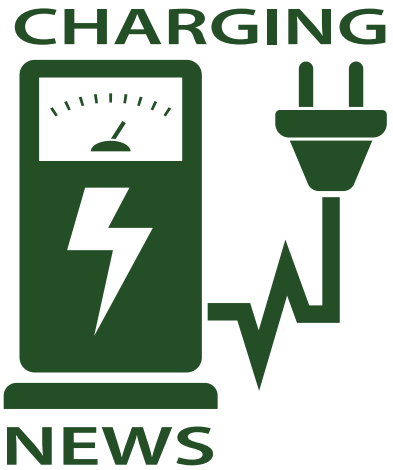


EV Navigator

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

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

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



Nissan, EVgo complete EV fast-charge corridor between Boston, DC

The stations feature both CCS and CHAdeMO plugs that will work with nearly every EV on the road.

You'll have to budget time to stop for charging, but nevertheless, you can now get from Boston to DC without spending much time away from the highway. Map and image prepared by Nissan

By Andrew Krok

The more EV chargers there are on the road, the more likely people are to eschew range anxiety and consider an electric car. That's why it's a good thing that Nissan and EVgo just completed a fast-charging corridor between two major cities on the eastern seaboard.

Nissan and EVgo announced today that the two have finished connecting Boston and Washington, DC with a series of EV fast charging stations along the I-95 corridor. The 500-mile span now features nine separate DC Fast Charging-capable stations. The chargers aren't on the shoulder of the highway, though — they might require a driver to venture slightly off the highway, but they were installed with the Boston-DC trip in mind.

Each of the nine stations carries at least four chargers. Its 50-kW output is less than half the power of a Tesla Supercharger, but it's enough to add 80 percent of a Nissan Leaf's battery capacity in 30 to 40 minutes, which is enough time for a driver to stretch their legs, grab a coffee or catch up on emails. Better yet, the stations were built with a 150-kW power upgrade in mind, so they're future-proofed to some degree.

The charging stations won't be exclusive to Nissan vehicles, either. They have both CCS and CHAdeMO plugs, which means nearly every EV on the road will be able to charge at these stations. This is the opposite of Tesla's Supercharger system, which is available only to Tesla vehicles. You'll have to sign up and pay for the electricity you use, of course — these corridors aren't free-meal distributors — but that's easy enough.

"This charging route along one of the most heavily populated areas of the country further demonstrates our commitment to the mass implementation and future development of easily accessible EV technology and will foster EV travel up and down the Northeastern coast of the United States," said Brian Maragno, director of EV sales and marketing for Nissan, in a statement.

Information on charging between Boston and Washington D.C. continues on the next page.

https://www.cnet.com/roadshow/news/nissan-evgo-fast-charge-corridor-boston-dc/

'I-95 Fast Charging ARC' Between Boston and Washington D.C.

- EV owners can now make the 500 mile journey from Boston to Washington D.C. with ease as a series of EVgo Fast Charging stations, known as the 'I-95 Fast Charging ARC' is now open.
- The ARC consists of nine EVgo Fast Charging stations equipped with 52 fast chargers in total, each with two charging connector options.
- Most of the fast charging stations are located within close proximity to I-95 providing convenient access
- These sites will be among the largest public fast charging stations available to the public

Nissan and EVgo have completed their plan to connect the cities of Boston and Washington D.C. with a series of nine electric vehicle fast charging stations. The completion of the Northeast fast charging corridor provides a comprehensive charging infrastructure, giving electric vehicle owners peace of mind and convenience when traveling the 500 miles between the two cities.

Each fast charging station can charge up to four or more EVs simultaneously at a power output of 50kW. The stations have also been designed and constructed to adapt to future advances in EV technology, including pre-wiring for higher charging outputs to allow easy upgrading to 150kW fast chargers.

"We're excited to continue pioneering the development of electric vehicle infrastructure with the opening of our second charging 'corridor' project in the U.S." said Brian Maragno, director, EV sales and marketing, Nissan North America, Inc. "This charging route along one of the most heavily populated areas of the country further demonstrates our commitment to the mass implementation and future development of easily accessible EV technology and will foster EV travel up and down the Northeastern coast of the United States."

"EVgo and Nissan's I-95 Fast Charging ARC is designed to make fast charging easy and convenient for EV drivers from Boston to Washington D.C.," said Cathy Zoi, EVgo CEO. "Because we own our fast charging stations, EVgo drivers can rely on us to offer exceptional service from coast to coast. We applaud Nissan's historic leadership in infrastructure investment in partnership with EVgo, affording drivers the opportunity to rely on the I-95 Fast Charging ARC today."

This charging corridor is the newest in EVgo's charging network, including more than 1000 fast chargers stations spanning 34 states.

https://www.evgo.com/about/news/nissan-evgo-open-95-fast-charging-arc-connecting-ev-drivers-boston-washington-d-c/

The Ultimate Guide to Charging an Electric Car

Anna Kucirkova, contributor

Of the more than 17 Million new cars sold in the United States in 2017, nearly 200,000 of them were electric vehicles, according to market reports. While that may seem like a drop in the bucket, it's actually a huge increase from previous years, especially since EV's have only been commercially available since the groundbreaking release of the Toyota Prius in Japan in 1997.

For most of us, electric vehicles still seem like a mysterious new piece of technology, but they actually have a long and storied history dating back over 100 years! EV's have been around a long time in various forms, but they finally seem to be picking up speed as the promised wave of the automobile future for a host of reasons.

Why Even Consider An Electric Vehicle?

Economics

While you might think electric vehicles are more expensive than standard automobiles, they can actually save you money in the long run. In fact, in 2017 the cost of buying a new EV car dropped over 10 percent from the previous year, and that downward trend promises to continue. Additionally, EV cars are far more reliable, requiring fewer costly repairs and maintenance that often plague standard vehicles.

By far the biggest value that comes with owning an electric car comes with its drastically reduced fuel costs. More on that in a minute…

Convenience

What can be easier than plugging in your car when you're home for the night, letting it charge while you sleep, and driving off in the morning with a fully fueled vehicle that can get you where you need to go all day long? It really is that easy, and with electric car charging stations popping up all over, maybe even at your office, you can drive wherever you want without having to worry about gassing up.

The incredible reliability of electric vehicles also means you'll spend less time at the auto shop, dropping off your car for oil changes and inconvenient repairs.

Environment

Nearly 9 billion barrels of petroleum are used in the U.S. each year, with the bulk of that going to transportation. The more drivers who choose EV cars, the more that number will decrease, as will toxic emissions that contribute to climate change, smog, water pollution, and other environmental concerns. Choosing an electric vehicle is one of the best ways the average Joe can go green and help the environment.

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Electric Car Ownership

Maybe you're already convinced of the benefits of going electric. You understand the convenience factor, as well as the economic and environmental benefits for making the switch from a standard vehicle, and you're ready to take the plunge.

You like how it drives, with its quick reaction time and excellent torque. It feels good, and looks even better when you pull up to the office or trendy new restaurant driving the latest in technology.

There's just one thing holding you back. Questions about how charging your potential new ride are plaguing you, keeping you from taking the plunge. It's just so familiar, pulling up to one of a dozen or more gas stations in your neighborhood when the tank is low and filling it up.

How does charging your EV differ from fueling up a traditional vehicle? Doesn't it take a long time? Where do I charge it on a road trip? What does it really cost? These questions and more have answers that might be simpler than you think.

Electric Car Charging Options

There are three types of electric car charging options. It's important to understand the differences before committing to an electric vehicle.

Level 1 Charging

Level 1 Charging is the technical term that refers to charging your EV through a plain old three-prong electrical outlet. The charging cord that comes with any electric car will connect to your standard wall outlet on one end, to your cars charging port on the other, providing 120 volts of electricity right in your own garage or driveway.

A visit from your electrician might be in order, as it's important to be sure your circuit is properly grounded and able to supply the juice your car needs without blowing a fuse. Level 1 is the slowest form of EV charging, often taking all night to fully charge. This is generally not a problem if you are using your EV for driving around town, since an overnight charge can take you 40 miles. For longer distance driving, you might need to rely on one of the other two charging options.

Level 2 Charging

A Level 2 or 240 Volt charging station can be easily installed in your garage to provide your EV with the power it needs to drive up to 70 miles per hour of charging, and do it in half the time of Level 1 Charging. It would also require a visit from your electrician, this time to install wiring and a plug similar to that of your stove or clothes dryer. Due to the higher amperage of this circuit, charging will go much faster,

continued on page 14

Charging Guide

Continued from page 13

Having a Level 2 Charger installed in your home will cost about $2,000. Consider that investment as a part of the cost of your car, but rest assured that it will save you money over the long haul.You might even find a tax rebate incentive to help offset the cost of making the switch to EV and installing this type of charging station.

Adding to the convenience factor of owning an EV, public Level 2 Charging Stations are popping up all over the country. While they may not yet be as common as gas stations, they can be easily found when you're out and about by using a site like chargehub.com. Additionally, many businesses are installing charging stations on site to serve their EV driving employees, and take advantage of incentives.

The cost of both Level 1 and Level 2 Charging in your home depends on electricity costs in your area as well as the efficiency of your particular vehicle. Start with your EV's kilowatt per 100 mile (kWh/100m) energy consumption rate which can be found on fueleconomy.gov. Then determine your home electricity rate, multiply it by the kWh/100m number to determine your car's fuel cost per 100 miles.

DC Fast Charging

Charging Networks

No matter which way you choose to charge your electric vehicle when you're out and about, finding a charging station is easier than ever. Many of these stations are free, while others charge a nominal fee that you can rest assured will cost you less than gassing up a standard car

A host of networks like Blink and EVGO are becoming increasingly available nationwide. Each one works a bit differently, so choose the one that's most convenient for you, learning how it all works before relying on it for your car's on-the-go electricity boost. As the electric car industry continues to boom, more and more charging stations and networks will become readily available, even in the smallest of towns!

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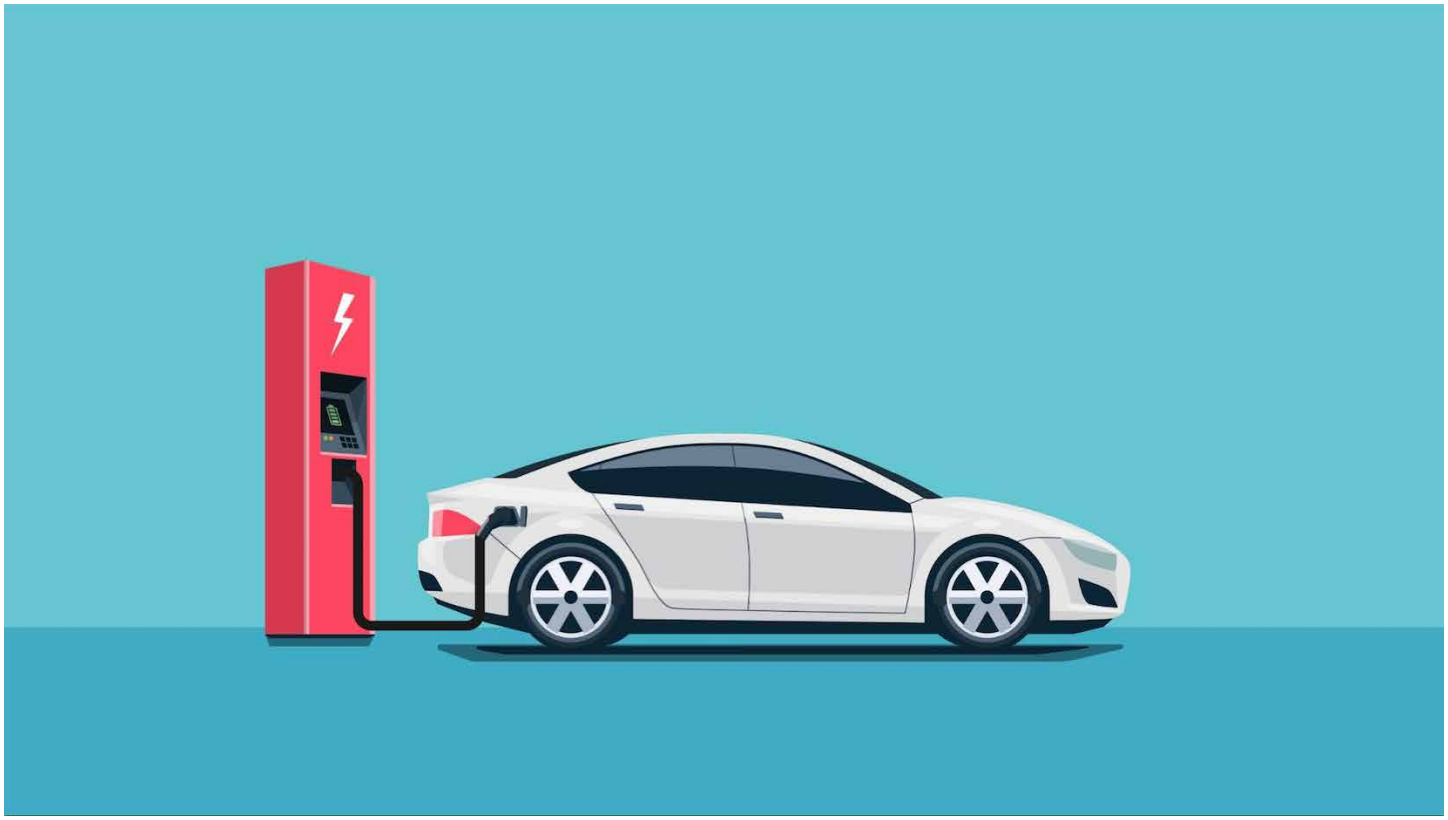
Charging Etiquette

It's important to use good charging etiquette when charging your electric car. Since public charging stations are limited, you'll want to consider the needs of other drivers and not take up space at a charging station for longer than you have to. Just as you would never leave your car at a filling station for longer than it takes to fill your engine, maintain the same consideration at the electric charging station.

Keep an eye on your vehicle while it is charging. When it is close to fully charged, unplug it and vacate the space so another driver can use it. Hybrid cars should defer to pure electric cars and give them priority at the charger, since they have a petrol engine to rely on if necessary.

Conclusion



Electric cars are finally here to stay. They make sense economically, environmentally, and practically. They may require a bit of research, but once you master the learning curve and think you're ready to make the switch, don't let the charging options scare you away.

Whether you plug it right into the outlet in your garage, install a faster home charging station, rely upon public charging ports, or a combination of all of these, charging your electric vehicle is easier than you think, and will keep you driving for miles and years to come.

Thank you to Anna Kucirkova for this contribution.

https://www.iqsdirectory.com/blog/the-ultimate-guide-to-charging-an-electric-car/

CHARGING NEWS

Oil Companies Fight Back for Charging Dollars

By Eric C. Evarts

As electric cars begin eating into profit growth at oil companies, the war for electric-car drivers' pocketbooks has begun.

Electric utilities are counting on supplying increasing quantities of juice, especially during off-peak hours to make their operations more efficient—and not insignificantly to boost revenues along the way.

Oil companies, who own and supply filling stations around the world, fear a commensurate drop in revenues as more drivers fill up with electrons, and they're starting to fight back, according to a report in Oil Price.

BP, the British petroleum giant, estimates that electric-car sales will explode by 8,800 percent between last year and 2040. That will take a big bite out of the market for gasoline and diesel fuel.

At the heart of the competition is the question of how often electric-car drivers fill up at home, versus when they're out driving as gas-car drivers do.

Oil companies are focusing on what they know—selling quick hits of

Shell Charging Station in Britain

energy, plus snacks and drinks, along the road—while power companies are banking on additional charging at home and in workplaces, where they already provide the energy.

So far the battle is starting in Europe, where oil companies are testing the waters of electric-car charging, according to a new *Bloomberg* report published in *Australian Financial Review:* *https://www.afr.com/business/energy/oil/big-oil-and-utilities-square-up-for-electric-car-war-as-both-offer-charging-20180702-h125w1?*

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Electrify America 350 kW chargers at Home Depot in Chicopee, Mass.

Today, more than 90 percent of electric-car charging is done at home, and some electric-car advocates expect this trend to continue. There is no more convenient way to charge, and electric car owners today, who mainly live in single-family homes where they can install such a charger, cite never having to stop at a gas station as one of the main advantages of driving electric.

Others point out a large untapped market for electric cars among consumers who don't have their own garages or dedicated parking spaces and may have no choice but to take on quick charges while they're out driving.

Estimates of the size of this market vary wildly. Erik Fairbairn, CEO and founder of Pod Point, a major charging network in Britain expects no more than 3 percent of electric-car charging to be done in public. Shell puts the number at 20 percent, with 40 percent charging at home and another 40 percent at work.

2015 Fiat 500e electric car recharging (Photo by Chris Baccus)

The market varies by region. In the U.S., almost 65 percent of families own their homes. Rates are lower in other parts of the world. And some of those homeowners live in condominiums or co-ops where installing home chargers can be challenging.

Fast charge networks, such as Tesla's Superchargers and VW's Electrify America in the U.S. and Ionity in Europe, are expanding rapidly to provide public charging for those who can't charge at home, and that's where the battle between utilities and oil companies is primarily playing out.

To serve the public charging market, oil companies are trying a variety of approaches. Some are partnering with charging networks such as BP, which bought Britain's largest electric-car charging network, Chargemaster.

Shell, the second-largest oil company in the world last year bought New Motion, another of Europe's largest charging networks, and made a deal with Ionity, a fast-charging network being set up across Europe by BMW, Daimler, Ford, and VW.

Oil companies are bidding for Electrify America to install fast chargers at gas stations around the U.S., and some early concepts show installations at Shell stations along highways.

Power companies, meanwhile, are stepping up efforts to install chargers at businesses where employees cars are parked for long periods, the *Bloomberg* report notes.

Of course, there's more than one way for wealthy oil companies to tap into the market for electricity. Shell also recently bought one of the largest electric utilities in Britain for an undisclosed sum.

Eric Evarts has been bringing topical insight to readers on energy, the environment, technology, transportation, business, and consumer affairs for 25 years.

https://www.greencarreports.com/news/1117563_oil-companies-fight-back-for-charging-dollars

EV Road Tripping: Bakersfield Bolt to Yosemite via US 395 and the "East Side"

By Paul Gipe

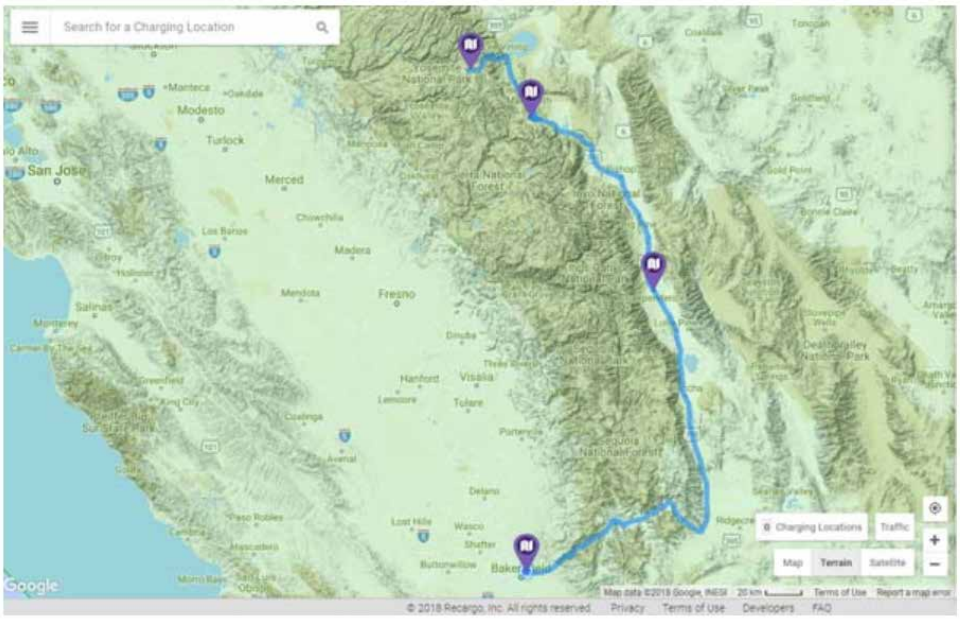
In mid August we took our annual vacation to Toulumne Meadows in Yosemite National Park. We drove the family car. Nothing special about that per se, we've been doing it for years. What was different was that we drove a Chevy Bolt EV, an electric car. And we drove it up the "East Side" on US 395, one of the nation's most scenic highways.

Paul Gipe and Nancy Nies, two EV adventurers enjoying the back country of Yosemite National Park, 2018

We could have done it easy enough in a Tesla. (We saw quite a few Teslas on the route.) But we don't own a Tesla. We drive a Chevy Bolt instead. (Some of have called the Bolt a poor man's Tesla because it costs a fraction of a Tesla, yet has the range of a Tesla—240 miles.)

However, there is only one charge location compatible with the Bolt on the entire 300-mile stretch from Bakersfield to Toulumne Meadows. That location, Mammoth Lakes, is 250 miles from Bakersfield—and on the other side of the Sierra Nevada.

We're a one-car family. And that car is a Bolt. We no longer operate a car with an internal combustion engine. In those circumstances where the Bolt won't meet our needs, we plan to rent a conventional car. Importantly, we haven't had to do so yet.



The drive from Bakersfield to Toulumne Meadows and return is one such trip where a rental might make sense. However, we've been adventuring with an EV for four years now and felt we could make the Bolt work. The trip would require more flexibility than most American would tolerate, but it could be done with minimum fuss.

And no, we didn't call AAA and had them tow the car to Mammoth Lakes. Though we know someone who did. . .

What we did do was break the trip up into segments doable with the Bolt. In a previous trip we proved that we could cross the Sierra Nevada and reach Independence, California 170 miles from Bakersfield. There we would charge overnight. (See Bolt EV Successfully Crosses Sierra Nevada Bakersfield to Independence.) From Independence, the next leg would take us to the ski center of Mammoth Lakes where we'd spend another night charging. From there it's an easy hop to the exhilarating drive up to Tioga Pass and then down into Toulumne Meadows. The route back, mostly downhill, would take us back to Independence for a night and then on to home.

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Mobile Charging

Despite California's reputation as being EV friendly, there are still many places without charge stations. The East Side of the Sierra Nevada is one of those places.

There are no charge stations in Independence. However, Jim Getzinger at the Independence Inn installed a NEMA 14-50 outlet at his 6-unit motel several years ago in the early days of the EV revolution. Any EV can plug into the NEMA 14-50 outlet if it has a mobile charge cable and the appropriate adapter.

Charging our Bolt at the Independence Inn in Independence, CA

The NEMA 14-50 is a receptacle often found in any RV parks. It can deliver up to 40 amps continuously for about 10 kW of power. It's the big boy of non-commercial charging.

Both times we charged overnight at the Independence Inn using our Jesla mobile charge cable. The Bolt draws its full 7.4 kW from the Jesla [*https://shop.quickchargepower.com/JESLA-is-THE-40-amp-J1772-portable-charging-solution-JESLA.htm*] and the NEMA 14-50 outlet, adding 7 kWh per hour to the 60 kWh traction battery. This will charge the car overnight.

Jesla mobile charge cable and NEMA 14-50 adapter can provide up to 40 amps continuous at 240 volts.

We've been using the Jesla for such out-of-the-way road trips since we've been driving electric. It's one of the most powerful mobile charge cables on the market. The Jesla's not cheap, but it's rugged and reliable and is superior to the mobile charge cable that comes with most EVs. We never leave home without it.

$425 for Level 2 Charge

We needed one more charge to make the trip work. There are four resorts in Mammoth Lakes that offer EV charging to their guests. These are the kind of places that cater to customers in Teslas. In fact, the charge stations were donated by Tesla for this very purpose.

Tesla is not your typical car company. They donate several of their "destination chargers" to resorts requesting them. These only work with Teslas and not other EVs. (There are ways around this limitation, see First Use of JDapter Stub for Tesla Destination Charger to Chevy Bolt.) But Tesla also donates chargers that work with EVs using the J1772 standard, such as the Bolt. (Imagine GM or VW donating a charge station that would work with a Tesla.)

Charging our Bold on a ClipperCreek HSC 40 in the valet garage at the Westin Monache Resort in Mammoth Lakes, California

We knew this was going to cost us. These are not the kind of hotels we normally frequent. And if the new fast chargers planned for the East Side are ever installed we may never have to charge in Mammoth Lakes again. Yet it was a necessity on this trip.

Our destination was the Westin Monache Resort where the valets will park your car in the garage at one of the three Tesla destination chargers or at one of the two ClipperCreek J1772 chargers. The valets assured me they knew what they were doing. My rule from bitter experience is "trust but verify." I checked Chevy's app and even went down to the garage to confirm that our Bolt was not only plugged in but

continued page 20

Yosemite Trip

continued from page 19

charging. The valets did indeed know what they were doing.

We had dinner and breakfast. The total tab? $425. That was one very expensive charge. The 40 kWh we added to the battery that night cost us about $10 per kWh. Ouch! (I now chuckle when I see some EVers complaining about some fast charging station costing them a few more cents per kWh than what it costs them at home.)

Nevertheless, the stopover worked. The car was charged. We got to visit another part of California that we wouldn't have otherwise. And we didn't spend much more than we would have anyway on a rental car.

Prices for a weekly rental from Bakersfield were ~$350 for a compact car. We would have spent another $50 in gas for the 600-mile round trip. So it was a wash. The total car rental cost of ~$400 offsets that expensive night at the Westin Monache Resort.

Lunch Not Quite Enough

I checked with the hotel's staff. They will charge your EV if you're there only for lunch or dinner. You don't have to spend the night.

However, a two-hour lunch at Mammoth Lakes is likely not enough time. You should be able to get 14 kWh into the traction battery of a Bolt. That's putting you at the limit of the Bolt's range when accounting for the drive up to Toulumne Meadows, the energy used driving back and forth to trailheads in Toulumne Meadows, and then the drive back to Independence. We used 11 kWh ferrying to and fro during the week we were there. And Aramark, the new concessionaire, has discontinued the shuttles. Driving is your only option.

The Lodge

The Bolt delivered. We were the only pure EV at Toulumne Meadows Lodge, but we did see two Volts.

No one charged at the Lodge, though it has been done before. My advice is not to plan on charging in Toulumne Meadows. There is only a 120-volt outlet at the Lodge and it's in a traveled way, making any overnight charging problematic.

We did raise some eyebrows when people realized the car was electric. The ranger at the entrance station even commented on the car when we entered the park.

Bakersfield to Independence Mammoth and Toulumne Meadows

		60 kWh						
			Actual		EVTP	GreenRace		Chevy
From	To	mi	kWh	mi/kWh	Leaf α	30 kW	Bolt	Assist
Bakersfield	Independence	172	45.7	3.8	55.6	52.7	58.3	45.6
Independence	Mammoth	84	26.7	3.1	28.1	31	34.2	28.8
Mammoth	Toulumne Meadows	49	10.9	4.5	17.2	13.7	15	12
Toulumne Meadows	Bishop	83	12.2	6.8	18.3	17.1	19	16.8
Bishop	Independence	47	13	3.6	11.3	12.1	13.5	10.8
Independence	Bakersfield	171	38.1	4.5	55.6	54.7	60.3	39.6
	Total	605	147	4.1				

Bolt Performance

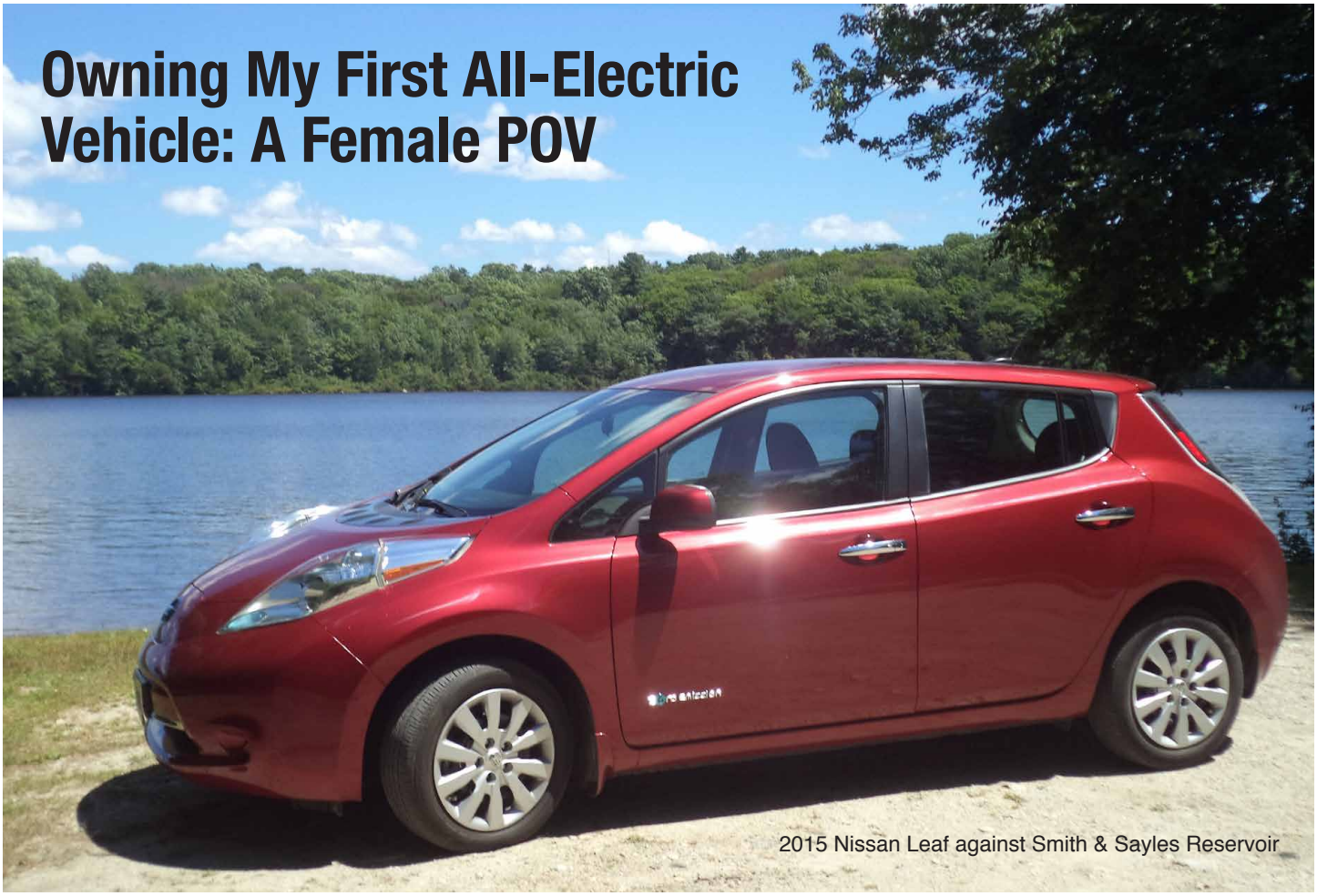
I entered each leg of the route into three trip estimators: EV Trip Planner, Green Race, and Chevy's Energy Assist app. The app delivered the best results for any of the estimators. The Bolt met or consumed slightly less than the estimates by Chevy's Energy Assist app for most legs.

This was our longest trip yet in the Bolt: 600 miles. For us, the trip was a success and our planning paid off. We drove our EV to Yosemite and spent a week hiking in the high Sierra.

By 2020 driving to Independence and other East Side communities on US 395 will be much easier. (See DCFC Stations Bakersfield to the Sierra Nevada East Side Coming.) [See below.] However, CalTrans three DC fast charging stations are delayed for an unknown reason. Those stations are needed to make US 395 accessible for those EV owners from southern California who want to vacation in the mountains or ski in the winter and who don't drive a Tesla.

http://www.wind-works.org/cms/index.php?id=84&tx_ttnews%5Btt_news%5D=5162&cHash=8217e1b05c229999062cb3091c2176c7

Owning My First All-Electric Vehicle: A Female POV



2015 Nissan Leaf against Smith & Sayles Reservoir

By Carolyn Fortuna

The dull red Mazda Miata was 17 years old. I'd spent many sultry summer afternoons cruising around winding roads, feeling the breezes waft around me, and sinking into a relaxed flow of road and car. But a late afternoon wait for the AAA tow truck reminded me that Miata repairs now loomed. It was time to move from the abstraction of writing about sustainable transport to owning my first all-electric vehicle (EV).

Surveying the EV options for all-electric and hybrid cars, I realized that new EVs with higher prices would offer more technology options and range. But I was seeking a second car, as I already own a reliable, peppy, low-mileage black Honda Civic SI. I looked to the previous generation of battery-powered rides, understanding that I'd be choosing an operating range of fewer than 100 miles on a charge. The more I searched, the more I came to the conclusion that earlier EVs make great second cars in a family's fleet — their low costs to purchase and operate make them a fine entrée into the world of EVs.

And the decision was *(drumroll — poignant pause — big smile)* a used 2015 Nissan Leaf, Cayenne Red, with around 22,000 miles on it. I liked the low mileage, and my research indicated that used all-electric vehicles tend to be driven fewer miles than the norm, which means they've typically endured less wear and tear.

I found it at a dealer in the next state and took it for a test drive. I was immediately impressed by the sturdiness of the vehicle and its handling. It wasn't a tin can on wheels! With excellent pick-up, I zipped into traffic and switched lanes with confidence. No, it didn't have the lane assist or traffic assist cruise control features of 2018 EVs (nor those price ranges), but it did have enough modern features to suit me: backup camera, center console screen with navigation system, heated seats and steering wheel, auto-dimming mirrors, Bluetooth phone pairing, and USB port for music.

A few hours later, I was driving my new-to-me all-electric vehicle home on the highway.

continued page 22

A New LEAF

Continued from page 21

Learning the Nissan Leaf Regen Features: ECO and D/B

Regeneration is an opportunity for maximizing mileage in an EV, a feature that isn't available in an internal combustion engine (ICE) vehicle. "Regen" utilizes [Ed: the motor as] **an onboard generator** (*https://cleantechnica.com/2015/10/24/hidden-benefits-evs-regeneration/*) — usually the primary drive motor — to slow the car while converting the deceleration power back to electricity. Done well and consciously, it's a practice that can have an impact on the range of an EV. As you step on the brake pedal or decelerator, the car engages the motor backwards to slow the car down and, at the same time, generates power. A 10-15% increase in range is a fair estimate of what you can expect from regen.

I took a quick primer at the dealership and chose the ECO mode to maximize regen for the 54 mile drive home. The 2015 Nissan Leaf has different driving modes. Dots on the dash indicate if you're using power or creating regen — white for power, green for regen.

A Nissan Reddit page (*https://www.reddit.com/r/leaf/comments/2r01gl/why_isnt_b_drive_mode_default/*) explains the modes as follows: With ECO on, it feels more like a slower start at the low end, a somewhat deadened response in the middle, and a big zap as you reach the full extent. In B mode, your car begins slowing as soon as you let off the pedal. It takes a bit of practice to feather the throttle accurately enough to coast. If you're using B to recover energy from traffic speed changes, a light touch on the brake pedal does engage re-braking before the actual pads hit. Staying in D allows you to coast without losing as much energy or expending as much concentration.


2015 Nissan Leaf

When you drive in B mode and lift off the accelerator, you get up to 4 dots of regen depending on speed. If you use D mode, then you usually get two dots until you apply some brake. I went ECO and B mode all the way home, wanting to be as sustainably conscious as possible.

First Experience with Range Anxiety

I left the dealership in my new all-electric vehicle nicely charged and quickly merged onto 95. The indicator gauge read that I had 82 miles remaining. With 54 miles to my destination, the math seemed to be in my favor.

Driving Range Gauge

As the miles unfolded, I meandered from the dealership's low elevation near to Connecticut shoreline and climbed gradually up hills to the slightly higher ground of interior Rhode Island. With few opportunities to engage regen on the highway, I realized that the driving range indicator in the LEAF, which I have since learned is lovingly known in the LEAF community as a **"guess-**

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o-meter," (*https://jpwhitenissanleaf.com/2012/04/12/a-more-accurate-way-of-predicting-your-range/*) is notorious for predicting mileage that is not achievable.

The range indicator is most accurate on level ground, not on Connecticut's rolling hills. My usage on the ride home from the dealership was double the anticipated miles. Hope faded fast. Could I stop for a celebratory dinner and relax? What does someone do when an EV runs out of energy? Ah, call the tow truck, I realized. While I had downloaded the Nissan Leaf app at the dealership, it was now early evening on a Saturday. Would the DMV or the regional car dealership charging points be accessible then? Uncertain, and not wanting my first foray in my own EV to be remembered for a tow, I skipped dinner and limped home, braking after I exited the highway every time I had a clear road behind me. I probably looked like an old person or tentative new driver — braking at every hill and turn.

The range indicator flashed continually and permanently once it dropped to 11 remaining miles. I coasted into my garage and breathed deeply. I had made it home and experienced range anxiety firsthand. It framed my understanding of my new EV explicitly. No wonder dealers will arrange to bring all-electric vehicles to potential buyers — they can't be driven home to many locations, as the distance is too far!

Weekly trips to the gas station have now been replaced with daily plugging in at home, which is both faster and more convenient. The Leaf has a limited range of 80-100 miles, so it's essentially a drive-to-work or haul groceries kind of car. That suits most of my driving, as I work primarily from home. For road trips or longer drives, I'll continue to depend on my Civic SI.

To the dealer's credit, the salesperson was absolutely clear that the all-electric vehicle I was purchasing did not have a fast charger option. I rely on overnight home charging, building in at least eighthours to return to full charge. It's very easy to charge, too — push the charging button on the dash and the charging portal below the hood opens. Remove the plastic cover and place the charging hose (which comes with its own tidy bag for charging away from home) vertically straight in until it clicks. Look up at the front windshield, and you'll see the blue car icons blinking with charging. When all three icons stop blinking, the charge is complete.

I may have a Level 2 charger installed at home — a move that may not be necessary but adds to convenience and peace of mind. It would enhance my current practice of plugging into a wall socket. Right now, I'm waiting for a visit from my local electrician for advice on this — and waiting, and waiting…

Final Thoughts

The Leaf has no transmission or starter motor, so its electric motor makes only a quiet, light humming noise when backing up. Because this is an all-electric vehicle, there's not much to maintain other than the brakes, tires, and a periodic battery check-up. Unlike ICE vehicles, there are no oil changes, spark plugs, or timing belts. This means the Leaf is **cheaper to run** (*https://www.forbes.com/sites/jimgorzelany/2017/09/18/why-you-should-consider-buying-a-used-electric-car/#6efac7564383*) than conventionally powered models, as it has inherently lower maintenance costs.

Yes, it's a little sluggish when driving in ECO mode, which maximizes regenerative braking to preserve range. I find the acceleration particularly a bit wanting, and ECO reduces the amount of AC I can crank on those rare, humid New England summer days.

continued page 24

A New LEAF

Continued from page 23

As I become accustomed to driving my all-electric vehicle, I'm starting to perceive it as "normal." I find myself thinking about my destination instead of the electric power. I'm waving at the gas stations as I drive by. I'm appreciating the storage room with the hatchback, and enjoying what's known as the "neighborhood effect." Many people have already asked about my all-electric car, and I've owned it less than a week.

I believe we may all be surprised by how quickly electrified transportation really takes off. And, for lots of people, the move into all-electric transportation may come by dipping the proverbial toes into the EV pool with a used model, like I did. With many of the tens of thousands (soon to be hundreds of thousands?) of Tesla Model 3 buyers upgrading from a Nissan Leaf, expect to see a lot more used Nissan Leafs hitting used markets in the coming months.

Carolyn Fortuna, Ph.D. is a writer, researcher, and educator with a lifelong dedication to ecojustice. She's won awards from the Anti-Defamation League, The International Literacy Association, and The Leavy Foundation. She molds scholarship into digital media literacy and learning to spread the word about sustainability issues.

https://cleantechnica.com/2018/08/05/owning-my-1st-all-electric-vehicle-a-female-pov/

Largest EV Charger Installation in Davis, CA

Photos by Eugen Dunlap, SacEVA.org

Continuing its long tradition of breaking new ground as a residential community, the Muir Commons Cohousing in Davis, CA, has installed an unprecedented 26 electric vehicle charging stations, one for each unit in this pioneering facility.

The project was spearheaded by Muir Commons residents and EV advocates Eugen Dunlap and Corey Bock, who organized an exploratory committee and facilitated the project last year.

"The challenge is clear," said Dunlap. "How do we develop access to pollution-free transportation for apartment and townhouse dwellers? We looked at all the options, and with the blessing of the Muir Commons board of directors, partnered with PG&E to have the charging stations installed in the community's parking lot."

"Muir Commons is the ideal environment to test this concept," added Dunlap. "Our community is made up of townhomes, and we have a track record of being ahead of the curve when it comes to energy technology. Electric vehicles are the future, and we wanted to make sure all our residents would have unfettered access to the charging capabilities they will need moving forward."

Muir Commons, which opened in 1991, initially made history as the first cohousing complex in the nation, inspired by the Danish cohousing model. Cohousing communities are intentional, self-managing communities made up of private homes clustered around shared spaces, where residents balance privacy with access to common resources and activities.

Located in West Davis, Muir Commons has long been at the forefront in adopting renewable energy technologies. In 2002, the community self-funded and installed what was the largest rooftop solar installation in the city at the time.

continued on page 26

The project site has been identified and cordoned off before work begins, to prevent construction mishaps and keep prying eyes out.

"Digging the trench the easy way" muses this spectator.

Underground vault installation begins.

Lifting of the several hundred KVA (and pounds!) transformer from the truck. Such units typically power a half dozen residences.

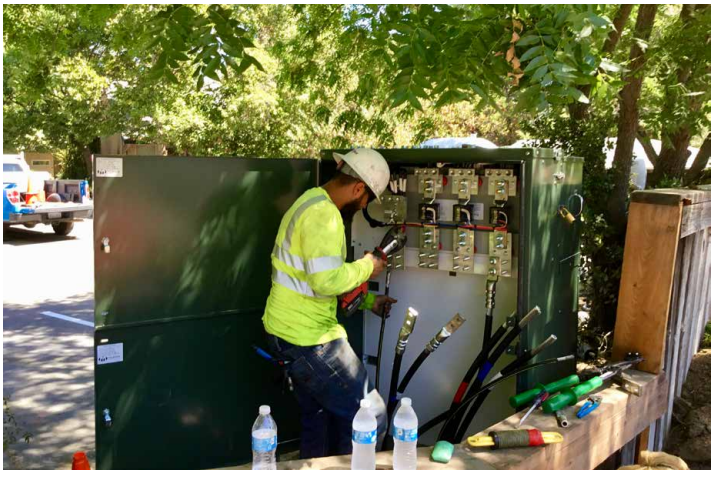
Plastic conduit is placed to accommodate the feeders to the EVSE. With trenching complete, backfilling begins.

Conduit in place ready for concrete. The trench has been backfilled.

Transformer pad with conduit to vault plus one pedestal base.

Two more bases ready with four wires per EVSE revealed (two hots, a neutral and a safety ground).

Each small conduit is for a charging station (EVSE). The larger conduit is for the on-site step-down transformer which gets fed from a higher voltage transformer located upstream (possibly fed from overhead wires).



Several distribution stages are involved for all power consuming locations. (One would never find a 9,600 or 12,000 volt feeder entering a house!) Here large lugs are being crimped onto large cables for downstream loads.

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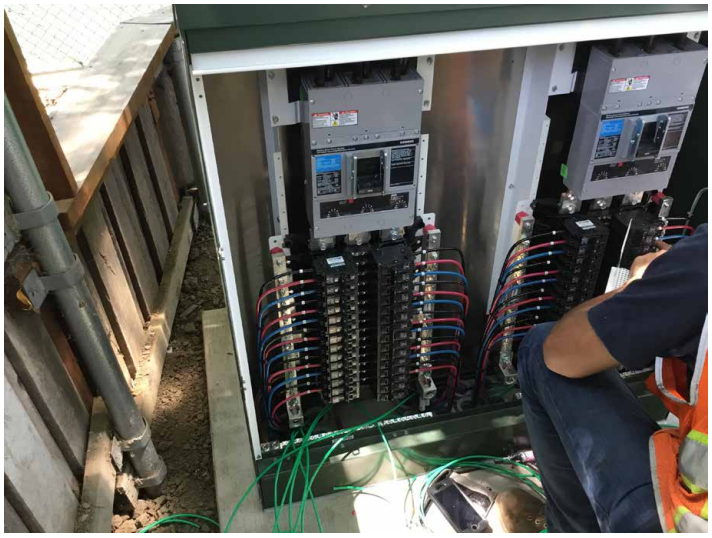
Pulling cable may be done in a bundle all at once. Green is for ground; red, black and blue are the current providing lines. These installations are single phase feeders to the various EVSE but come off different phases of the transformer.

"Christmas in August! Oh, boy!"

Pulling the bundle thru even lubricated conduit is always an effort.

Hardware for the site arrives, gets "roughed in" and briefly exposed until the termination of the feeder cables is complete.



Final wiring – one 40 Amp breaker per station and a 400 Amp main for all circuits on this panel. Proper capacity provisioning for public EVSEs is not complicated, but can get involved.

continued on page 28

A row of new public charging spots is the result. This should function for the decades ahead as more EVs appear.

Signage is critical, as some law enforcement will not enforce parking ordinances if improperly done. Variations abound, YMMV.

This dual pedestal can really only provide two stalls with EV charging power. It could be an example of what NOT to do. If this post were centered in the marked stall – the cables might stretch to cover three parking stalls.

Such mistakes stem from not properly coaching the project lead in advance. EAA members could contribute their insight, so as to prevent this!

For the charging stations project, Dunlap, Bock and the Muir Commons board of directors worked with PG&E to develop sources of funding. The necessary infrastructure improvements were made possible by a grant from PG&E EV Charge Network Program.

The ribbon cutting celebration for the charging stations took place Sept. 5, 2018 at 2222 Muir Woods Pl., Davis CA 95616.

Lidar vs Radar in Autonomous Driving Vehicles

By CE Staff

An ongoing debate as to why doesn't Tesla switch to Lidar systems requires a bit of understanding of the technology.

While no one can see into the future, driving a car does require us to see clearly! In order for a car to drive without human assistance, a method of "seeing" and informing an intelligent decision-making piece of hardware is needed. Some of the hardware in question is comprised of ultrasonic sensors, microwave radar (at around 77 GHz) and visual sensors (such a cameras). It feeds motion detection software and other interpretive software. Lidar is light wave equivalent of radar, sending out a pulse of light to create an image of what's out there. The data returned is a "point cloud" (a bunch of dots). Point cloud data gets calibrated to meet a specified accuracy and can be processed into downstream products such as asset extraction (wires, poles, etc.) Such a system has been deemed a must for self-driving cars.

Humans drive cars with two eyes, their binocular vision providing depth perception. Having cameras surrounding the car seems like they should be sufficient for that task. But what happens in reduced visibility, in heavy snow or dense fog? Safe travel is reduced to a crawling speed. Unknown is whether camera resolution and lack of binocular vision will be sufficient for full self-driving. A parallel can be drawn with airplanes flying in darkness or zero visibility. If a person can drive looking only at internal vehicle screens using their cameras, then full self-driving should be possible.

But if a human can't do that due to lack of information, can a sensor equipped computer do it for them? It is apparent that the current on-board vehicle computational power is insufficient. Given that the new NVIDIA architecture can operate at 100–250 Tera operations per second (TOPS, where Tera is a million times beyond Mega and a thousand times beyond Giga) and Tesla says their newest custom chip beats NVIDIA — then their new computers should have the ability to process the information fast enough. Years of Model S, X and 3 driving data has been collected and accumulated, from literally billions of miles traveled on roads all around the globe. That amounts to a lot of data. How to make intelligent decisions, and do it quickly?

BIG DATA AND THE CRUNCH

GPS geolocation limits the data set to be scrutinized, to help reduce this task. But a big problem with current machine-based learning is that it is fairly primitive. The information flow is unidirectional. In a learning network such as the human brain, there are many more (numbers) of neurons feeding information backwards than forwards! Stated another way, a snapshot in time makes it easy to look backwards in time, to see what happened at that instant. But a snap shot can't anticipate what hasn't yet happened.

Older information (past snap shots) creates a 'time layer' which could be switched in an out, depending on needs. This creates a filter, which means the earlier filter layers are much more robust and sensitive to what is being "seen." They have been built up from accumulated data. If the most recently created layer detects a car, all the layers before which detect parts of a car are sensitized to this; yet wisely choosing filters looking for car parts (and not cat parts, or people parts or tree parts or road parts) takes some interpretive effort by the software. That take precious time.

Our brain also has neurons which call attention or focus. These increase activity on what has attention and reduces activity on what does not. This improves overall performance and reduces energy consumption by eliminating all those extraneous distractions. Really good self-driving needs a machine learning model to include these into a computational structure. We're not there yet. It's a massive issue with large amounts of frequently changing data, a task of primarily programming. Figuring out how to optimize, how to best do that once an approach is chosen — only then will performance shoot up significantly.

Take a simple example: look at a smooth surface, trying to detect an imperfection. Your eyes are seemingly drawn to a bump, a color difference, odd shading, dirt, bugs, etc. It is relatively easy for a human to do, but very difficult for machine vision to accomplish with close to zero errors. A human gets tired quickly doing this task, while a machine on the other hand doesn't; but — it takes time for it to accomplish such a task. The amount of data flowing to be evaluated is massive. And in the case of a moving car — is constantly changing.

The following URL is a good article (*https://cleantechnica.com/2016/07/29/tesla-google-disagree-lidar-right/*) which breaks down the reasons why a Lidar system is unnecessary for autonomous driving and why Tesla is correct; it is not the definitive work. Lidar does, however, have two

continued on page 30

LIDAR VS RADAR

Continued from page 29

advantages. From this article we have extracted some useful visualizations.

The requirements for a complete sensor set for autonomous vehicles include four types of sensors which provide external and immediate information to autonomous and semi-autonomous vehicles:

- **Lidar:** *https://en.wikipedia.org/wiki/Lidar* – a surveying technology that measures distance by illuminating a target with a laser light. **LIDAR** is an acronym of **L**ight **D**etection **A**nd **R**anging, (sometimes Light Imaging, Detection, And Ranging) and was originally created as a blending of the words "light" and "radar."

- **Radar:** *https://www.mouser.com/applications/radar-every-bumper-autonomous/* – an object-detection system that uses radio waves to determine the range, angle, or velocity of objects.

- **Ultrasonic:** *https://en.wikipedia.org/wiki/Parking_sensor#Ultrasonic_systems* – an object detection system which emits ultrasonic sound waves and detects their return to determine distance.

- **Passive Visual:** *https://en.wikipedia.org/wiki/Computer_vision* – the use of passive cameras and sophisticated object detection algorithms to understand what is visible from the cameras.

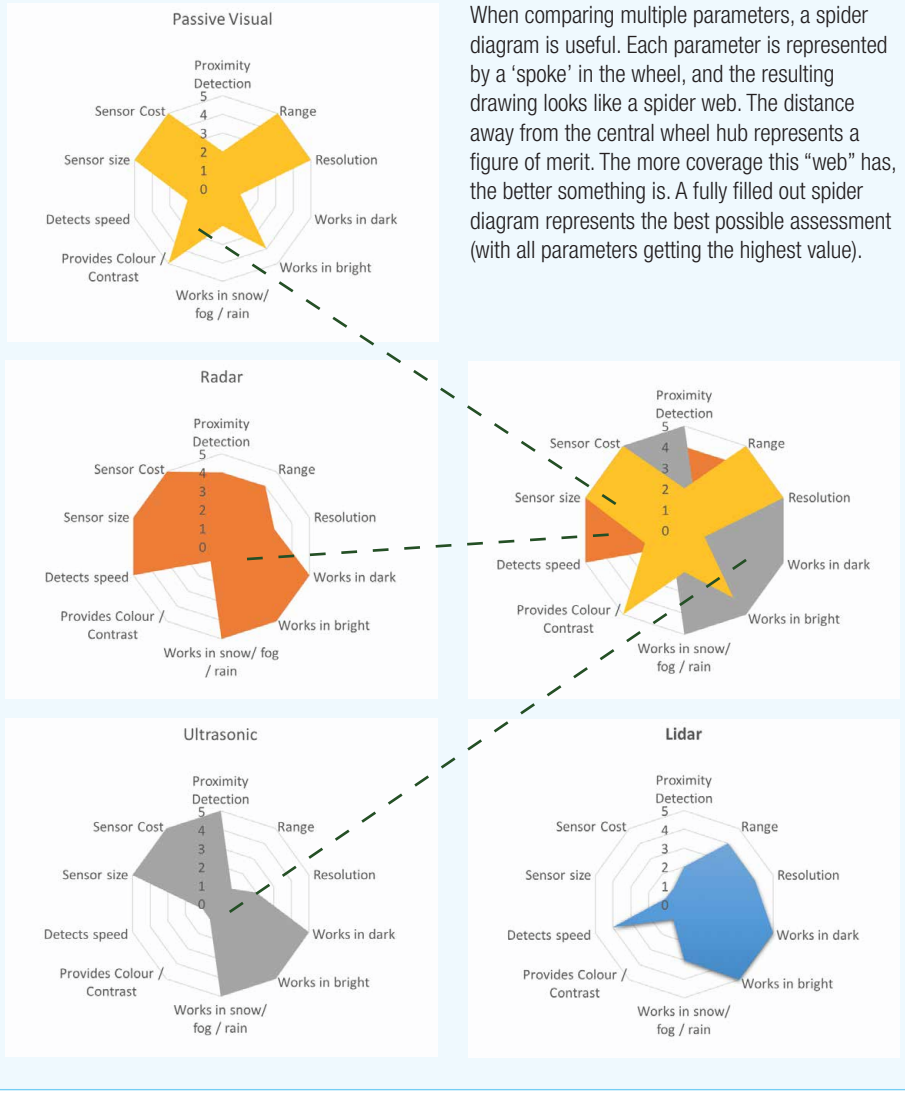
Clearly each technology has different strengths and weaknesses. One can assess the competence of Lidar, radar, passive cameras and ultrasonic sonar in achieving those attributes individually. Lidar does reasonably well as an individual sensor having good range, resolution, it works in all lighting conditions and it can detect variances in velocities. However, it is not so good for other things such as very near field proximity detection (time shrinkage), costs, size, color or luminosity differences, and *it works poorly when there are refractive elements such as snow, fog, rain and dust particles in the air due to its use of light spectrum wavelengths*. Admittedly, radar and sonar raw data can be very noisy and false positives are common. Decoding these signals is tricky and vitally important. But aircraft and boats have been using these for years, and the techniques are pretty well understood.

We see Lidar is imperfect and quite expensive. While all sensors are imperfect, that's why autonomous vehicles use multiple types of sensors, as backups. Tesla uses radar, ultrasonic sonar and passive cameras, while

continued on page 31

SPIDER DIAGRAMS

When comparing multiple parameters, a spider diagram is useful. Each parameter is represented by a 'spoke' in the wheel, and the resulting drawing looks like a spider web. The distance away from the central wheel hub represents a figure of merit. The more coverage this "web" has, the better something is. A fully filled out spider diagram represents the best possible assessment (with all parameters getting the highest value).



most other autonomous vehicles uses all three of these in addition to Lidar. In addition to being more expensive by itself, Lidar just adds to the cost of the other sensors. Is it really necessary? Why doesn't Tesla bother with Lidar when everyone else does? This spider diagram shows the overlap of abilities of ultrasonic sonar, radar and passive cameras against the requirements. The three sensors provide all of the capabilities between then. Tesla concludes that Lidar is not required. As the diagrams in the Sidebar bear out — there is little benefit from adding the expensive Lidar hardware. As in all engineering, things are accomplished by tradeoffs.

Lidar systems still cost between $12,000 and $75,000 per vehicle. See the following URL.
http://www.latimes.com/business/la-fi-hy-ouster-lidar-20171211-htmlstory.html
Currently large and needing to be mounted outside of vehicles, the system Google uses is in the range of 175 lbs., (80 kg) for example. It must be mounted on top of the vehicle for unobstructed sight-lines. That quickly destroys good aerodynamic characteristics. Because of their current limitations, they are not useful for detecting anything near the vehicle.

It is believed that the engineers at Tesla ran their numbers realizing that needed computing power would get much cheaper more quickly than the Lidar hardware would. So Tesla went with a much lower cost sensor suite and a higher power computer (see 'Tesla Says Its New Self-Driving Chip Is Finally Baked' *https://www.wired.com/story/tesla-self-driving-car-computer-chip-nvidia/*). Their new custom AI-optimized chip supposedly can handle 2,000 frames per second (ten times their old Nvidia hardware). The comments posted with this article contain interesting and revealing discussions.

Lidar has its share of problems too, with very fuzzy resolution being one. It can't really tell the difference between similar-sized objects, like a fire hydrant and a toddler. It gets dazzled by reflective (wet or snowy) surfaces, and cannot read street signs or traffic lights. It relies on light, and when objects are obscured, it fails. Video processing with artificial intelligence was going to be critical no matter what, so Tesla to date, has decided to just do without the Lidar.

Radar of the proper frequency can easily penetrate such misery and help the computer make faster decisions without computer overhead, without averaging or building a representation of a scene (via layers) from a point cloud. Tesla suggests that 8 video cameras, 12 ultrasonic sensors, and low-cost radar will be enough for autonomous driving… if their AI software and computing power are sufficient. (The forthcoming Tesla 'Semi' supposedly will have 26 cameras!)

CONCLUSION

Tesla has pretty well committed to video, radar, and sonic sensors in their AP 2.0 hardware included on Model S, X and 3 being built since late 2016. That probably won't change unless there is a legal requirement or a technological advancement that warrants it. Owners will watch for updates on the latest beta release of the AutoPilot 2.X software which is being prepared for over the air (OTA) update release. Early testing with customer vehicles is said to begin later this month.

REFERENCES AND FURTHER READING:

https://cleantechnica.com/2016/07/29/tesla-google-disagree-lidar-right/
http://www.lidarnews.com
https://www.tesla.com/autopilot
"Tesla releases the details of its new radar processing technology: point cloud, 2-car ahead tracking & more"
https://electrek.co/2016/09/11/tesla-autopilot-radar-processing-v8-update/
for a more detailed description of their sensor suite.

Nevada Confirms: Tesla Continues To Exceed Gigafactory Performance Targets

By Kyle Field

The Nevada Governor's Office of Economic Development has conducted an audit of Tesla's and parter Panasonic's spending in Q4 2017. The office found that the combined capital investment at the Reno Gigafactory continued to exceed benchmarks set to earn state tax incentives.

The news comes as a welcome positive story for the company while it rides out shockwaves emanating from recent Elon Musk tweets about potentially taking Tesla private. The audit found that Tesla spent a mind-boggling $459 million in capital at the Gigafactory in the fourth quarter, bringing cumulative capital spending up to $3.7 billion by the end of Q4 2017.

The total exceeds the minimum capital investment benchmark set by the company in cooperation with state officials back in 2014 when the initial tax subsidy package was approved. If you add in the $402 million in spending for the first half of 2018, Tesla has already exceeded $4 billion in capital spending at the Gigafactory, making it clear where its profits are going for those who weren't paying attention.

On the employment front, Tesla added more than 34% more employees, with 832 new hires being added in Q4. The surge brought total enrollment at the Gigafactory up to 3,249. On top of the new Tesla employees, the Gigafactory employed 1,332 new construction workers, bringing the total number of construction workers to 13,743 — or more people than the town I grew up in.

continued next page

Indeed, the thought of a single facility only a few years old employing 16,992 employees is staggering and puts some scale to the work happening at the Gigafactory in support of Tesla's Model 3 production ramp. Hiring, work, and spending at the Gigafactory must continue if Tesla is to have any shot at hitting its 10,000 per week production target of the Model 3 next year.

News of Tesla spending what it said it would spend and hiring as many people as it said it would hire was received positively by the executive director of the Office of Economic Development, Paul Anderson. He recognized Tesla's diligent adherence to achieving targets set years ago, even in the face of so much change in the intervening years.

"Tesla is an outstanding partner for Nevada, from surpassing their performance benchmarks at the Gigafactory to their $37.5-million pledge in support of science and robotics programs at our schools, they've done everything they said they would do and more. We're very proud to have Tesla as a member of the Nevada family," Anderson shared.

Critics of the 2014 subsidy package were quick to chime in with their staunch disapproval of the 4 year old plan, alleging that Nevadans are picking up the bill on increased state spending on schools, roads, public safety, and more, but such critics illogically ignored the sizable taxes paid by Tesla in the state, not to mention taxes paid by employees working at the factory.

Bob Fulkerson, co-founder and state director of the Progressive Leadership Alliance of Nevada, sounded his tired horn yet again, relating that, "We can want Tesla to succeed and we can want them to pay their fair share of taxes and not get away with robbing the store, which is what they are doing." This is why I could never be a politician. The highly prevalent nonsensical resistance to letting the past be the past and resistance to solving today's problems with a long-term approach together just frustrates the hell out of me, to be perhaps a bit too honest.

Tesla shared that all of the spending and new employees meant that the battery factory exceeded a run rate of 20 gigawatt-hours per year — or more than 1.67 gigawatt-hours per month. The updated production numbers make Tesla the largest battery producer in the world "by a significant margin," according to the **RGJ**. For perspective, if all of those batteries went straight into Tesla's Long Range Model 3s, the company would be able to churn out just over 22,000 Model 3s per month.

With Tesla having already achieved an admittedly forced run rate of 5,000 Long Range Model 3s per week (and **possibly now 6,000 per week**), the new data from the Gigafactory highlights that an equal, if not greater, amount of work than what is being put into Tesla's Fremont factory is also being applied at the Gigafactory as it works to produce the new 2170 cells for Tesla's products.

If that were only the whole story, it would be more palatable, but Tesla also needs its new batteries for its Tesla Energy products, like its Powerwall residential energy storage pack, which also has long backlogs from high consumer demand, and the much larger Powerpack. Looking at these numbers, it's no wonder **Tesla leaned on Samsung** to provide the battery cells for its **129 MWh grid-tied battery installation in South Australia.**
Source: RGJ

https://cleantechnica.com/2018/08/23/nevada-confirms-tesla-continues-to-exceed-gigafactory-performance-targets/

Harley-Davidson to Expand EV lineup, May Include Scooters, Bicycles

By Jake Bright

You'll soon be able to get your battery running and head out on the highway on a variety of Harley-Davidson EVs.

That according to news the Milwaukee-based motorcycle manufacture will offer "an exciting portfolio of two-wheeled electric vehicles" in the near future, including a possible e-scooter and bicycle.

These EVs are an addition to Harley-Davidson's first production LiveWire e-moto — announced earlier this year and set to hit showroom floors by August 2019.

So what new tech will Harley add to its predominantly chrome and steel internal combustion stable? "A broader range of electric models that are light, nimble and ready to tackle the urban landscape…available by 2022," was the description an HD spokesperson gave TechCrunch.

Harley-Davidson plans to make five production EVs in total, two by 2022, according to the spokesperson and an interview by Chief Operating Officer Michelle Kumbier.

Harley isn't ready to "take the full cover off" yet, the spokesperson said, but did share some indicative concept photos of one lightweight electric motorcycle, an e-scooter and an e-bicycle.

Harley's EV development started with the 2014 Project LiveWire concept motorcycle, which will become its full-sized electric LiveWire motorcycle by next year.

The electric news came as part of a new growth plan announced by CEO Matthew Levatich to expand HD's lineup of lighter motorcycles — including several new gas bikes — and push more aggressively into emerging markets such as India and China.

Levatich placed "enabling E.V. technology" squarely in Harley-Davidson's priorities. He said HD

continued next page

looked "to create new riders," meet them where they are "in the cities" and give them "a cool product… that is much more twist-and-go" — a reference to electric motorcycles' no clutch, no gears design that also makes them easier to ride.

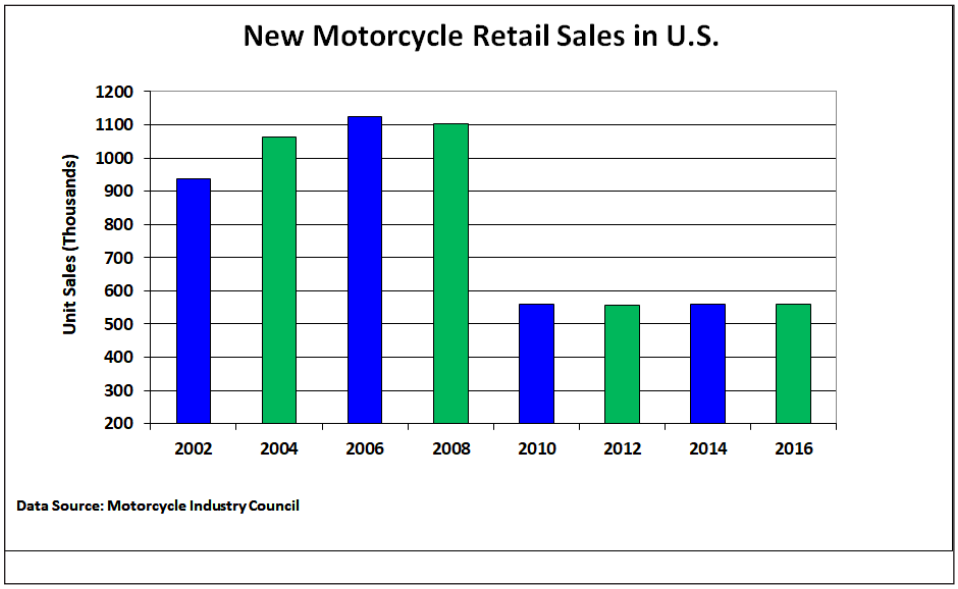
Harley's revised focus comes as prevailing trends have brought financial pains to many big motorcycle makers, including Harley-Davidson. Since the recession, America's motorcycle sector has been in the doldrums. New bike sales have dropped roughly 50 percent since 2008 — with sharp declines in ownership by everyone under 40.

As TechCrunch reported in February, and this recent e-moto feature, Harley and the entry of several e-moto startups could shake up the motorcycle industry.

Three e-motorcycle startups — Alta Motors, Energica and Zero Motorcycles — have revved up promotion, distribution and sales in the U.S. They are betting on pulling more gas riders to the e-moto experience and attract more young folks and women into buying motorcycles.

E-moto and scooter sales in the U.S. — currently 12.9 percent of the market — are expected to grow to 598K units worth $304 million by 2024, according to Global Market Insights. GMI projects global electric motorcycle and scooter sales to exceed $24 billion by 2024.

On the tech side, two-wheel gas manufacturers have mostly stagnated around EV concepts. None of the big



names — Honda, Kawasaki, Suzuki, BMW, KTM — offer a production electric street motorcycle in the U.S.

Competitive pressure from EV upstarts — added to Harley's EV production commitments — could pressure the likes of Honda, Yamaha and Ducati to produce electric motorcycles sooner.

A shift in two-wheel preferences also could prompt fresh acquisitions and alliances in the motorcycle world.

Shortly after their LiveWire EV commitment earlier this year, Harley-Davidson took an (undisclosed) equity stake in Alta Motors and entered into a co-development partnership.

However things play out, Harley-Davidson's commitment to produce two-wheelers that connect to wall sockets versus gas pumps — and buzz instead of rumble — signals electricity could upend convention in the motorcycle industry.

https://techcrunch.com/2018/07/31/1683385/?yptr=yahoo

Additional Resources: Harley-Davidson Makes Even Deeper Commitment to Electric Motorcycles
https://finance.yahoo.com/news/harley-davidson-makes-even-deeper-133300637.html

Harley-Davidson is opening a Silicon Valley R&D center to power EV production
https://techcrunch.com/2018/09/07/harley-davidson-is-opening-a-silicon-valley-rd-center-to-power-ev-production/

Keep Up on all Auto Shows & EV Related Conferences

US and International Events

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

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

EEVCONVENTION, OSLO, NORWAY
9/25/2018

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

WASHINGTON AUTO SHOW
04/05/19 - 04/14/19

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Save the Date...

EVS 31 & EVTeC 2018

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

http://www.evs31.org

JANUARY 17-21, 2019
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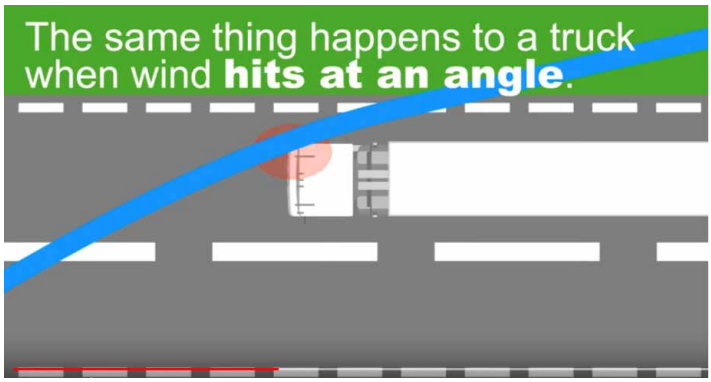
https://www.bostonautoshow.com/

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

Electric wind vortex generator reduces drag on trucks



For road vehicles, wind resistance increases fuel consumption. But one way to fight wind is with wind. Researchers in Sweden are experimenting with reducing drag on trucks with electric wind devices that mimic the way vortex generators increase lift on airplane wings.

https://www.youtube.com/watch?time_continue=92&v=8zQokKKWBLg

"Panic in Detroit" An Electric Dragster

Have you been wondering what the National Electric Drag Racing Association has been up to recently? Here is an example of the effort they have put in, and the result they are getting out. This is already a couple race seasons old! Built in the US of A, a really quick dragster in the truest sense of the word. The dragster that recently set a new record 1/4 mile run at Royal Purple Raceway in Baytown TX. The result: "Quickest and Fastest EV Dragster 7.24 186mph

https://insideevs.com/panic-in-detroit-sets-dragster-14-mile-run-record-7-24-186mph/

Repairing & Restoring a Tesla Model 3 (Full Version)

In a recent time-lapsed video, technician Erik Garcia works to save a beautiful Midnight Silver Metallic Model 3. The video playback is sped up to keep the length under 8 minutes. But even with the shortened running time, you can really see the amount of work that goes into a vehicle restoration like this. If you're curious about what happens in each stage of the repair, you'll enjoy watching this video showcasing the process from beginning to end.

https://insideevs.com/watch-time-lapse-video-of-tesla-model-3-body-repair/

Dear Tesla Killers...

In this short piece, Ben Sullins vents quite sensibly, aiming at the other big automakers, chastising them for several things, among them - for not jumping into the growing EV market. The CE staff has wondered out loud, about the reticence of certain major (and minor players) to produce more PEVs (e.g. Ford, Mazda, Subaru and others).

https://www.youtube.com/watch?v=5fW9ne9mFVk&t=515s

Articles of Interest (cont.)

Electric Wind Takes Truck Aerodynamics from Brick to Slick

By David Szondy

Researchers at Sweden's KTH Royal Institute of Technology are developing a device that increases the fuel efficiency of trucks by cloaking them in electric wind. Using plasma actuators to charge the air, the new technology controls the flow of wind around the truck to reduce drag and could improve fuel consumption by five percent.

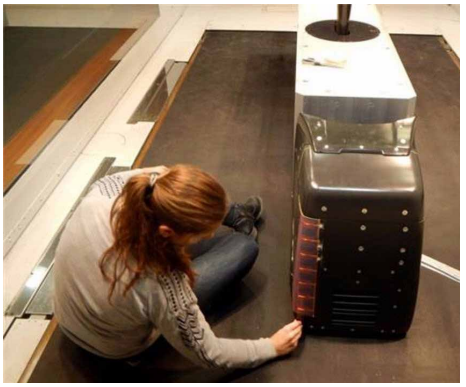
According to the American Trucking Association, 70 percent of heavy freight in the US alone is moved by trucks – that's 10.5 billion tons of cargo on 3.4 million heavy-duty Class 8 trucks. Worldwide, that not only translates to a lot of stuff hauled by a lot of trucks, but also a lot of fuel burned.

The basic truck is a moving crate that's about as aerodynamic as a brick. As it travels down the highway, it doesn't so much slide through the air as rip it up and fling it churning to the side, which is one reason why passing a juggernaut in the pouring rain is such an unpleasant, if not frightening, experience.

Engineers have been aware of this shortcoming since the 1920s and have developed any number of ways of streamlining trucks to make them more aerodynamic. This makes them faster and more stable, as well as more fuel efficient. However, there's still a long way to go, so KTH is taking a page from aerospace engineering.

Aircraft, too, have problems with drag. When a plane is taking off, for example, the increasing angle of attack causes the air to flow less smoothly over the top of the wing and breaks up into turbulence. Engineers get around this by fitting winglets to the tips of the wings to generate vortices that increase lift. KTH wanted something similar for trucks to reduce drag. The snag is that trucks, obviously, aren't airplanes.

KTH is testing a system the uses electric winds to reduce fuel consumption in trucks (Credit: KTH)



KTH researcher Julie Vernet with the model plasma truck (Credit: KTH)

The KTH system uses plasma actuators mounted on the cab of the truck (Credit: KTH)

What the KTH team came up with is a way to generate vortices at the front of the truck cab to control air flow, but instead of using metal vortex generators like winglets, they used electric wind.

The idea is that as air strikes the front of the truck, it flows around it, forming a boundary layer that, if the truck is aerodynamic enough, follows the surface cab and cargo area until it reaches the back and breaks up into eddies. If the truck is moving through still air, that's okay, but if there's wind striking the vehicle at an angle, it can slow down the boundary layer, causing it to separate and form turbulence.

The KTH system uses plasma actuators on the front of the cab. These are two high-voltage electrodes that ionize the surrounding air molecules and accelerates them through the electric field to generate wind without the need for moving parts or protruding airfoils. In addition, these actuators can be adjusted to counter the specific strength and direction of an incoming wind by setting up vortices that force the air into the boundary layer, lowering drag.

"Our ultimate goal is to reduce the flow separation that occurs on the front corners of the truck," says KTH researcher Julie Vernet. "By adding momentum close to the surface, the size of the separated region is reduced."

https://newatlas.com/truck-aerodynamics-fuel-efficiency-plasma/48646/#p456481

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Charged Up: $60	"Current EVents" Personal Listing, "Electric Car Insider Guide"
Supercharged: $120	EAA Polo Shirt, "Current EVents", Supercharged Personal or Business Supporter listing (one issue)
Supercharged Plus: $240	EAA Polo Shirt, "Current EVents" , Supercharged plus Personal or Business Supporter listing two issues)
High Voltage: $500	Polo Shirt, "Current EVents" listing as a High Voltage Personal or Business Supporter (three issues), "Who Killed the Electric Car" movie

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

Join Today!

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Don't Miss These (cont.)

EV Charging in Cold Temperatures Could Pose Challenges for Drivers

By Nicole Stricker

New research from Idaho National Laboratory suggests that electric vehicle drivers could face longer charging times when temperatures drop. The reason: cold temperatures impact the electrochemical reactions within the cell, and onboard battery management systems limit the charging rate to avoid damage to the battery.

The new study, which looked at data from a fleet of electric vehicle (EV) taxis in New York City, was posted last week by the journal Energy Policy.

"Battery researchers have known about the degradation of charging efficiency under cold temperatures for a long time," said Yutaka Motoaki, an EV researcher with INL's Advanced Vehicles research group.

But most of the current knowledge comes from experiments with smaller batteries in the lab, not data from large, electric vehicle batteries in real-world conditions. Further, EV manufacturers often provide consumers with only rough estimates of charging times, and they typically do not specify the range of conditions for which those estimates apply.

"We wanted to ask the question: What is the temperature effect on that battery pack?" Motoaki said. "What is the effect of degradation of charging efficiency on vehicle performance?"

Motoaki and his colleagues analyzed data from a fleet of Nissan Leafs operated as taxis over roughly 500 Direct Current Fast Charge (DCFC) events. Temperatures for the charging events ranged from 15 to 103 degrees Fahrenheit.

The researchers found that charging times increased significantly when the weather got cold. When an EV battery was charged at 77 degrees, a DCFC charger might charge a battery to 80 percent capacity in 30 minutes. But at 32 degrees, the battery's state of charge was 36 percent less after the same amount of time.

EV drivers may need to factor external temperatures into the time they'll need to charge batteries, according to new study in Energy Policy. Credit: Idaho National Laboratory

And, the more the temperature dropped, the longer it took to charge the battery. Under the coldest conditions, the rate of charging was roughly three times slower than at warmer temperatures.

It's important to note that cold weather would only impact EV drivers under specific circumstances, Motoaki said. For instance, people who charge their EVs in a warm garage and use their EVs for commuting within the range of their battery might not experience much inconvenience. Decreased fuel economy in cold weather is also a well-known phenomenon with gasoline and diesel-powered vehicles.

But time spent charging in cold temperatures could make a big difference for a taxi driver, since every minute spent charging a vehicle is a minute the driver is not making money.

"There's a lot of uncertainty about what the vehicle owner's experience would be if they drive the vehicle in Maine or Michigan," Motoaki said.

The research poses questions not only for EV customers, but also for utilities and charging infrastructure providers. For instance, the location or abundance of charging infrastructure may need to be different in colder climates, and electric utilities might see electricity use vary as the seasons change.

https://phys.org/news/2018-08-ev-cold-temperatures-pose-drivers.html#jCp

ELECTRIC AUTO ASSOCIATION CHAPTERS AND AFFILIATES

International

CANADA

EV COUNCIL OF OTTAWA
Web Site: www.evco.ca
Contact: Darryl McMahon
info@evco.ca

VANCOUVER EVA
Web Site: www.veva.bc.ca
Contact: Bruce Sharpe 604-897-9072

MEXICO

EVA of SONORA (AVES)
Web Site: Diadelautoelectrico.org
Contact: Oscar Vidal
662-105-6551

TAIWAN

TEVA | Taiwan Electric Vehicles Association
FaceBook: www.facebook.com
TaiwanElectricVehiclesAssociation
Contact: Mr. David Lane
Phone: 011 866 987 526 892

United States

NEDRA
National Electric Drag Racing Association
Web Site: www.nedra.com
Contact: John Metric, 979-665-5621

PLUG IN AMERICA
Web Site: www.pluginamerica.org
Contact: Joel Levin
info@pluginamerica.org

ALASKA

JUNEAU EVA
Contact: Duff Mitchell, 907-723-2481

ARIZONA

PHOENIX EAA
Web Site: www.phoenixeaa.com
Contact: Jim Stack, 480-659-5513

TUCSON TEVA
Web Site: tucsonelectricvehicle.org
Contact: David Gebert 520-881-8010
tevadave@cox.net

CALIFORNIA

CENTRAL COAST (CCEAA)
Web Site: eaacc.org
Contact: Will Beckett, 831-688-8669

CHICO EAA
Web Site: www.chicoeaa.info
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continued on next page

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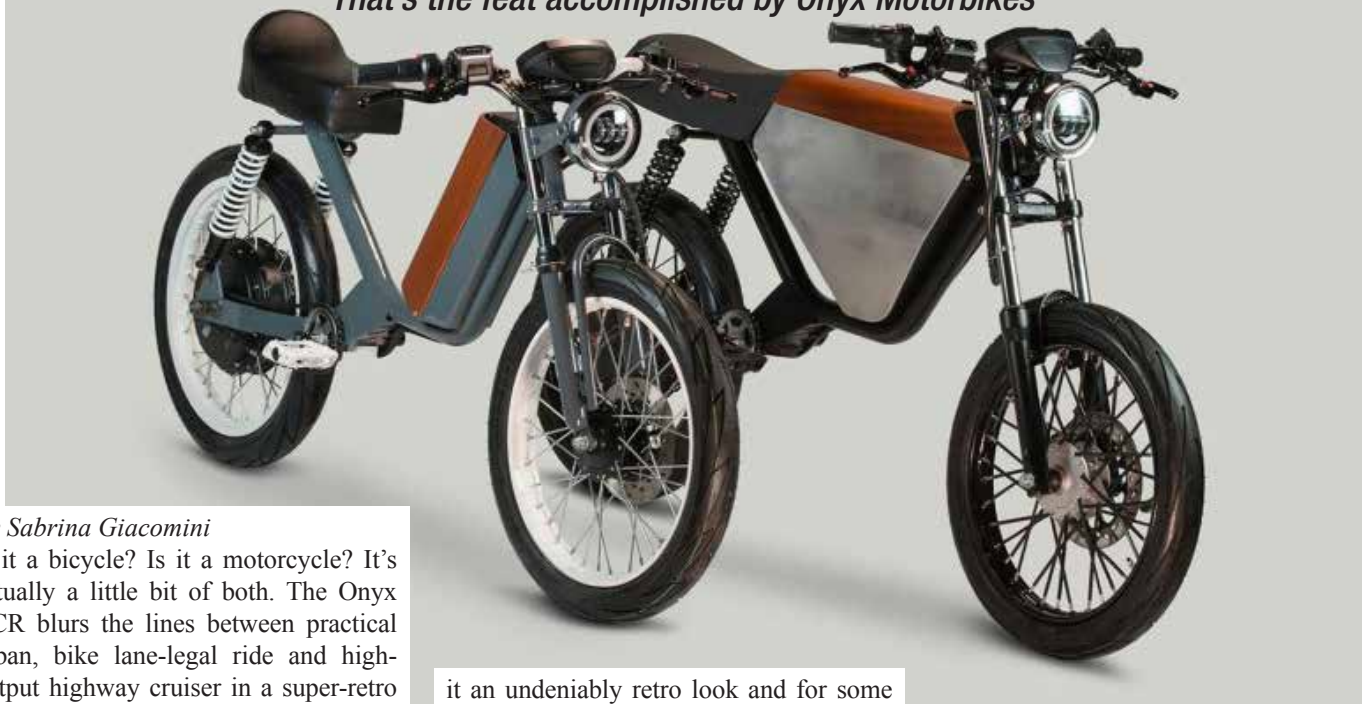
Onyx RCR is Both E-Bike and Electric Motorcycle

A versatile electric bicycle that doubles as a motorcycle? That's the feat accomplished by Onyx Motorbikes



By Sabrina Giacomini

Is it a bicycle? Is it a motorcycle? It's actually a little bit of both. The Onyx RCR blurs the lines between practical urban, bike lane-legal ride and high-output highway cruiser in a super-retro package.

Onyx Motorbikes is a San Francisco, CA based company that recently launched two models of electric mopeds. While one is a proper city-dweller, the other one has a wheel in the city and the other on the highway.

The CTY [left in the photo] is the tamer model of the lot and a standard e-bike. It has a 48-volt battery with a range rated at roughly 25 to 40 miles, depending on your speed. It's the perfect partner for a ride in the city as it can reach a top speed of 30 mph and is fitted with pedals, should the battery run out. The spoke wheels and banana saddle give it an undeniably retro look and for some extra comfort, the CTY has a motorcycle-like suspension to absorb bumps.

It's priced at $1,875 on pre-order, and comes with a few added perks such as an LCD display, headlight, USB 3.0 port, Bluetooth connectivity, and a smart key.

The RCR [Right in the photo] is a bit of a different beast. It's hard to understand what you are looking at while scanning the RCR's design with its low-swept frame and thin tires, but believe or not, it will actually take you on (most) highways. Onyx calls it the Cafe Blaster for its look reminiscent of a cafe racer with its flat saddle, wire wheels, and round headlight.

The model is a cross between electric bicycle and motorcycle. It receives at 72 V battery paired with a 5.4 kW electric motor for a 7.2 hp output — for a bike weighing in at 120 lb. This makes the RCR equivalent to a 125cc motorcycle and therefore doesn't require a license. Its electric range is estimated at 75 miles. The "economy mode" turns the RCR into a quiet urban commuter, limiting its speed to 20 mph, but when you change the mode, the RCR becomes a proper highway motorcycle with a top speed of 60 mph. *The beauty of technology!*

[Interested? Go to the url below.]

https://rideapart.com/articles/onyx-rcr-e-bike-electric-motorcycle

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