

Electric Auto Association



Current **EV**ents

July 2019 Promoting the use of electric vehicles since 1967 Vol. 51 No. 7

The Long-Awaited All-Electric Mini!



BMW has introduced the long-awaited all-electric Mini with its new Mini Cooper SE. We already know what it looks like but do its specs impress? *Continue reading on page 10*



**Rivian's
Electric Camping**
... page 22



**A Power Play
Climate Discussion**
... page 30



**2020 LiveWire
First Ride**
... page 36

Articles

- 1 **THE LONG-AWAITED ALL-ELECTRIC MINI** — New Mini Cooper SE
- 3 **ELECTRIC CAR HEROES AROUND THE GLOBE** — Setting world records
- 4 **THANK YOU TO OUR SUPPORTING MEMBERS**
- 7 **2019 WAVE IN SEPTEMBER**
- 8 **EV VETERANS HONOR SCE'S 'DEAN' OF ELECTRIC VEHICLES**
- 10 **BMW UNVEILS ALL-ELECTRIC MINI COOPER SE WITH 168-MILE RANGE, BASED ON OLDER i3 PLATFORM** — The Electric Mini offers four driving modes
- 12 **NISSAN LEAF BATTERIES ARE LASTING A VERY LONG TIME** — The need to create second-use demand for the Leaf's battery packs
- 14 **HOW RECYCLABLE ARE BATTERIES FROM ELECTRIC CARS?** — Production and disposal of their batteries
- 16 **TESLA REPORTEDLY WORKING ON ITS OWN BATTERY CELL MANUFACTURING CAPABILITY** — Another key part of its supply chain
- 17 **NEW SOLAR + BATTERY PRICE CRUSHES FOSSIL FUELS, BURIES NUCLEAR** — It's half the estimated cost of power from a new natural gas plant
- 18 **CHINA'S BREAKING UP THE EV BATTERY MONOPOLY IT CAREFULLY CREATED** — Effectively shutting out foreign battery makers
- 19 **HELP US TO STOP CLIMATE CHANGE** — CleanTechnica Survey
- 20 **THIS "BAGGED" TESLA MODEL 3 GOES VIRAL IN A JIFFY**
- 21 **ANALYSIS FINDS HYBRIDS MAKE BETTER USE OF SCARCE BATTERIES THAN PURE EVS**
- 22 **RIVIAN'S 750-HP ELECTRIC CAMPING PICKUP DRIVES, COOKS AND LIVES ON PURE BATTERY POWER** — Finally the possibility of overlanding in an EV
- 24 **WITH PORTABLE EV FAST CHARGERS, COULD BACKUP JUICE BE AS EASY AS PIZZA DELIVERY?** — SparkCharge and its new modular charging system
- 25 **ASTON MARTIN RAPIDE-E HOT LAP AT MONACO FORMULA E I FULLY CHARGED**
- 26 **CHARGEPOINT AND ELECTRIFY AMERICA SIMPLY CHARGING ACCESS WITH ROAMING AGREEMENT** — More connections between networks and operators
- 27 **TESLA IS PUSHING FOR ITS OWN >1 MW HIGH-POWER CHARGING STANDARD FOR ELECTRIC TRUCKS**
- 28 **TESLA'S NEW V3 SUPERCHARGER CAN CHARGE UP TO 1,500 ELECTRIC VEHICLES A DAY** — Next generation charging in Las Vegas
- 29 **CHARGE YOUR ELECTRIC CAR IN THE NATIONAL PARKS** — 100 stations
- 29 **BILL WOULD ADD CAR CHARGING STATIONS AT PARKS, FORESTS**
- 30 **A POWER PLAY** — Climate Change Blog
- 34 **WE'RE DRIVING 6,000 MILES IN AN ELECTRIC CAR. HERE'S WHY** — The Electric Road Trip
- 36 **FIRST RIDE: 2020 HARLEY-DAVIDSON LIVEWIRE**
- 47 **THE 2022 BMW i4 COULD BE THE TESLA MODEL 3'S BIGGEST THREAT YET**
- 48 **CHARGING YOUR EV E-BOOK FOR DOWNLOAD**

Columns

- 3 **PRESIDENT'S COLUMN**
- 42-43 **NOTABLE VIDEOS & ARTICLES**
- 44 **EAA MEMBERSHIP FORM**
- 45 **EVENTS & CONFERENCES**
- 46 & 47 **CHAPTER LISTINGS**



Officers:

President: Raejean Fellows
Vice-President: Simon Freedman
Secretary: Guy Hall
Treasurer: Kelly Berry

Directors:

Nathalie Belanger, Marina Cerin-Stith,
 Ron Freund, Marc Geller,
 John Higham, James Stephens

Board Participant, Chapter Liaison:
 Charles Gerena

Membership:

Nathalie Belanger



Current Events Staff:

Editor: Ron Freund
Associate Editor: Guy Hall
Managing Editor: Dorothy Foglia

Article Submissions:

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

Advertisements:

A full advertiser's information package and Rate Sheet can be sent by E-mail. Please contact CE Staff for details.

National EAA:

Web Site: electricauto.org

Membership/Address Changes:

E-mail: electricauto.org
Mailing: Electric Auto Association
 P.O. Box 927090, San Diego, CA 92192

If you have comments, please send them to
ceeditor@electricauto.org.

© *Current Events* is a members only e-magazine. No reposting of any issue is allowed on any website. Copies marked "For Display Only" may be showcased to the public. However, *Current Events* may not be distributed to non-members without the written consent of an EAA Board of Directors member. Unauthorized use of copyrighted material will be prosecuted to the fullest extent permitted by law.



Follow us on Facebook
<https://www.facebook.com/ElectricAutoAssociation>
 On Twitter: @EAANational <https://twitter.com/EAANational>



©2019 *Current Events* is a publication of the Electric Auto Association. All rights reserved. While *Current Events* and the Electric Auto Association strive for clarity and accuracy, we assume no responsibility for usage of this information. Permission to copy for other than commercial use is given, provided that full credit is given to originator of material copied. This permission does not extend to reprinted articles. In accordance with Title 17 U.S.C. Section 107, this material is distributed without profit to those who have expressed a prior interest in receiving the included information for research and educational purposes.

Current Events Back Issues

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

Please visit

<http://electricauto.org/> and from the home page, click on "Documents" in the top navigation bar. You will see the document library. Click on that to reveal a listing of years (in a folder), which, when selected, will list the issues for each month. In that folder you will be able to download the PDF that contains the issue you choose.

Electric Car Heroes Around the Globe

... setting World Records



Meet Richard Absenger. He owns a 700 year-old hotel, restaurant and pub in a small village outside Salzburg, Austria. Richard grew up without a lot of material resources, in a very poor farming area of Austria. In his village, they modelled the importance of using resources well. “We learned to re-use all things. We have to reduce waste, it cannot be good for our planet,” Richard explained.

His [Hotel Kaiserhoff Anif](#), with 36 rooms and a wonderful restaurant serving farm-to-table sustainable food, offers free charging to all guests. Everyone on the premises drives an electric car, including the staff. There are 30 chargers altogether in the parking lot; all levels, Superchargers, DC



Fast Chargers, and Level 2 chargers. Richard’s goal is to have charging possibilities in every parking spot.

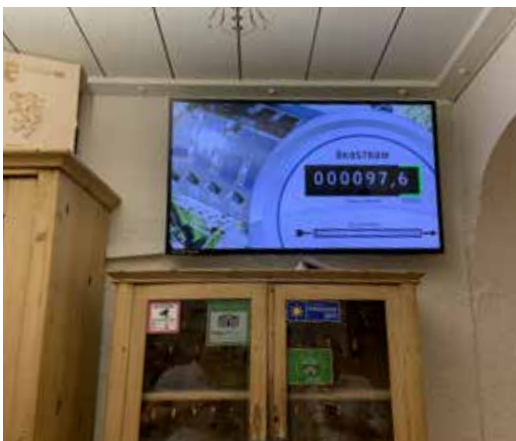
The roof of the hotel is loaded with solar. When you check in, you see a monitor on

the wall behind the front desk showing current solar production and the carbon averted by the clean energy generation.

Guests visit from many countries. Not only do you enjoy Richard’s food and lodging, but he will rent you an electric car. A recent guest drove 5,000 kilometers to Norway and back. Richard likes renting electric cars because he observed that with dealer test drives, car buyers can’t always have a long enough time in the car. “Within 2-3 days, guests get an authentic experience in a calm environment,” he says. The Hotel offers packages on their website. He offers a selection of Renault’s Zoe, and Tesla models, S, X and 3.

One guest complained about the lack of engine noise when the car goes fast. Richard took him for a ride, delighting the customer with Tesla’s “Insane” mode. The customer was so impressed that his desire for noise was no longer a concern. “Did you miss the noise?” Richard asked. “Ah — I forgot all about it.” said the guest.

Austria’s Electric Mobility Club ([EMC](#)), an EV educa-
continued on page 6



SUPPORTING MEMBERS

Thank you to our Supporting Members

COMMERCIAL AND INDIVIDUAL GIGAWATT DONORS

Clipper Creek, Inc., James Ferris, Ben Sullins, Sven Thesen

HIGH VOLTAGE DONATIONS - \$500

Jason France; James Green; Dave Hanson; Tiffany Hinton; Bill Hopkins; Rob Loblaw

SUPERCHARGED PLUS - \$240

Karen Casner
Scott Cronce

Bob Dockendorff
Tom Dowling

Ron Freund
Marc Geller
Steve Greenberg

Joe Lervold
Kim Rogers
Jim Stack

Dan Vogler
Stuart Williamson

SUPERCHARGED UP - \$120

Raymond Alden
Alan Arrison
Ronald Ballman
Philip N. Barnhart
Sidney Baum
David Borth
Rick Borth
Stephen Braun
Michael Bussler
Don Clayton
Bill Clem

Keith Comstock
Kyle Cuzzort
James Darnauer
Jay Donnaway
Kevin Douglass
Doug Duke
Jason Ellis
Jeff Finn
Simon Freedman
Gary Graunke
Dennis Griffin

Guy Hall
Christopher Hayden
John Higham
Lawrence Jakobi
Rick Kominowski
Margaret (Peggy)
Matarese
August Mathisrud
Cindi McVeigh Wagner
Todd Minnella
Bernard Moret

Rob Neary
Jeff Nisewanger
Norman Pease
Robert Poeschel
Bruce Rathbone
Maurillo Sanchez
Mark Schiller
Richard Shipp
Alan Soule
Mark Steffen
Matt Walton

CHARGED UP - \$60

Geoffrey Ainscow
Ace Allen
Areg Bagdasarian
Kent Bakke
Lon Ballard
Varant Basmajian
Nathalie Belanger
Sean Berry
Jason Bloomberg
Douglas Brentlinger
Tom Bressan
Steve Conley
David Crow
Mike Cummings
Joe DiLellio
Stephen Distant
Gary Dove
Monica Duncan
Bob Erdman
Todd Flax

Brian Flippo
Fabrice Florin
John Gaglione
Wayne Gale
Lee Gasper-Galvin
Sharon Geiken
Westerberg
Steven Gilbert
Jeffrey Gould
Chris Haley
Dean Hancock
Michael Heaney
Phillip Henke
Tom Higley
George Hoech
Merlyn Hough
Mark Hughes
Jason Jungreis
Raymond Leury
Michael London

Douglas MacDonald
Kyle Mahan
Edward Malkiewicz
Tom McCalmont
Sarah McCann
Robert McCaston
Maria Meyer
Gary Miller
Duff Mitchell
Noel Morin
Robert Neighbour
Stephen Noctor
Paul Olson
Jeff Oring
John Overstreet
Paul Pancella
Dennis Pestka
Robert Powell
Donald Preister
Theresa Ramsdell

Lloyd Reece
Molly Roth
William Rothaus
Mike Sasnett
Ramin Shahidi
Darren Sims
John Sisk
John Steiner
Robert Stratten
Chuck Swackhammer
Jared Terpak
Josh Thede
Michael Thwaite
Joseph Voss
Rusty West
Steve Wilson
Steven Wypyszcak
Michael Zuteck

Your generous donations are vital to supporting our activities.



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 outdoor 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

EV Heroes

continued from page 3

tion and advocacy non-profit, boasts over 1,000 members in Austria. Similar to our EAA experience, it is sometimes hard to get the accurate story about the real costs of owning EVs. In Austria, there are heavy taxes tied to horsepower on gas cars. These taxes can be as high as 400 euros/month. However, electric cars are exempt. It is not uncommon to save as much as 15-20,000 euros over five years. Yet, people don't grasp the lifetime costs of an EV versus a gas car. To tell the story, EMC members do what we do at Electric Auto, they get out there with their cars and talk face-to-face with people at festivals, auto shows, and monthly meetings. In fact, over 7,000 face-to-face conversations were had last year.

Not only do Austrian EV owners bring good information to people, but they hold some exciting events. Last year, they broke a world record. It was called the "24 Hour Challenge." How many

kilometers can you drive in 24 hours (a team of drivers in each car). The previous record was 2,400 kilometers. A new world record was set with 2,600 kilometers (1,585 miles) in 24 hours, including charging. The winning team accomplished this by averaging over 180 kilometers per hour (about 110 miles per hour), on the Autobahn (within the speed limit). Electric cars have a higher speed limit than gas cars on the Autobahn in Germany. EVs are overtaking internal combustion technology in so many ways.

Richard is a role model of living the sustainable life and an Electric Car Hero. With his business, he takes the long view. "Eventually, my investments will pay off." He uses nearly all his personal resources to help others join the transition to cleaner energy generation and use.

Richard's closing remarks:

"Every single person should look at what

they are doing. If everybody looks in the mirror at what they are doing, how they are spending their money, we will all be a lot better off."

Does this story of Richard inspire you? Do you know EV owners who will take up the "World Record Challenge"? 2,600 kilometers in 24 hours, including charging and using driving teams in each car. Can we beat it? Are there electric car heroes whose story needs to be told? All story ideas to ceeditor@electricauto.com. Let's raise up our heroes!

Raejean

p.s. Be sure to look up EV association members when you travel. It is sure to enrich your travel experience. Just find them via our chapter map on the website electricauto.org.

A rough version of our interview is at:

<https://bit.ly/30YpX6Z>

TucsonEV.com

US Shipping now included in price - Check it out!!!

12/16/32A 120/240VAC EVSE

- 32A capable
- 120/240vac
- 14-50 Plug standard
- Great LED Display shows Status, kWh used Time, Volts, Amps, Temp, Etc



Zero to J1772 Adapter

- 14AWG
- 18" cord
- C-13, C-19 and 5-15 Plugs
- Can have up to 3 plugs



CHAdEMO Inlet and Plug

- Yazaki
- 500VDC
- 120 Amps
- 1m cord



Plugs with and without Cord



20ft 30A or 40A Extension Cord

- Any length cord in 30A or 40A
- All Plugs and Inlets are 50A rated

Inlets with and without cord



- 10AWG, 8AWG and 6AWG
- 1m to 10m lengths

J1772™ Adapter Boxes

- For Conversions so that they can use Public J1772 EVSE's



- Remote and regular, 30A - 50A

EVE 40A Cord

- Orange Jacket, UL Certified 105 deg C
- Use as EVSE cord or J1772 Extension
- 2 legs of the 12AWG are connected for 40A like the Tesla UMC 40A EVSE

EVE 30A Cord

- Black Jacket, UL Certified 105 deg C
- Use as EVSE cord or J1772 Extension
- 10AWG Power and Ground

Quantity discounts available, for more information and pricing:

www.TucsonEV.com or EV@TucsonEV.com

Feb 2019

2019 WAVE in September



Welcome to the WAVE

The first WAVE was launched in 2011 and since then it has become the world's largest EV rallye. Since 2018, we are even organising two different WAVEs, in order to accomodate all teams. Each WAVE starts on a Friday evening and ends eight exciting days later, on Saturday night, after around 1500 spectacular kilometers.

Our mission is clear: we want to show to the public that electric mobility is ready for every day life. At the same time, we want to have fun, make friends and enjoy breathtaking scenery and enjoy unique insights in green companies and beautiful cities along the way.

The WAVE Switzerland

has already take place from 14 June – 22 June 2019, starting in Reinach near the city of Basel and finishing in the heart of Switzerland, in the city of Zug. Our aim was to visit all 26 cantons, crossing six spectacular Alpine mountain passes and visiting all four language regions of Switzerland.

The WAVE Germany

will start in Dortmund on Friday, 13 Sept. 2019. This tour will take us along the beautiful Rhine and Mosel River to Southern Germany, over the Schwarzwald region and into the German Alps. Spectacular scenery is important to us! The WAVE will finish on 21 Sept. in Erlangen north of Munich. <https://wavetrophy.com/english/>



See the route at this URL

<https://wavetrophy.com/wave/germany-2019/>



EV Veterans Honor SCE's 'Dean' of Electric Vehicles

The retirement celebration becomes a reunion of electric car trailblazers.



Dean Taylor shows off an early plug-in hybrid electric vehicle.

By Paul Griffo

Photo Credit: Courtesy of Dean Taylor

By the early 2000s, the battery electric car in America seemed all but dead.

General Motors had stopped making its EV-1 electric car — and, after more than a decade of modest progress, not much else was on the horizon for the movement to popularize electric vehicles.

“When the electric car got crushed, it felt like we were Don Quixote tilting at windmills,” said Dean Taylor.

One of the very first employees of Southern California Edison’s electric transportation program, Taylor wasn’t giving up. He was part of a small band of EV die-hards that continued to toil against all odds, doing their level best to keep their fading hope of mainstreaming electric cars on life support.

It was during that dark period that Taylor and his fellow EV advocates held onto a promising concept that they believed could breathe new life into their languishing movement: the plug-in hybrid EV, or PHEV for short.

And persist he did. Taylor started in SCE’s newly formed electric transportation department in 1991 and has served in that capacity longer than anyone in the company’s history.

continued next page



At the reunion, Dean Taylor and fellow EV advocates Felix Kramer (center) and Ron Gremban (right) of CalCars hold up the plug for their prototype plug-in hybrid.

WE WERE DOING EVERYTHING WE COULD IN THE 2000s TO MAKE PLUG-IN HYBRIDS HAPPEN AND BRING BACK BATTERY EVs, TOO.” ~Dean Taylor, SCE Retiree

Diane Wittenberg, SCE’s first director of electric transportation and former president of the now-defunct Edison EV, called Taylor “the brains” of the fledgling operation.

“At first, no one knew what the impact of EV charging would be on the distribution and transmission system,” Wittenberg said. “Dean worked up the scenarios that helped the whole utility get comfortable with the advent of EVs and get behind it.”

During his 30-year tenure with SCE, Taylor drove numerous EV technical studies, led a campaign that secured the federal EV tax credit — spearheaded

utility efforts to make the Low Carbon Fuel Standard — benefit utility customers, helped design and justify SCE’s EV charging infrastructure programs — and helped to write many new EV laws, including those that give utilities an expanded role in accelerating all types of electric transportation.

Taylor credits Edison International and SCE leadership with making these accomplishments possible. “Fortunately, we were very lucky to have supportive management and still do,” he said.

Felix Kramer, who founded California Cars Initiative — or CalCars, a nonprofit that promoted plug-in

hybrids, told fellow attendees that Taylor is responsible for bringing the California PHEV community together.

“Dean was this incredible connector, more than anything else he did,” Kramer said. “Everybody in this room met somebody else and their lives have changed because of Dean.”

As Taylor departs SCE, he commends the company for helping to mainstream — EVs and training the next generation of EV experts.

“Edison is in a very good place for the future,” Taylor said.



<https://energized.edison.com/stories/ev-veterans-honor-sces-dean-of-electric-vehicles>

BMW Unveils All-Electric Mini Cooper SE with 168-Mile Range, Based on Older i3 Platform

By Phil Dzikkiy

BMW has introduced the long-awaited all-electric Mini with its new Mini Cooper SE. We already know what it looks like but do its specs impress?

The electric Mini Cooper SE is BMW's first all-electric car since the BMW i3 was released in 2013. Its electric motor delivers 135 kW/184 hp and a maximum torque of 270 Nm. BMW claims the front-wheel drive electric SE can get from zero to 60 km/h (37 mph) in 3.9 seconds, and zero to 100 km/h (62 mph) in 7.3 seconds. Prices in Germany start at 32,500 Euros (about \$36,400).

The electric Mini's 32.6 kWh battery has a reported range of 235 to 270 km (146-168 miles) based on the new WLTP cycle. That means EPA/real world will be closer to 140 miles. The battery is located in the vehicle floor, so the electric Mini Cooper SE has the same luggage volume as the ICE 3-door Mini, with the body positioned 18 mm higher for ground clearance.

Its charging connection uses Type 2 and CCS Combo 2 plugs for AC and DC charging. When fast charging, the Mini can get an 80% charge in 35 minutes at a maximum capacity of 50 kW.

BMW says the new electric Mini will be a three-door based on the current ICE version of the Mini Cooper SE:

The first-ever purely electric model of the British brand is a genuine MINI to the core. Its vehicle concept is based on the MINI 3 Door. The dimensions, design, space, and interior ambience of

continued next page



COPYRIGHT
MINI / BMW AG



COPYRIGHT
bild@me.com



COPYRIGHT
bild@me.com

the new MINI Cooper SE are clearly based on the conventionally powered vehicle, the development of which already took account of the expansion of the model range to include a electrically powered version.

The electric Mini offers four driving modes. BMW says of the electric car's driving experience:

Electric drive takes the typical MINI concept of go-kart feeling into an entirely new and fascinating dimension. The enthralling agile handling of the new MINI Cooper SE is supported by suspension technology that has been refined and harmonized on a model-specific basis. In conjunction with purely electric drive too, the tried-and-tested design principle of the suspension — with single-joint spring strut at the front, a multilink rear axle that is unique within the competitive field, and electromechanical steering — guarantees maximum ride stability, steering precision, and spontaneity when changing direction. With a center of gravity that is at least 30 mm lower than in the MINI Cooper S, optimum weight distribution helps the new MINI Cooper SE achieve a level of cornering dynamics that is unique within the small-car segment.

The electric Mini will be produced in Oxford, UK, starting in November, and BMW has already been taking preorders in Germany, France, the Netherlands, Sweden, and Norway. Customers in the US, UK, Italy, and Spain can also register their interest. BMW says more than 40,000 customers have already registered their interest.

Bernd Koerber, senior vice president of MINI, said in a statement that BMW has decided against one launch date for all markets. Koerber continued, "The first vehicles will then be delivered as early as possible."



COPYRIGHT
bild@me.com



COPYRIGHT
bild@me.com



COPYRIGHT
bild@me.com

Nissan Leaf Batteries are Lasting a Very Long Time

By Bengt Halvorson

Since even before the first market deliveries of its Leaf electric car in late 2010, Nissan has made frequent mention about the need to create second-use demand for the Leaf's battery packs.

It turns out, they may need to see many of those ideas put into place. According to comments made last month by a Nissan-Renault executive, citing charging and battery degradation data from Nissan on the 400,000+ Leafs sold globally, the battery packs are going to easily outlast the life of the vehicles—not just the ones that are in accidents.

“We are going to have to recover those batteries,” said Francisco Carranza, the managing director of Renault-Nissan Energy Services, at the Automotive News Europe Congress.

In the UK, the company is currently offering Nissan Energy Solar solutions, combining solar panels with battery storage and an app-based control system. In some other places within Europe the Leaf is allowed to be grid-connected, and globally the 4R Energy Corporation, a company founded by Nissan and Sumitomo, is testing a scheme that would use second-use EV batteries to take street lights completely off the grid. And there have been some novel solutions along the way, such as using them for pop-up travel trailers.

Other larger-scale uses include megawatt energy-storage systems good for smoothing peak demand at commercial venues, industrial plants, or smaller buffers used for electric-vehicle charging stations. But some big-picture fundamental questions

continued next page

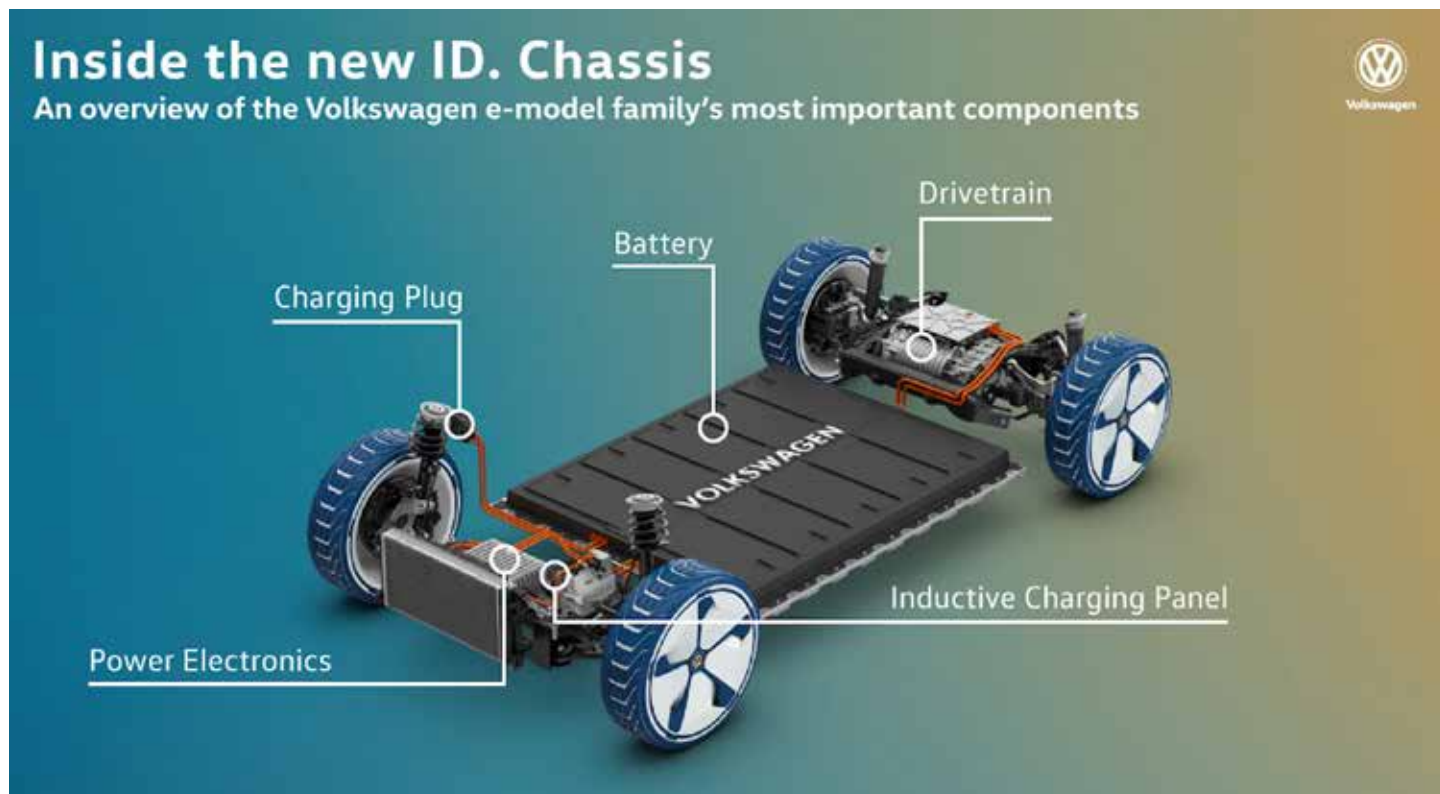


Nissan Energy Solar



Nissan x Opus camper with reused Leaf batteries in Britain with Nissan Qashqai

The battery packs in upcoming ID models will be built on its mainstream modular electric platform (MEB) to last “the life of the cars.”



MEB represents German: Modularer E-antriebs-Baukasten (where ‘antrieb’ means driven, and ‘Baukasten’ is a essentially a building block)

remain: Like whether recycling existing less-efficient batteries for their raw materials might be better.

Some months ago Nissan in the U.S. said that it’s examining a wide range of uses but hasn’t committed to any on a larger scale. We’ve reached out to Nissan once again for comment to see if that remains a fair characterization—and to see if the company’s experience with degradation and projected life mirrors that in Europe.

Volkswagen last month said that it expects the battery packs in upcoming ID models, built on its mainstream

modular electric platform (MEB) to last “the life of the cars.”

Specifically, VW says that its batteries will keep 70 percent of their original capacity for 8 years or 100,000 miles.

That’s close to Nissan’s goal at the original rollout of the Leaf—that they then expected its battery to keep 70 percent or more of its original capacity after 10 years—although its original warranty was also for 8 years or 100,000 miles.

But even when their capacity degrades far lower than that, they’ll be fine for

second uses. Nissan R&D staff, for example, projected that at 20 years the typical cells might store less than 40 percent of their original energy capacity. That would still make them a productive piece of larger-scale energy storage.

With VW planning 22 million electric vehicles in 10 years, all with active thermal conditioning that could give those battery packs an even longer life, let’s hope more companies get together on solutions that can truly scale up.



[Ed: Despite their weakness in high ambient temperatures, Nissan packs are being used successfully in prototypes of stationary energy storage systems, retrofitted into USElectrica pickups, (and soon first generation RAV4EV’s). The degradation slows, moving asymptotically towards lower values over time, and as long as operating temperatures are within bounds, these cells are very capable.]

https://www.greencarreports.com/news/1123670_nissan-leaf-batteries-are-lasting-a-very-long-time

How Recyclable Are Batteries From Electric Cars?

Electric cars produce zero emissions as they drive around, but how environmentally friendly is the production and disposal of their batteries? Vicky Parrott investigates

By Vicky Parrott

Electric cars are *The Future*. We all know it. Sales of pure electric cars rose by nearly 14% in 2018 compared to 2017, while hybrid and plug-in hybrids rose by more than 20%.

This is an environmental and air quality win, no doubt – especially as mains electricity is getting greener every year, but there is an environmental burden that often causes concern: the batteries.

If every new vehicle sold in 2040 is a plug-in vehicle, it could equate to around 2.5 million battery packs that will need to be reused or recycled.



Lithium ion batteries

These batteries – most of them lithium-ion – typically last around 10 years before losing enough performance that most would consider replacing them. So how recyclable are they, and what are the options other than recycling?

Well, one popular solution is to re-use them as power storage for domestic and commercial buildings. Nissan recently launched the largest power storage facility in Europe to use both new and used car batteries; the Johan Cruyff Arena in Amsterdam (above) uses 63 second-hand EV battery packs and 85 new battery packs, which feed off of 4,200 solar panels on the stadium roof.



Europe's largest energy storage system is now living at the the johan cruyff

This doesn't mean that the stadium is off grid, although it is capable of powering the entire venue during an event for up to an hour (the equivalent of providing energy for 700,000 domestic homes) if necessary. Rather, Nissan's battery-powered energy storage system acts as a generator that can back up the stadium's energy supply during times of heavy power usage, reducing the strain on the grid at peak times.

Nissan also offers an off-the-shelf home or commercial energy storage unit, called xStorage (below); a rival to Tesla's Powerwall 2 system, Nissan's system is different in that you can choose to have new or second-hand EV batteries. There's an appealing circuitousness to the situation, if used electric car batteries can provide a home energy solution to solve the potential issue of increased car charging putting too much strain on the mains power grid at certain times.

Even so, static energy storage is no one-shot solution for where the redundant electric vehicle batteries will go. Some don't think it's a viable solution at all.

Batteries for electric vehicles need to provide a lot of energy in a small package, which requires fairly large* quantities of cobalt in lithium-ion batteries. But energy storage units in buildings don't need to be so small and lightweight, so it's a common argument that the precious metals of lithium and cobalt are better recycled for more transport applications.

Cobalt production is a critical issue for battery production and the future of electric mobility. Much of it is currently mined in the Democratic Republic of

continued next page

* [Ed: Tesla currently uses less than 3% cobalt by volume on their current cells, which is not 'large'. Other OEMs may use more.]



Nissan and Eaton make home energy storage reliable and affordable.

Congo, where the process raises serious ecological, ethical and human rights concerns, so reducing dependency on it as demand for batteries rise is one of the greatest challenges.

Dr. Gavin Harper, a Faraday Institution Research Fellow at the Birmingham Energy Institute's project on Recycling and Reuse of lithium-ion batteries (ReLiB), stated that "if we face constraints around cobalt, some feel we should focus this precious resource on more demanding applications such as EVs. It may make more economic sense to recycle EV batteries for use in brand new batteries for cars, rather than using them in a used state in a less demanding application [such as power storage]."

Mercedes-Benz would agree. The German manufacturer launched a home energy storage system (above) using batteries from its range of EVs in April 2017, but the product was axed a year later, with the company claiming that "it's not necessary to have a car battery at home: They don't move, don't freeze, it's overdesigned." So, for Mercedes-Benz at least, the costs didn't add up.

Nissan, however, is adamant that EV battery tech is transferrable for home energy use. A spokesperson stated that Nissan "is committed to operating in the energy services market and is strongly placed to utilise both new and second life EV batteries for energy storage in a way that is commercially viable." Another huge consideration is the re-

cycling process. Belgium-based company, Umicore, is one of the businesses already offering recycling for lithium-ion batteries. It reclaims the valuable metals using a combination of pyro- and hydro-metallurgy, and while the company currently runs a pilot plant, it can still recycle around 35,000 EV batteries per year. According to a company spokesperson, Umicore "can easily scale up its recycling activities when the market grows, which we expect to happen in 2025."

Even better, metals are infinitely recyclable, so they can be reclaimed from used batteries and to produce new batteries that are as good as any other. Tesla plans to recycle its batteries to the point where it hopes that the reclaimed materials would negate the need to mine new metals. Tesla CTO, JB Straubel, said that Tesla is "developing more processes on how to improve battery recycling to get more of the active materials back. Ultimately, what we want is a closed loop that reuses the same recycled materials." Changing battery tech is another big factor. One hope for the future is sodium-ion batteries, which operate in much the same way as lithium-ion and are similarly recyclable. Sodium is cheaper and far more abundant than lithium, so if sodium-ion batteries can be brought up to the same performance levels as li-ion it could be a no-brainer.

Solid-state batteries are another likely battery tech of the future, as they're much less flammable and potentially even more efficient than current lithium-ion cells. BMW, Dyson and Toyota are just some of the manufacturers who have stated that they'll be using solid-state batteries in the near future. But how recyclable are solid-state batteries?



According to Peter Slater, Professor of Materials Chemistry and Co-director of the Birmingham Centre for Energy Storage, the recyclability of solid-state batteries "would present different challenges in terms of separating the components. In particular, it is likely that it would need chemical separation routes, such as those being developed through the Faraday Institution's 'ReLib' project."

Ultimately, if the appalling environmental ramifications of putting batteries into landfill aren't persuasive enough, the cold reality is that the metals they contain – regardless of the cell tech involved – are too valuable to waste.

In the end, there will be many and varied answers to the question of "what do we do with used electric vehicle batteries?" The good news is that ecological and economic good reason are unanimous on one thing: don't put them in the ground.

Photos: Nissan

Tesla Reportedly Working On Its Own Battery Cell Manufacturing Capability



Tesla reportedly working on its own battery cell manufacturing capability

By Darrell Etherington

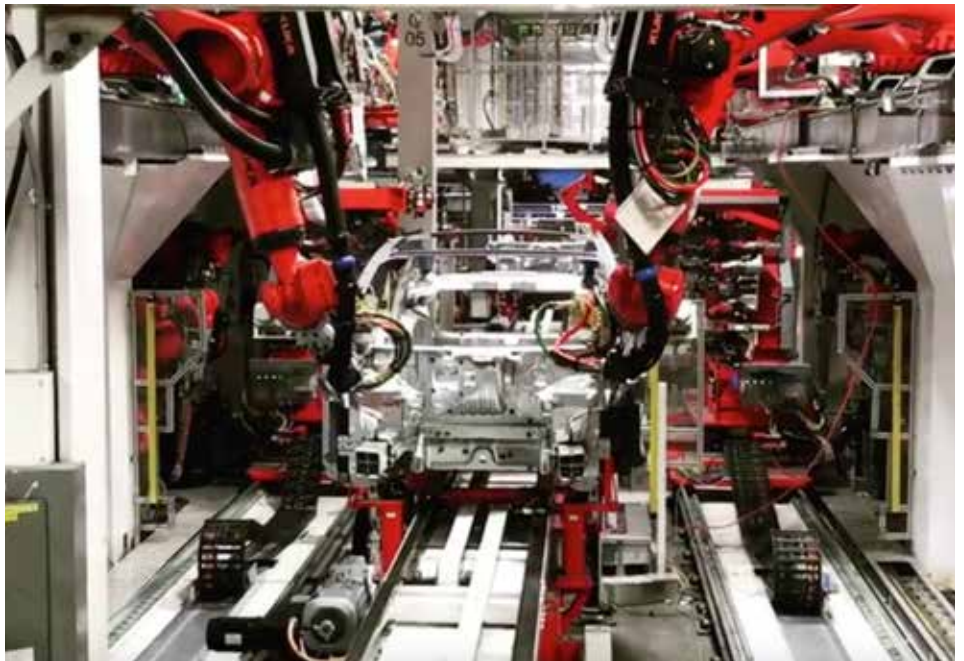
Automaker Tesla is looking into how it might own another key part of its supply chain, through research being done at a secret lab near its Fremont, CA factory, CNBC reports. The company currently relies on Panasonic to build the battery pack and cells it uses for its vehicles, which is one of, if not the most significant component in terms of its overall bill of materials.

Tesla is no stranger to owning components of its own supply chain rather than farming them out to vendors as is more common among automakers – it builds its own seats at a facility down the road from its Fremont car factory, for instance, and it recently started building its own chip for its autonomous features, taking over those duties from Nvidia.

possible is a move emulated from Tesla CEO Elon Musk inspiration Apple, which under Steve Jobs adopted an

aggressive strategy of taking control of key parts of its own supply mix and continues to do so where it can eke out improvements to component cost. Musk has repeatedly pointed out that batteries are a primary constraint when it comes to Tesla's ability to produce not only cars, but also its home power products like the Powerwall consumer domestic battery for solar energy systems.

Per the CNBC report, Tesla is doing its battery research at an experimental lab near its factory in Fremont, at a property it maintains on Kato road. Tesla would need lots more time and effort to turn its battery ambitions into production at the scale it requires, however, so don't expect it to replace Panasonic anytime soon. And in fact, it could add LG as a supplier in addition to Panasonic once its Shanghai factory starts producing Model 3s, per the report.



Eliminating links in the chain where Tesla has achieved a "semi-automatic" Model 3 battery production line, says Elon Musk

<https://techcrunch.com/2019/06/26/tesla-reportedly-working-on-its-own-battery-cell-manufacturing-capability/>

New Solar + Battery Price Crushes Fossil Fuels, Buries Nuclear

By Jeff McMahon

Los Angeles Power and Water officials have struck a deal on the largest and cheapest solar + battery-storage project in the world, at prices that leave fossil fuels in the dust and may relegate nuclear power to the dustbin.

Later this month the LA Board of Water and Power Commissioners is expected to approve a 25-year contract that will serve 7 percent of the city's electricity demand at 1.997¢/kwh for solar energy and 1.3¢ for power from batteries.

"This is the lowest solar-photovoltaic price in the United States," said James Barner, the agency's manager for strategic initiatives, "and it is the largest and lowest-cost solar and high-capacity battery-storage project in the U.S. and we believe in the world today. So this is, I believe, truly revolutionary in the industry."

It's half the estimated cost of power from a new natural gas plant.

Mark Z. Jacobson, the Stanford professor who developed roadmaps for transitioning 139 countries to 100 percent renewables, hailed the development on Twitter Friday, saying, "Goodnight #naturalgas, goodnight #coal, goodnight #nuclear."

The nuclear critic Arnie Gunderson, who predicted storage prices under 2¢/kwh four years ago on the night Elon Musk unveiled the Tesla Powerpack, noted Saturday that his 2015 prediction was too high. He too said, "Goodbye coal, nukes, gas!"



This new project will join the current large Barren Ridge solar panel array in Kern County, CA. (Photo by George Rose/Getty Images)

The Eland Project will not rid Los Angeles of natural gas, however. The city will still depend on gas and hydro to supply its overnight power. But the batteries in this 400-megawatt project will take a bite out of the fossil share of LA's power pie.

"It reduces the evening ramp (of natural gas) as the sun sets," Barner told commissioners at their June 18 meeting. "As the sun goes down for our other 1,000 MW of solar that doesn't have batteries, the gas-fired generation and hydro have to compensate for that. So that net peak load in the evening will be offset with this facility. We'll be able to contribute to that and keep gas powered generation not running at the full amount."

Crudely, Los Angeles can count on solar power generation from 7 a.m. to 7 p.m.,

said Louis Ting, director of power planning development at the agency. The batteries in this project effectively extend that horizon four hours, to 11 p.m.

"The battery can be dispatched differently," Barner added, "depending on the system need. So you could run that four-hour battery over 16 hours at one-fourth of the output, so you can vary it over time. It's not just fixed over four hours."

The plant will be developed by 8minute Solar Energy on 2,653 acres of privately-owned land in the Barren Ridge renewable corridor in Kern County. [Read the rest of the article at the URL below.]



In accordance with Title 17 U.S.C. Section 107, this material is distributed without profit to those who have expressed a prior interest in receiving the included information for research and educational purposes.

<https://www.forbes.com/sites/jeffmcmahon/2019/07/01/new-solar--battery-price-crushes-fossil-fuels-buries-nuclear/>

China's Breaking Up the EV Battery Monopoly It Carefully Created



By Echo Huang

As China phases out subsidies for electric vehicles next year, it's also ending a related policy that effectively shut out foreign battery makers, creating the domestic monopoly we see today.

China's Ministry of Industry and Information Technology (MIIT) announced yesterday on June 25, it is dropping its practice of publishing lists of battery makers that met technical standards. The policy, put in place in 2015, was meant to help develop the industry. Supplying the information to get on the list was supposedly voluntary, but in reality, using the batteries on the ministry's lists made it more likely car makers would qualify for government subsidies. As of 2016, the last time the list was updated, it included a total of 57 companies—none of them foreign firms.

As a result, the top 10 battery makers powering the world's largest EV market are all Chinese, according to 2018 data from the China Battery Industry Association. That means China dominates the value-added chain for domestically made electric vehicles, since batteries contribute 40% of the cost of an EV—quite a contrast to the value added when China assembles an iPhone.

Financial newspaper *Economic Observer* noted in April last year that Chinese car makers made their component decisions from the lists, while local governments and investment firms also consulted them. "Associated with subsidies, these became known as the 'white lists,'" the newspaper said.

The lists included CATL, the world's largest EV battery maker (Quartz

membership), which supplies Chinese and foreign carmakers that include state-owned BJEV, one of the country's biggest manufacturers, Volkswagen, Daimler, BMW, Honda, and Shanghai-based start-up NIO. The world's biggest EV manufacturer, BYD, is also the country's second-biggest battery supplier, since it makes the batteries for its own electric cars—last year it sold some 100,000 of them. Both BYD and CATL could supply batteries to Toyota cars soon. In third place is Guoxuan High Tech, a major supplier to state-owned carmaker BAIC Motor, the parent company of BJEV.

This situation isn't the case everywhere. Tesla, the biggest US EV firm, gets its batteries from Japanese electronic firm Panasonic, France's Renault sources

continued next page

the batteries for its ZOE electric vehicle from South Korea's LG Chem.

Taking away the lists could benefit established foreign battery makers. "It's a gesture of China opening up, along with pressure from G20 and trade," says Qiu Kaijun, who runs an EV news blog (Quartz membership). Chinese president Xi Jinping is set to discuss US-China trade tensions with US president Donald Trump on the sidelines of the G20 meeting of leaders of top economies, which begins in Japan.

Before the policy was put in place, when China's EV market was starting to take off, foreign firms like LG and fellow South Korean major Samsung were about to expand in China. In 2015, LG had opened a battery factory in China's eastern city Nanjing that could supply to more than 100,000 EVs, yet it never got on the white list and the factory ended up being sold to Zhejiang-based carmaker Geely in 2017.

"Earlier, all the subsidies went to those using Chinese EV batteries—if you use LG and Samsung, you won't get subsidies," said Angus Chan, a Shanghai-based auto analyst at Bocom International, "When 2020 comes, it will be free-market competition. It's straightforward for carmakers—energy density, safety, and price... Everybody is on the same racing starting point in the post-subsidy era."

China began reducing its massive subsidies two years ago, and will move to a credit system next year.

The scrapping of the battery lists comes at a time when China has rolled out the welcome mat for foreign EV firms in other ways. China last year said it

would phase out foreign investment limits for car manufacturing, a rule that earlier made it impossible for foreign car makers to set up shop in China without a local partner. That reform began with manufacturers of electric vehicles, allowing Tesla to become the first foreign car maker with a wholly-owned plant in China. Located in Shanghai, it is taking orders for the first made-in-China Teslas, which are expected to roll out in the next six months.

Other new rules limiting the number of new factories in a province mean Tesla's factory has put a spanner in the works for local manufacturers who were also hoping to set up near one of the country's most important cities for EV sales. It's clear China's EV industry is going to put under greater pressure as a result of these moves—which could improve their technologies, or kill off some of the weaker firms.

Already, CATL is looking beyond China, setting up offices in France, Canada, Japan, and Germany (Quartz membership).

"What happens after the typhoon passes?" asked Zeng Yuqun, CATL's founder, in an internal email (link in Chinese) in 2017. "Can a pig really fly?"

He was referring to a Chinese allegory—"When the typhoon comes, the pig will fly"—comparing the government subsidies to strong winds lifting the company's fortunes, and warning of a possible heavy landing once those winds die down.

Help Us to Stop Climate Change

Every year since 2016, *Clean Technica* has published annual reports on electric vehicle drivers. These reports tell us what the world thinks about electric vehicles (EVs), which EVs they drive, what they expect to buy or lease as their next vehicles, charging experiences, what features they want in a vehicle, and more. We also ask related questions to non-EV drivers to better see the future market. We think it's fascinating research!

Each year, we share the results with the *CleanTechnica* community after the full analysis is complete — via articles and with a full-length report available to researchers, industry, and corporate customers. This is your opportunity to participate in the 2019 survey.

We are currently running our biggest survey ever, and we need your help! With so many more people driving electric this year, we are particularly excited to see the results and see how they've changed over time.

If you drive an electric car (or more than one), we'd highly appreciate it if you could complete one or more of the following surveys at the URL below! Anyone can take the survey, whether you have an EV or not.

Also, we encourage you to share with your EV friends!

<https://cleantechnica.com/2019/07/20/uk-canada-us-readers-tell-us-what-you-think-about-electric-vehicles/>

<https://qz.com/1651944/china-ends-policy-steering-ev-makers-to-local-battery-firms/>

This “Bagged” Tesla Model 3 Goes Viral In a Jiffy



By: EVANNEX for Inside EVs

Apparently, this Model 3 broke the internet?

We’ve seen some pretty wild Tesla Model 3 transformations — especially at a Tesla car show event thrown earlier this year for Trevor Page from Tesla Owners Online. But that’s old news. Right now, there’s one standout Model 3 that “breaks the internet” according to New Zealand’s Driven.

Attributions follow:

Instagram: @1320video

<https://www.instagram.com/p/BzoIs3LA5Lc>

Photo: @leofenderrolls;

<https://www.instagram.com/p/BzmN5bInM2H>

Note: 1320video has an impressive 1.7 million followers and says, “This bagged Model 3 is mindblowingly good.”

<https://insideevs.com/news/359668/bagged-tesla-model-3-breaks-internet/>



In accordance with Title 17 U.S.C. Section 107, this material is distributed without profit to those who have expressed a prior interest in receiving the included information for research and educational purposes.

Analysis Finds Hybrids Make Better Use of Scarce Batteries than Pure EVs

By Eric C. Evarts

In the face of growing shortages of batteries and battery materials for electric cars, one respected analytics firm says those batteries would do more good for the environment put to use in more hybrid vehicles rather than fewer all-electric cars.

Per kilowatt-hour of battery capacity produced and installed in plug-in vehicles, hybrids deliver 14 times the benefit in emissions reductions that pure electric cars do, according to British analytics firm Emissions Analytics.

In European terms, the company measures the grams of carbon-dioxide saved per kilometer of driving, per kilowatt-hour of battery installed in the car.

The company considered 153 cars, including 59 conventional full hybrids, 7 mild hybrids, and 57 plug-in hybrids, and compared them to a theoretical electric car with a 60-kwh battery pack. It included vehicles in Europe and in the U.S., and showed even bigger benefits to drive on electricity in the U.S. than in Europe because gas cars in the U.S. are relatively less efficient than those in Europe.

The average mild hybrid across Europe and the U.S., with a battery pack of 400 watt-hours, saved almost 30 grams per kilometer of CO₂ emissions, or about 74 g/km per kilowatt-hour of battery.

Full hybrids cut more CO₂ emissions, but also had much bigger batteries averaging 1.3 kwh. Each kilowatt-hour of batteries installed accounted for a reduction of only about 51 grams per kilometer. The metric is key in an era of scarce materials.

	Vehicles tested	Average of battery size	Average CO ₂ reduction	CO ₂ reduction per unit of battery size
	#	kWh	g	g/km/kWh
Mild hybrid	7	0.4	25	73.9
Full hybrid	59	1.3	65	50.5
Plug-in hybrid - mostly engine	29	10.5	43	4.0
Plug-in hybrid - 50% engine	29	10.5	126	12.0
Plug-in hybrid - mostly battery	29	10.5	210	19.9
Battery electric vehicle*	n/a	60.0	210	3.5

Emissions Analytics g/km/kwh chart

One of the biggest criticisms of plug-in hybrids is that they carry around a lot of extra weight (and use a lot of unnecessary materials in manufacturing) to include a gas engine and fuel tank that are seldom used.

The same argument can apply to the large batteries in long-range electric cars. The cars aren't driven any differently. On average, cars still get driven less than 30 miles a day. Allow some extra battery capacity for driving in cold weather, running the heater, and having some buffer left when a driver gets home, and they still normally use less than 30 or 40 kilowatt-hours a day. Yet many of today's electric cars have batteries twice that size or bigger to accommodate occasional trips.

Any bigger battery than that adds extra weight and accounts for extra material consumption that rarely gets used. Since manufacturers have been building internal combustion engines for more than 100 years, there's no shortage of supplies to make them. But there are increasing reports of shortages in the materials needed to make large lithium-ion batteries for cars.

The Emissions Analytics report shows that plug-in hybrids that rely mostly on batteries in their daily driving cycle—the Chevrolet Volt, for instance—saved the same amount of CO₂ emissions as fully electric cars in their tests: 210 grams per kilometer. But they required much smaller batteries, just over one-sixth the size.

The report comes just as several automakers, such as General Motors, Volkswagen, and BMW are reducing or eliminating their efforts to build plug-in hybrids and replacing them with more long-range battery-electric cars to compete with Tesla.

Given the urgency of the need to reduce CO₂, to combat global warming, the report says, “paradoxically BEVs may not be the best way to achieve it. A major concern is that the push to pure battery electric vehicles (BEVs) will crowd out a more effective program of mass hybridization.”



https://www.greencarreports.com/news/1123815_analysis-finds-hybrids-make-better-use-of-scarce-batteries-than-pure-evs

Rivian's 750-hp Electric Camping Pickup Drives, Cooks and Lives on Pure Battery Power

By C.C. Weiss

The idea of overlanding in an electric vehicle, meandering miles and miles off the electrical grid for days on end, has so far been largely unfathomable, a bit terrifying, even. But we've seen that it's not impossible, and now electric truck startup Rivian is hoping to make it more mainstream. Less than a year after turning heads with an LA Auto Show double debut, it made the trip to Overland Expo West to show how electric power can be a boon rather than bane for overland travel. Its all-electric pickup camper offers an estimated 400 miles (644 km) of range, a roof-top tent and an electric kitchen.

Rivian has been hinting at the R1T's overlanding chops ever since it showed a picture of the model with a roof-top tent during last year's debut. Now it's taking things a step further, bolting a Tepui roof-top tent over the bed and adding a slide-out kitchen.

"We've been coming to Overland for a few years now, learning from this community how they use their vehicles," explained Rivian Creative Director Larry Parker. "Much of what we've learned from Overland attendees has gone into our product design."

EV disadvantages when it comes to long-distance travel are more pronounced, but the five-seat Rivian R1T does offer some advantages, too. The lateral passthrough compartment just ahead of the rear tire has previously been marketed as an ideal storage space for the likes of snowboards and golf bags, but it also fits Rivian's custom-designed slide-out kitchen prototype like a glove, freeing up bed space



The Tepui tent provides overnight accommodations to go along with the R1T's cooking capabilities (Credit: Rivian)



The Tepui tent offers some overnight shelter (Credit: C.C. Weiss/New Atlas)

that might otherwise be dedicated to kitchen gear.

In equipping the kitchen, Rivian sticks with the all-electric theme by wiring up a dual-burner induction cooktop to the vehicle battery, showing how

the massive 180 kWh pack can fulfill multiple roles in the field. Rivian says that campers can cook on the stove and use the electric lighting at camp for over a week, depleting only 20 kWh of battery power — 11 percent of the total capacity. The company does notably

continued next page



Rivian packed the Dometic fridge away in the frunk as the bulky unit is a bit large for the gear tunnel (Credit: 4theriders.com/New Atlas)

neglect to mention how quickly the Dometic fridge/freezer hidden away in the frunk will drop battery level.

The kitchen also includes a sink hooked up to a 19-L water tank, a purpose-built slide designed to hold an electric kettle, and the usual collection of drawers, storage nooks and worktop. The slim induction cooktop, sink and work top on the front side all fold down when it's time to slide the kitchen away.

Out back, the custom Tepui tent is mounted on Rivian's flexible cross bar system. The versatile bars can easily pop in and out of the bed walls, making it simple to add them when needed, get them out of the way when not.

Power for Rivian's Overland Expo special comes from the standard 750-hp quad-motor electric drive, which delivers loads of vectored torque to each wheel for precise control and handling. Other features that should prove advantageous for off-road adventurers include the 11,000-lb (5,000-kg) tow rating, 3-foot (1-m) wading depth, adjustable air suspension with up to



A look inside the Rivian R1T (Credit: 4theriders.com/New Atlas)

14 in (356 mm) of travel, onboard air compressor and trio of 110-volt outlets in the bed. And the 330 liters of additional storage in the front trunk is sure to find some use, too.

For those looking to tow a trailer, it's worth noting that Rivian estimates



Rivian will launch the R1T in late 2020 (Credit: 4theriders.com/New Atlas)

towing the full 11,000 lb will cut the R1T range in half, so from 400 miles to 200 miles (322 km) with the flagship battery option.

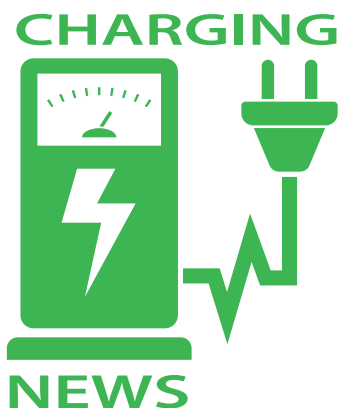
Deliveries of the R1T pickup will begin in late 2020, and the base model with 105-kWh battery pack and 230-mile (370-km) range will start at US \$69,000. Rivian plans to keep the price of the 400-mile flagship below \$90,000. It said at Overland Expo that the production slide-out Overland kitchen will be available as an option at launch. The seven-seat R1S doesn't have the gear tunnel that the R1T has, but Rivian said it will entertain the idea of building a different kitchen specifically for the SUV, should it receive enough interest.

Source: Rivian

Update: Dometic contacted us to echo the sentiments of a couple of commenters, saying that its CFX35 cooler only uses about 219 watts a day, its CFX75 about 375 watts, so not the big power draw we were thinking it might be. The CFX75's spec sheet lists energy consumption at 105 kWh/year, so the same in a year as the capacity of Rivian's small battery and well less than the 180-kWh battery in the R1T overland truck.



With Portable EV Fast Chargers, Could Backup Juice Be as Easy as Pizza Delivery?



By Bengst Halvorson

Cross the ubiquity of ordering a pizza with the form factor (and weight) of a backup “jerry can” of fuel and you’re close to what it seems the startup SparkCharge is attempting to produce with its new modular charging system.

SparkCharge is a startup that won the top \$1 million prize at the 43 North pitch competition in 2018. It aimed to create something that provided ultra-fast charging to help fill the gaps left by the lack of charging infrastructure, [https://www.greencarreports.com/news/1114285_do-cities-have-enough-electric-car-charging-stations-are-highways-the-last-hurdle] in a product that was modular, reasonably light-weight, and easily transported.

That yet-unnamed product, so far called “Portable, Ultrafast, Modular Electric Vehicle Charging Unit,” is what SparkCharge delivered last week, as part of a demo day for its current base, which claims to be the largest cleantech startup incubator in the U.S.—Greentown Labs in Somerville, Massachusetts.

The charger module weighs an official 19.8 pounds while the battery



SparkCharge modular fast charging system

module weighs 48.4 pounds. Both are approximately 24 by 13 by 9 inches, which makes them about the size of a large carry-on suitcase—so a size that should easily fit into the cargo compartment of just about any vehicle.

The system has a battery module that holds 3.5 kilowatt-hours (3.2 kWh usable) and can provide 20 kw of maximum continuous power. The charger module allows a maximum continuous 40 amps out, and a maximum 500 volts.

For energy storage, the units are packed with small cylindrical lithium-ion cells in the 18650 format—the “commodity” format used in the Tesla Model X and Model S [https://www.greencarreports.com/news/1084682_what-goes-into-a-tesla-model-s-battery--and-what-it-may-cost], for instance—but the company asserted to Green Car Reports that “this is not the secret sauce that

allows our charger to charge at a rate of one mile every 60 seconds.”

SparkCharge devised its solution to be modular—meaning you could stack as many of the battery modules as you wanted—and it says that the unit is one of the first chargers on the market that isn’t tied to a grid-connected station.

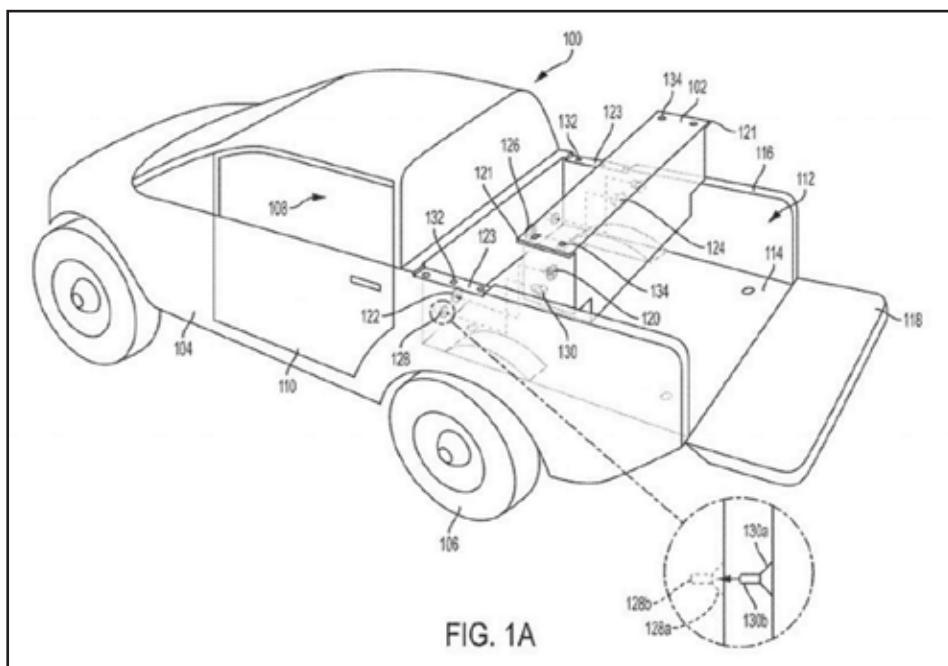
The company says that it is currently talking to “some of the most distinguished names in the automotive industry,” there could be multiple scenarios for using such a solution—as an on-demand “pizza delivery” solution ordered via phones or smart devices; as a tool for roadside assistance; or as a perk for a brand’s concierge service. Although the SparkCharge units could feasibly be something that’s sold to customers eventually—or, perhaps, provided with a vehicle, not unlike the

continued next page

[https://www.greencarreports.com/news/1123507_rivian-ceo-confirms-auxiliary-batteries-truck-to-truck-charging] Rivian auxiliary-battery solution recently confirmed — Spark Charge is envisioning them as something that would be provided by roadside assistance or something you'd order via a smartphone app.

“SparkCharge is bridging the gap between electric vehicle owners and charging stations by changing the perception and way electric vehicle owners charge their vehicles,” said Joshua Aviv, CEO of SparkCharge. “We believe we can help the electric vehicle market grow at a faster rate.”

The company says that with its solution, it can charge EVs at a rate of one mile a minute. According to the company's spec sheet, its DC fast charging hardware supports CHAdeMO protocols and will soon support CCS (Combo).



Rivian Auxiliary Battery

Although 3.2 kwh of energy isn't a lot in the terms of today's long-range EV battery packs—or even 6.4 kwh, if you were to stack a couple of battery modules—a solution like SparkCharge

could indeed provide a “last few miles” solution to help fill the gaps and get a few more people to put aside their range concerns and get into electric cars.

https://www.greencarreports.com/news/1123928_with-portable-ev-fast-chargers-startup-aims-to-be-as-easy-as-pizza-delivery

Aston Martin Rapide-E Hot Lap at Monaco Formula E | Fully Charged



Johnny, from the Fully Charged YouTube channel shows up in Monaco, to ride the circuit before the race and talks with the designer, the driver about the newest first BEV offering from the iconic British manufacturer, at a staggering \$330,000. Energized by an 800-volt, 65 kWh battery, the traveling range on a charge is estimated to be “over 200 miles”, per Aston Martin. Using two rear axle motors generating 450 kW (or over 600 horsepower) it can achieve a top speed of 155 mph The 0 to 60 mph spec is under four seconds (just a tad faster than the ICE Rapide S). Charging rate is to be over 310 miles per hour connected, according to sources familiar with this expensive beauty.

<https://www.youtube.com/watch?v=75IkUQJYbfw>

ChargePoint and Electrify America Simply Charging Access with Roaming Agreement

By Bengt Halvorson

While public charging sessions are few and far between for most electric car owners, who typically charge at home the vast majority of the time, they can present a disproportionately high level of frustration.

With more connections between networks and operators, like the new partnership agreement announced Tuesday between ChargePoint and Electrify America, the mess of multiple apps, fobs, and RFID cards may soon be a thing of the past. So, too, will the late-night calls to tech support to process credit card numbers, or to enroll as members in a different network in order to just use one of its chargers once.

Although some of the charging and utility sector wants to term this “interoperability,” the word “roaming” is appropriate because the users who most need to understand it—people new to electric cars—can think of it like cellphone coverage. Simply put, you use the app for the charging network you most use, and occasional sessions on other networks will just work—and be billed via your usual network.

The ChargePoint/EA tie-up should prove especially useful from a consumer standpoint as those using an existing account from one of the networks won’t incur additional fees on the other.

“This roaming agreement further accelerates the seamless integration of individual EV fueling networks and brings us even closer to the day when the movement of all goods and people will be powered by electricity,” said ChargePoint president and CEO Pasquale Romano. “Partnerships like this make transitioning to electric drive easier than continuing to use fossil fuels.”

In all, there will be more than 30,000 individual charge points connected by the two networks, including Level 2



Electrify America DC fast chargers



2018 Kia Niro Plug-In Hybrid charging at ChargePoint station, Santa Cruz, CA, Dec 2017

AC and DC fast charging (CCS or CHAdeMO). ChargePoint claims to be the largest electric vehicle charging network in the world, while Electrify America, created by the Volkswagen diesel emissions settlement, is committed to having 2,000 charge ports at 484 locations by July 1.

https://www.greencarreports.com/news/1123582_chargepoint-and-electrify-america-simplify-charging-access-with-roaming-agreement

Tesla Is Pushing For Its Own >1 MW High-Power Charging Standard for Electric Trucks



By Fred Lambert

Tesla and a few other companies are currently competing to push their own >1 MW high-power charging standard for electric trucks within CharIN, an industry association behind the CCS standard.

CCS has become the electric vehicle charging standard most popular with global automakers and those automakers created the CharIN organization to work on the standard and promote it within the industry.

Tesla was a little bit late to the game when it comes to CCS, but the California-based automaker still ended up joining the organization and made the CCS connector standard on its Model 3 in Europe.

Now CharIN is also working on High Power Charging for Commercial Vehicles (HPCCV) with its members in order to create a standard for interoperability of vehicle charging stations for electric trucks.

An Electrek reader sent us a presentation (embedded below) from Rustam Kocher, Electric Mobility Ecosystem Leader at Daimler Trucks North America, that highlights progress made toward establishing the standard and it reveals that Tesla is amongst five companies who submitted a proposition:

“There were five submissions, from Tesla, Electrify America, ABB, paXos, and Staubli.”

Tesla is the only automaker in the list as the other companies are charging network operators or charging station suppliers.

With the unveiling of the Tesla Semi in 2017, Tesla unveiled its plan to deploy ‘Megachargers,’ a more powerful version of its Supercharger network to charge its electric trucks.

Daimler is working on its own electric truck charging system with a capacity of ‘up to 3MW’.

However, fleet operators would like to see a standard within the industry to help with interoperability of vehicle charging stations.

Brian Hard, President and CEO of Penske Truck Leasing, commented:

“As a leading services provider to commercial fleets, we feel standardization around electric vehicle charging and charging stations will help accelerate the use of electric vehicles within the transportation industry. The interoperability of vehicle charging stations over the road is essential for commercial fleet uptime, efficiency, maintenance, and general ease of use for the industry.”

The document reveals that a task force within CharIN has already chosen a winner but it has yet to be announced:

“Ranked choice voting was used to select a winning submission. That winner has not yet been announced due to some further discussions taking place.”

<https://electrek.co/2019/07/10/tesla-high-power-charging-standard-electric-trucks/>

Tesla's New V3 Supercharger Can Charge Up To 1,500 Electric Vehicles a Day



By Kirsten Korosec

Tesla has opened a massive next-generation electric vehicle charging station in Las Vegas that combines the company's core products into one sustainable energy ecosystem, fulfilling a vision CEO Elon Musk laid out nearly three years ago.

The new V3 Supercharger, which supports a peak rate of up to 250 kilowatts, is designed to dramatically cut charging times for its electric vehicles. Tesla unveiled its first V3 Supercharger in March at its Fremont, Calif. factory. A second V3 Supercharger is located in Hawthorne, Calif., near the Tesla Design Studio. Both of these locations, which were initially used as test sites, lack two key Tesla products.

This new location in Las Vegas is considered the first V3 Supercharger. It's notable, and not just because of the

size — there are 39 total chargers in all. This V3 Supercharger also uses Tesla solar panels and its Powerpack batteries to generate and store the power needed to operate the chargers. The result is a complete system that generates its own energy and passes it along to thousands of Tesla vehicles.

The new Supercharger, located off the Las Vegas Strip, below the High Roller on the LINQ promenade, was built on Caesars Entertainment property. The site is part of Caesars Entertainment's goal to reduce greenhouse gas emissions 30% by 2025.

There are caveats to the capabilities of this Supercharger station. Only one Tesla vehicle — the Model 3 Long Range iteration — can charge at the peak rate of 250 kW. The 250 kW results in up to 180 miles of range added to the battery in 15 minutes on a Model 3 Long Range.

The company's new Model S and Model X vehicles can charge up to a 200 kW rate.

However, even older Model S and X vehicles and more basic versions of the Model 3 will experience faster charging rates at this location because there is no power sharing, a standard practice at Tesla's other charging stations.

Improvements to charging times are critical for the company as it sells more Model 3 vehicles, its highest-volume car. Wait times at some popular Supercharger stations can be lengthy. Early adopters might have been content to wait, but as new Tesla customers come online, that patience could dwindle. And as more of these V3 Superchargers come online, potential customers might be encouraged to buy the pricier long-range version Model 3.

Tesla has said in the past that these improvements will allow the Supercharger network to serve more than twice as many vehicles per day at the end of 2019 compared with today.

The V3 is not a retrofit of the company's previous generations. It's an architecture shift that includes a new 1 MW power cabinet, similar to the company's utility-scale products, and a liquid-cooled cable design, which enables charge rates of up to 1,000 miles per hour. Tesla uses air-cooled cables on V2 Superchargers.

—

<https://techcrunch.com/2019/07/18/teslas-new-v3-supercharger-can-charge-up-to-1500-electric-vehicles-a-day/>

Charge your electric car in the National Parks

To start, 100 charging stations will be installed at 13 sites.

By Amelia Arvesen

Earlier this year, the National Parks Conservation Association released a study titled, “How America is Failing to Protect Our National Parks, People and the Planet from Air Pollution.” [<https://npca.s3.amazonaws.com/documents/NPCAParksReport2019.pdf>] News article after news article followed, reporting that 96 percent of parks have hazardous air quality.

“If we don’t take immediate action to combat this, the results will be devastating & irreversible,” NPCA wrote on Twitter.

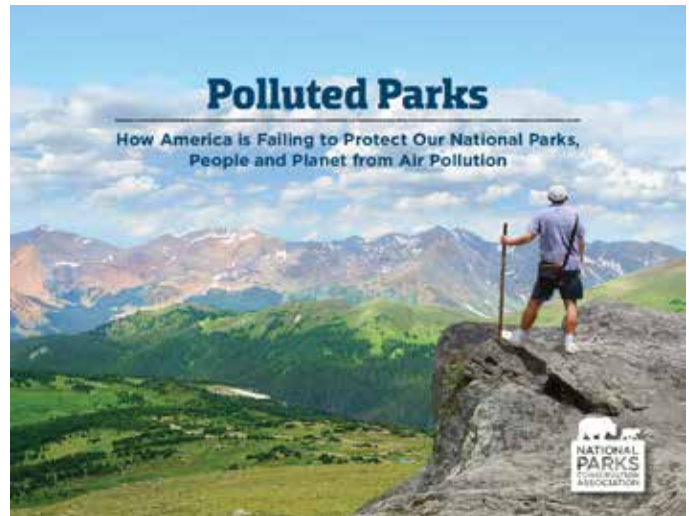
Action will be multi-pronged, but for starters, the National Park Service [<https://www.snewsnet.com/tag/national-park-service>] (NPS) has ramped up sustainability efforts with water refill stations, low-flow toilets, LED lighting, and now, electric vehicle (EV) charging stations.

The NPS is partnering with the National Park Foundation, BMW of North America and the U.S. Department of Energy to install 100 EV charging ports [<https://www.nps.gov/articles/partnerships-add-a-charge-to-your-travel-plans.htm>] in and around at least 13 National Parks and recreation areas.

For a table identifying which NPS sites have chargers already, click on this URL:

<https://www.snewsnet.com/news/electric-vehicle-charging-stations-in-national-parks>

“We know that people are creatures of convenience and habit,” the NPS wrote. “Adding new EV charging ports in these places helps link people to parks in a different way and increases the likelihood of EV drivers driving longer distances and finding a more convenient way to make their outdoor recreation plans a reality.”



Bill Would Add Car Charging Stations at Parks, Forests

By Rob Hotakainen, E&E News reporter

A California congressman wants to make it easier for drivers to charge their electric cars at national parks and forests.

[The San Diego area] Representative Mike Levin’s new bill, H.R. 3681, the “Green Spaces, Green Vehicles Act,” would expand charging infrastructure on public lands across the country and convert fleets owned by the National Park Service and Forest Service to zero-emission vehicles.

Levin, who introduced the bill [recently] Wednesday, said greenhouse gas emissions from the transportation sector “are destroying our planet, polluting the air we breathe and driving the climate crisis.” [Recent research reports now indicate that the transportation sector causes more GHG emissions than the power electric generation does.

“It is imperative that we expedite the transition to cleaner cars and expand the charging infrastructure they require,” he said. “We can either embrace zero-emission vehicles and the clean energy jobs they create or let other countries take the lead and reap the economic reward.”

Levin’s bill would require the Department of Energy to work with the park service and Forest Service to form agreements with companies and nonprofits to secure the new charging infrastructure. [The bill text was unavailable at this publication.]

More than 90 charging stations have already been installed in or near national parks under a project that began in 2017. [There are 58 national parks in the US today]. BMW of North America donated 100 charging stations for the project.

Twitter: @HotakainenRob Email: rhotakainen@eenews.net
<https://www.congress.gov/bill/116th-congress/house-bill/3681>

A Power Play

About this Blog: *From the Author: Climate change, despite its outsized impact on the planet, is still an abstract concept to many of us. That needs to change. My hope is that readers of this blog will develop a better understanding of how our climate is evolving and how they want to respond, and will feel comfortable asking questions and exchanging comments on the topic. It is important that we develop a shared understanding of the basic science and impacts of climate change, to make sense of our actions and policy options going forward. My background is not in climate science, and I'm not even particularly green; my hope is that helps to make this blog more relatable. I studied math and neurobiology on the east coast before moving out here in 1987 for grad school in computer science. After working in the tech industry for about 25 years, I retired a few years ago to better align my time with my priorities. I love spending time outdoors, and feel deeply our responsibility to this incredible planet that we call home.*

Published in the Palo Alto On-line media: <https://www.paloaltoonline.com/blogs/p/2019/05/19/a-power-play>

By Sherry Listgarten

One of the amazing things about the power grid is that when you flip on a light switch, the power for the light is generated right then. There is no “pool” or “store” of electricity that is used to service requests. The grid doesn’t “hold” electricity in some way; it just moves it from one place to another. As it says in this primer on energy markets, “For all practical purposes, electricity use is contemporaneous with electricity generation; the power to run a light bulb is produced at the moment of illumination.” (1) Think about that. It’s hard to imagine that it actually works. You can’t have too little electricity on the grid, and you can’t have too much, yet you don’t really know what you need until it happens. On top of all that, the transmission network is subject to faults and congestion. From that same source: “Operators must plan and operate power plants and the transmission grid so that demand and supply exactly match, every moment of the day, every day of the year, in every location.” Yowza. (2)

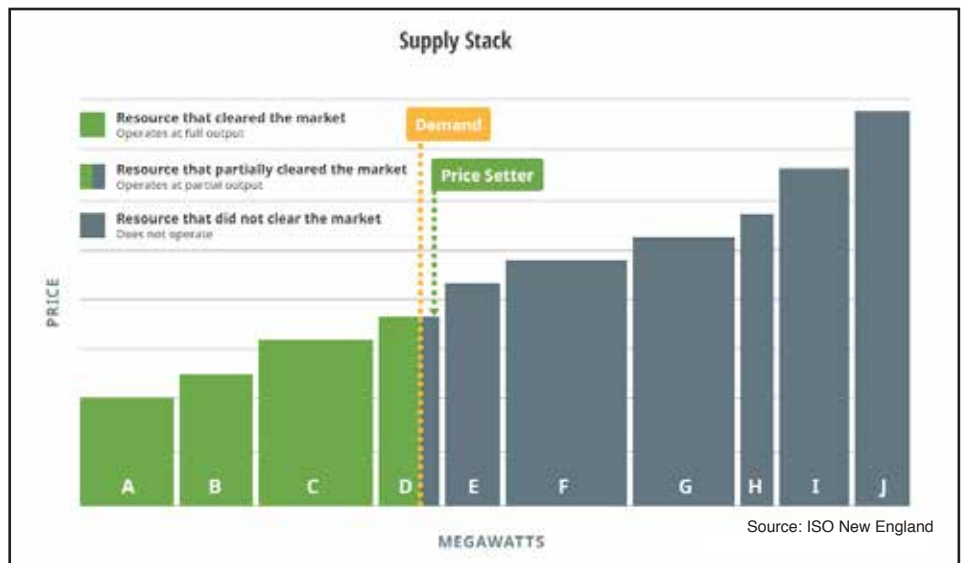
In the “olden days” (up to about twenty years ago), a single utility would be responsible for an area, and would dial up (or down) its supply to meet demand. It owned all the power plants and transmission lines needed to do that. Now in many areas of the country,

including ours, we have allowed for more competition and more resource sharing, to increase reliability, decrease prices, and spur innovation. So the job of matching supply to demand now falls to an “energy market”, which in our case is CAISO.

Similar to the monolithic utilities of old, these markets have been forecasting demand and meeting it with (flexible) supply. They do long-term demand forecasts (a year or more) to assess infrastructure needs. And they do shorter-term forecasts, including the important day-ahead forecast, which is typically within 1-3% of actual demand.

Power suppliers place bids, and the lower bids are scheduled to run. These bids can be placed in the day-ahead market, or in the real-time market. That market is evaluated every five minutes throughout the day, and picks up the difference between actual demand and what was forecast a day ahead.

Here is what that looks like. In the case shown below (charts are from this market writeup), the market has ten power plants that have put in day-ahead bids, and it meets demand based on price. The cheapest four are set to run, and the price is set at the most expensive of the operating plants.



Charts source: <https://www.iso-ne.com/about/what-we-do/in-depth/how-resources-are-selected-and-prices-are-set>

blog continued next page

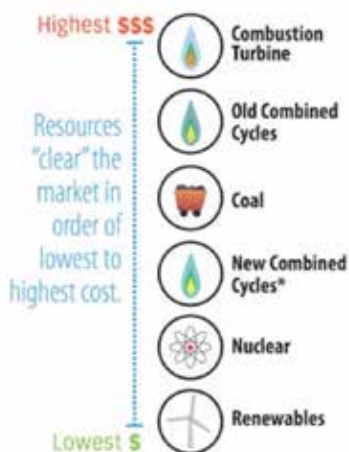
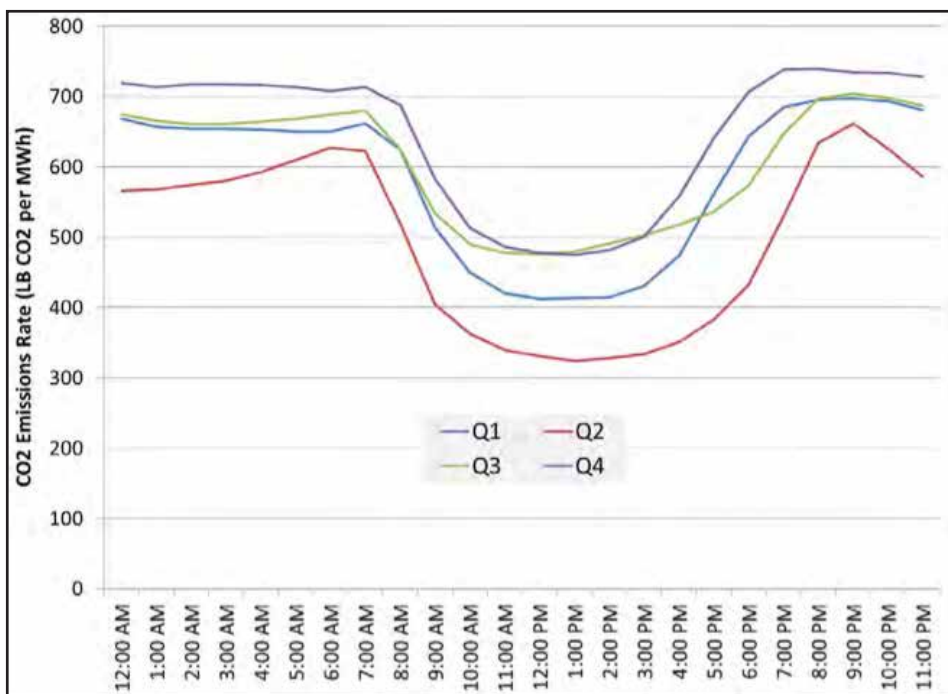
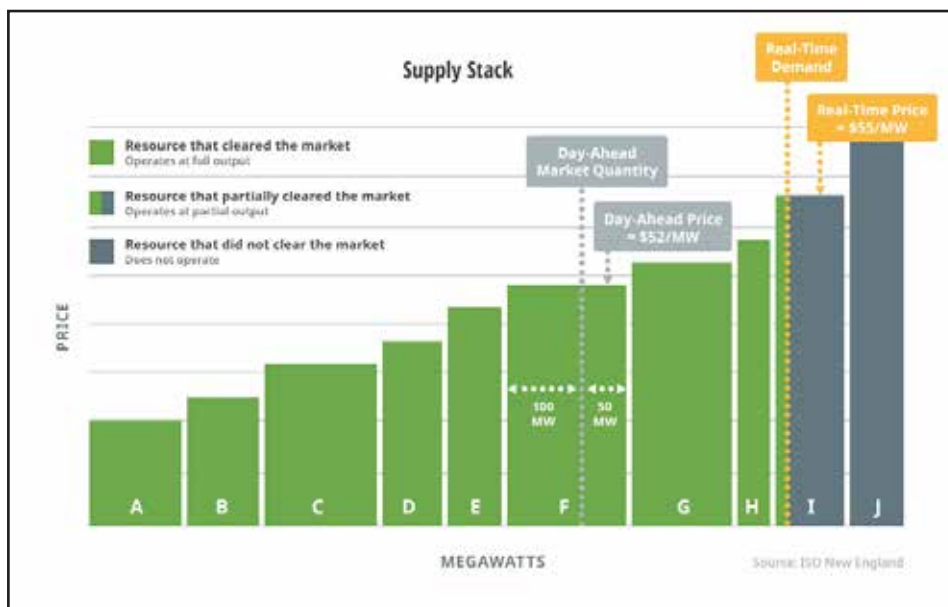
Every five minutes the market reevaluates the price. If demand is higher than forecast, then additional plants will be called on, and they will set a higher clearing price for the entire market. In a similar fashion, if there is too much supply, fewer plants will be called on to run, and the price will be lowered. (3)

Why am I telling you all this, and what does it have to do with climate?

As you hopefully remember from the last blog post, **the best time to charge your EV is in the middle of the day.** It's not even close. Look at how much CO₂ was generated for each MW of power throughout the day, on average, for each quarter of 2018. The average emission rate is uniformly high outside of the midday hours. **For much of the year, charging your EV at night is like filling up with 70% natural gas.**

Many of you were probably pretty bummed (exasperated?) by that blog post. Maybe you drive to work and can't park your car at a charger during the day. You might be able to "fill up" during the day on a weekend, but maybe you are driving around then too. What can you do, short of getting your own rooftop solar coupled with a car-sized battery to plug into at night? There is hope.

People love to make money on markets. "Buy low, sell high" is an aphorism you may be familiar with, and it is no less true with the power market than any other market. **In fact, because the power market is relatively new and quickly changing, there are arguably more opportunities to make money than in a typical market. There is considerable price variability, several markets in which to trade, and relatively little competition.** Why does this matter? The beauty is that price often corresponds with



emissions, and that is true even when renewables are out of the picture, due to variability in non-renewable plants. Here is a diagram showing power resources from most expensive to least expensive. You can see the correlation with emissions. (4)

So organizations trading on the power market with the goal of making money are also, as a nice side effect, lowering emissions. How does this work?

continued page 32

Climate Change

continued from page 31

Throughout the day there is some variability in prices as different power plants come online. Events occur that result in a drop in supply, such as congestion on a portion of the grid or a power plant going offline. An auxiliary power plant will start to ramp up. The power from these responsive “peaker units” is higher priced and often fairly dirty. So we see transient price (and emission) spikes. Here is what that looks like, with real-time pricing on top, compared with the day-ahead pricing below, from May 14. (5) A “normal” price would be between \$20-\$50 per MWh, but you can see spikes up to \$1000 per MWh on the real-time market!



Money can be made, and emissions avoided, by bypassing these expensive (and dirty) spikes as they occur with flexible demand.

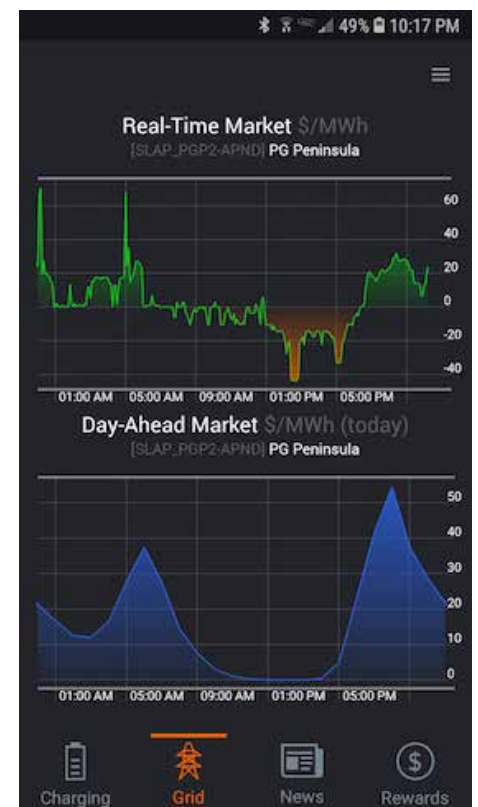
What is flexible demand? It is an electric load that can be decreased or moved to another time. Have you ever heard of a program where a utility offers to control your thermostat or air conditioner in return for a lower rate? The utility is doing this so they can turn down your AC and save money when there is a spike in price. The fastest growing source of flexible demand in this area is the electric vehicle, representing an enormous load without a fixed charging schedule. A 30-amp level 2 EV charger, which would charge a typical electric car in about 4 hours (6), is like running two central-air units at the same time. A Tesla super-charging station would be like running 40 (!) of those units at the same time. Since charging schedules often have flexibility, there is money to be made (and emissions to be saved) with EV batteries!

No, I'm not suggesting you stand by your charger and plug and unplug your EV based on the grid prices. Fortunately, technology can do that for you, such as that built by a local company, eMotorWerks, based in San Carlos [CA]. Using both their own JuiceBox smart chargers and a platform they have built that can be integrated into other chargers, they are able to aggregate these EV charging loads into virtual batteries that charge less when prices are high and more when prices are low.

Val Miftakhov, [former] CEO and founder of eMotorWerks, is enthusiastic about the simple but powerful concept of flexible demand. “This kind of optimization can effectively double renewables penetration, simply by shifting demand away from high-emission and high-cost supply.” The virtual battery earns revenue for his company by competing on the market as a flexible demand resource. Customers can specify a minimum charge and a charging window, which the optimizer respects. A typical delay might involving post-

poning a 7pm charge during a spike in the after-work ramp to later in the night. Some customers may receive discounted chargers or rebates by participating. And utilities that sponsor this program can also benefit financially. In a nutshell, all parties can benefit: the environment, the customers, the utilities, and the company.

eMotorWerks today is operating a 35 MW virtual battery on both the day-ahead and real-time markets in California. As an example of their operation, in a recent month they bid on 1000 hours of excess renewable power, receiving \$50/MWh. Take a look at these market graphs from May 15. Prices dipped into negative territory in the afternoon, so purchasing then would result in an income(!) of around \$20/MWh. So even though eMotorWerks isn't selling power, just by being judicious about when they purchase power (“avoid high, buy low”), they can make money and lower power costs.



continued next page

And remember, this not only reduces our overall costs, it reduces our emissions. Starting in November 2016, Sonoma Clean Power deployed around 2600 JuiceNet-enabled smart chargers at no cost to consumers, and has saved over 7100 metric tons of GHG emissions. That is the equivalent of the total transportation emissions of about 160 households in that area over the same time period. That is a big difference for an essentially invisible change. Other areas are looking into this as well — eMotorWerks is running trials in Colorado, Minnesota, and Europe. They are also testing a JuiceNet integration with Honda, in which the cars themselves would implement optimized charging.

Prices are not perfectly correlated with emissions. We know that because night and day prices are similar even though emissions are much higher at night. (8) So the rule of thumb to charge midday still holds. The JuiceNet platform is flexible enough to optimize more tightly to emissions for those who choose to do so. eMotorWerks gets real-time emissions data from the energy non-profit WattTime, and can use that as well as price to schedule charging times. It costs \$50 extra for this enhancement to the charger, presumably because eMotorWerks will make less money from it, but “JuiceNet Green” is a great option for those who want to prioritize emission savings.

Christy Lewis, an analyst at WattTime, says that “interest in these time-shifting technologies is skyrocketing. People in the industry are beginning to recognize that this level of granular load-shifting is a necessary component to our high-renewables future, especially as we electrify buildings and transportation. eMotorWerks is leading the charge in this field, and we expect to see many others across multiple industries follow suit.”

There is no shortage of opportunity in this area. The difficulty, Val suggests, is in the bureaucracy needed to move forward on the ideas. The grid has long been open to integrating EV batteries, but implementing the ideas has been slow going. “For example, each customer currently requires a process with over 20 steps to participate in CAISO. We have a whole section of our company devoted to energy

market participation and providing grid services. This process was designed for large resources, but could have great potential for smaller distributed resources.”

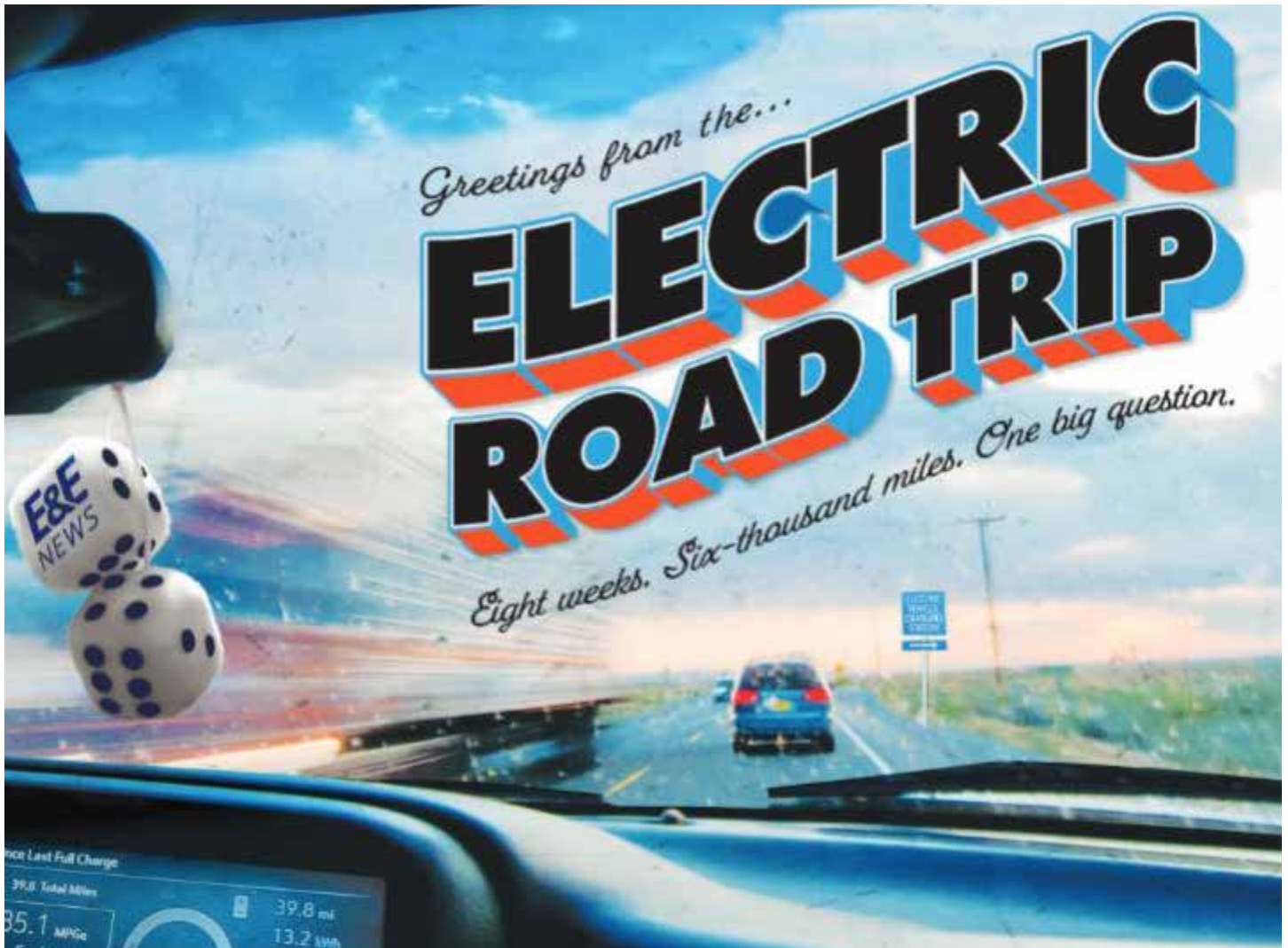
There are several other ways to use EV batteries to address the needs of our power grid, which I will cover in a later post.

Notes and References

1. Yes, electric signals do travel that quickly through transmission lines. The speed for a signal to travel between San Francisco and Los Angeles would be measured in thousandths of a second.
2. There is some tolerance for error, in that very small frequency changes can absorb some imbalance. But frequency must be kept within a very narrow margin, and in fact there is a “frequency regulation market”, often powered by batteries, that acts every few seconds.
3. Some power plants cannot respond easily to changes in demand. These plants aim to keep prices low and run at a steady pace. Nuclear and geothermal are an example of this. Gas plants and some hydropower are more likely to respond to load, and are referred to as “load following” plants. So-called “peaker plants” run only at times of high demand. Because they run infrequently, they are not built to be particularly efficient. They are dirty and charge high prices. The more we can avoid them, the greener our power. Indeed, they are slowly being phased out as battery storage comes on line. Battery storage is cleaner, can be built closer to demand, and has prices that are increasingly comparable.
4. Coal is often an exception, as it is very dirty but can be inexpensive. Fortunately it is rarely available in California.
5. These two screen shots were taken from the EV JuiceNet app.
6. A “typical” EV with a 100-mile or so range might have a 30 kWh battery. (Some Teslas have 100 kWh batteries, while a plug-in hybrid might have a small 8 kWh battery.) The load on the grid depends on how fast you charge it. Some cars, particularly older EVs and those with small batteries, will limit charging power to 3.3 kW. But a “typical” car today will support a 6.6 kW charge (via a level 2 30-amp charging station). The largest Teslas can take up to a 150 kW charge (via the supercharging network).
7. **Interested in learning more?** Next10.org has a recent series of articles on the California grid, [<https://www.next10.org/ca-grid>] and one specifically on EVs [<https://www.next10.org/grid-ev>]. FERC has also written a lengthy primer on the energy market, from Nov. 2015. [<https://www.ferc.gov/market-oversight/guide/energy-primer.pdf>]
8. This writeup has excellent graphs of price vs marginal emissions for the year 2017 on pages 7 and 8. [https://gridworks.org/wp-content/uploads/2018/12/LSWG_GridImpacts_Brief_20181126.pdf]



We're Driving 6,000 Miles In An Electric Car. Here's Why.



We're doing something crazy this fall. We're driving all over the United States in an electric car to explore how electric vehicles will change the experience of driving — and parking, and fueling, and other things you might not expect.

Because if you're like us, you've been wondering what the deal is with electric cars. Automakers say they're coming: Volkswagen pledged 70 new electric models within a decade, and Cadillac is supposed to be reborn as an electric brand. But the roads are still full of

the same old gas cars. So ... are they coming or not? Is buying one worth it or just a hassle? Are they fun to drive?

We'll find out on the Electric Road Trip.

We're going to drive 6,000 miles around this beautiful country — a lot farther than today's electric cars are really designed to go. (Range anxiety? Yep, we're anxious!) We'll get behind the wheel of several electric models that are available today. We'll explore questions like: Do you save money

driving one? How is charging a car different than filling it with gas? Does an EV actually help the climate? Or is it all just a lot of hype?

What we're finding is that EVs are going to change a lot more than just the kind of car you buy. The automobile has been running on gas for over 100 years, and when we start to switch to something else, a lot of other things start to shift. It changes how it feels to hit the pedal. It changes how you shop,

continued next page

ROAD TRIP



Nine E&E News reporters will take an EV road trip this fall (left to right): David Ferris, Joel Kirkland, Edward Klump, Jeff Tomich, David Iaconangelo, Maxine Joselow, Kristi Swartz, Jenny Mandel and Peter Behr. (Dylan Brown/E&E News)

where you park and the air we breathe. It alters how and where you spend time. It creates new kinds of jobs while sending others to the junkyard.

So, who is doing this trip, anyway?

We're reporters for E&E News. The two E's stand for energy and environment, so if you follow those topics closely, you've probably heard of us. If not, all you need to know is that we're good at making complicated things easy to understand and are committed to journalism, not opinions. We are a subscription-based news operation, but for the Electric Road Trip we're making our coverage available for free, including feature and investigative stories, a blog, a newsletter, and dashcam videos.

We reporters — a total of nine of us will take turns behind the wheel — are curious types who ask hard questions and find the answers. On the Electric Road Trip, we're taking almost two full months, September and October, to drive to the hidden corners and uncover how electric vehicles will change America.

We start in Texas, aka the "Nation-State of Gasoline," to explore how electric cars will transform the experience of fueling. Then to Tennessee, where there's a grassroots move to electric that surprises us. We'll zigzag through the Midwest to places like Detroit, where they've been making internal-combustion car engines forever. What changes when they start making

electric cars instead? It's creating some winners, and yep, some losers too.

We'll go to Iowa in the heat of election season and see what the presidential candidates have to say about our electric ride. We'll traverse North Dakota, where there's almost no place to plug in an electric car. Are we worried about being stranded on the side of the road? In fact we are.

Then it's on to the West Coast, where we'll make lots of stops in California, where Tesla reigns supreme. We'll visit the places where pioneers are imagining that EVs could be the solution to all sorts of problems, from urban poverty to a polluted lake.

In short, it's going to be a fascinating ride. Join us on this Electric Road Trip by signing up and follow @EENewsUpdates #ElectricRoadTrip on Twitter and Instagram.



Photo credit for the graphics:
Claudine Hellmuth/E&E News
(illustration)

https://www.eenews.net/eeep/electric_roadtrip_signup?signup_source=association_eaa

First Ride: 2020 Harley-Davidson LiveWire



This thing sounds like a speederbike. It's awesome.

By Jason Marker

And just like that, the LiveWire and I went face first into the hedge at full throttle. Now, before we get too far into this, there are two things you should know. One, I had just spent over an hour flogging Harley's new electric wunderbike through some of the loveliest and most technical roads the Greater Portland Metropolitan Area has to offer and was really feeling myself. Two, there's no neutral on an electric bike. When active, it's always armed, as it were. My cockiness high spirits, combined with the LiveWire's always-on status was a recipe for disaster. Or hilarity. Either one.

I had just come back from my penultimate photo pass. The route was exhilarating. Turn right out of the staging area, a cozy little joint called the Rock Creek Tavern, on to a long,

flat straightaway just over a mile long where you could unwind the LiveWire and get a sense of its power. Then, as quick as you like, get off the throttle, let the regenerative braking haul the bike down to a manageable speed, and ease into the gentle left-hander. Sweep right over the bridge, then hard left to a short uphill straight into the lethal, left-handed, decreasing-radius hairpin where the photographers were camped out. Whip through the hairpin as fast as you can to look your best for the cameras (while trying to ignore them), throttle out, scream up the hill and into one more gentle right-hander, then pull over at the dirt road to wait for the next pass to do it all over again backward. Lather, rinse, repeat.

As I pulled back into the tavern's parking lot after my sixth pass, I felt like Rennie Goddamned Scaysbrook.

Each pass I'd made had been faster and better than the last, every line tighter and truer. I was, in the words of Lightning McQueen, speed. You see where this is going, right? I got into the turnaround at Rock Creek at a bad angle—nose down a little hill and pointed at a hedge separating the parking lot from the property next door. So, like I would with any other bike, I pulled back on the bars to yank the bike's front end up the hill for a little turnaround. You know, the electric bike, the one with no clutch lever and no neutral. As I pulled back I apparently grabbed a fistful of throttle (apparently, because things get blurry for a few seconds here) and the LiveWire leaped forward like a stung horse.

We probably reached 30 miles-per-hour in the six feet between where we

continued next page

started and where we hit the hedge. I buried the LiveWire in that hedge up to the foot pegs before I had the presence of mind to lay off the throttle and bail out. I was half on the bike, half stuck in the hedge and, after a moment, the bike listed slowly to port and trapped my right ankle. I was immediately rushed by a dozen Harley techs checking to see if I was okay, reassuring me, and tending to the bike—which seemed more freaked out than I was, if the numerous warnings and buzzings and flashing lights on the TFT were any indication. Pride definitely wenteth before the fall. So, yeah. That’s my story of how I crashed a LiveWire into a hedge in front of God and everyone else during a press ride.

Earlier, in Downtown Portland...

It wasn’t all high drama and hedgerows, though. The morning of the press ride was gorgeous with the sun rising in a mottled Pacific Northwest sky. We were all in a fancy-pants hotel downtown, and when I opened my curtains, I could see the candy-colored LiveWires lined up in ranks in front of a big tent across the street. Inside that tent was a good, hearty breakfast, some powerful coffee, a pile of my colleagues in the motoring press, and a gaggle of Harley employees—including CEO Matt Levatich—just itching to tell us all about the LiveWire.

After our eggs and coffee and amazing tropical fruit parfaits, we all settled in to listen to the Harley people wax poetic about their new bike. First off was an impassioned speech from Levatich about new riders, the future of Harley-Davidson, and LiveWire’s place in it, as well as various technical briefings from Harley engineers. There was also a bit about the bike’s target demographic that definitely left me (and, seemingly, many of my colleagues) with a mixed feeling of incredulity, bemusement, and dread. Harley seems to be on shaky



One of each, please...



Just having lunch with Harley’s CEO, no big.

footing here (more on that later), and the messages regarding who and what LiveWire is for are mixed at best. After about 90 minutes, and a spirited Q&A

session where we all asked some very pointed questions, we all saddled up and headed off to our first photo stop.

continued on page 38

First Ride Harley

continued from page 37



How do you do, fellow kids?

battery when you come off the throttle, but also acts as a sort of engine brake for those riders who might be missing their clutch and shifter.

The bike's frame is a modular,

These little guys were there too!

Stopping, Starting, and Cornering... Oh My!

Let's talk about what makes the LiveWire tick for a moment before we hit the road, shall we? At the bike's heart is the new Revelation electric motor, a powerful, water-cooled mill that generates a claimed 105 horsepower and 86 pound-feet of torque from zero RPM. As soon as you even look crosswise at the throttle all those ponies are on tap, which makes for an interesting experience to say the least. All that power gets to the rear wheel via a spiral bevel gear and a belt final drive. Harley claims that the bike does 0-60 in three seconds, and after riding one around, I believe it. Acceleration is instant and savage. The LiveWire is all ate up with (electric) motor.

The Revelation draws power from a 15.5-kilowatt battery that provides a range of 146 miles in the city or 95 miles of combined city/highway riding on a full charge. Speaking of charging,



It's a revelation!

the bike is set up for both level 1 and level 3 charging. The former uses a standard household outlet and will charge your bike overnight like your phone. **The latter is the high-output DC fast charging that can get a battery from empty to 100 percent in an hour.** The bike is also equipped with an adjustable regenerative braking system that not only recharges the

cast aluminum affair that uses the battery pack as a stressed member. The suspension is a premium, high-tech, fully-adjustable kit. It includes a Showa 43mm inverted Separate Function—damping on one side, rebound on the other—Big Piston fork up front and a Showa Balance Free Rear Cushion Lite monoshock aft.

continued next page



Braking is handled by a dual 300mm floating rotor setup grabbed by Brembo four-piston monoblock calipers on the front wheel and a single floating rotor on the rear wheel bit by a Brembo two-piston caliper. The stiff frame, high-quality suspension, brake hardware, and surprising 45-degree lean angle work together to make the LiveWire handle more like a Japanese naked hot rod than a lumbering, big-twin Harley.

Technological Marvel

The LiveWire's technological innovation doesn't end at its ability to stop and corner, however. If the Revelation motor is LiveWire's heart, the powerful, adaptable Reflex Defensive Riding System is its brain. The RDRS is an onboard computer and electronics suite that controls the bike's high-tech systems and provides numerous rider aids and riding modes to fit any taste or style. It includes a cornering enhanced ABS system, cornering enhanced traction control system, rear wheel lift mitigation, and drag-torque slip control system. That's a lot of technobabble for what is, essentially, a bunch of sensors and a six-axis inertial measuring unit that help the rider keep the wheels firmly planted on nearly any kind of surface.

All of the bike's techno-wizardry is controlled through a trick 4.3-inch, full-color TFT display that makes up its gauge cluster and infotainment control system. It's equipped with an

ambient light sensor that adjusts both brightness and contrast (I never had trouble reading the TFT through my polarized visor no matter how bright it was outside) and displays the clock, speed, and idiot lights. It can also cycle through various functions and displays like range, voltage, odometers, etc. As befits a thoroughly modern motorcycle, the TFT is Bluetooth enabled and can sync to iOS or Android devices. The rider can sync up, toss their phone in a pocket, and control everything via the bike's touch screen. That includes things like displaying turn-by-turn navigation and controlling music and phone calls. Pretty nifty. Sadly, none of the test bikes were set up to actually do this, so I didn't have a chance to try it out. Hopefully next time.



continued on page 40



First Ride Harley

continued from page 39

Of course, since we live in a dystopian, app-driven, subscription-based Cyberpunk hellscape now, the LiveWire is fully cloud-connected and can be controlled and communicated with via the Harley-Davidson App. Called H-D Connect (natch), the app allows a LiveWire owner to connect to their bike and do things like check its settings, charging status, security, etc. Owners can set up push notifications so that the bike alerts them of the current status of the battery, if anyone is dicking around with the bike when they shouldn't be, and all sorts of things. It's like a Tesla up in there, seriously. Do we need all this? Maybe. Harley sure thinks we do. I just worry that it's a bit... much.

Yeah, Well... How Is It?

In a word, the LiveWire rules. It's a towering technological achievement on Harley's part, a powerful, aggressive, sporty, comfortable, incredibly fast, and agile electric bike that showcases what can be done with essentially infinite money and a six-year development time. Despite the one little hedge-related hiccup, my time with the LiveWire was amazing. It did everything I asked of it. It attacked every corner eagerly and effortlessly, and the various electronic systems allowed me to push the bike right to the edge of my riding abilities—if not its own prodigious capabilities—without anxiety. I felt like I could count on the bike, like it was there for me. It let me wind it out and never punished me for it.

At speed, LiveWire is a goddamned freight train. It just pulls and pulls and never seems to run out of steam. Roll the throttle on at any speed and the Revelation spools up instantly to



rocket you into or out of any situation. Acceleration is like a kick in the ass, and more than once I felt like I was just hanging on while the bike drove instead of actively piloting it myself.

The ergos are fantastic, too. The bike has an aggressive, slightly forward, naked bike seating position with mild rearsets and flat bars. The saddle was

continued next page

surprisingly comfortable for how small it looks, and with the low, low center of gravity, it was flickable at speed and nimble in tight confines. I would have liked the TFT better had it been mounted a little higher, but that's just me. Also, since the bike doesn't vibrate or generate tons of wasted heat, LiveWire is super comfortable for the long haul and doesn't beat you up like other bikes. I was tired at the end of my ride, but a contented tired like from a hard workout. Not a deep, exhausted tired you'd get from, say, wrestling with a hot, loud, vibrating big-twin all day.

As for fit and finish? Well, that's only mostly great. Everything not part of the handlebar is pretty great. The paint is deep and rich, the surfaces feel good to the touch, and everything fits together seemingly perfectly. The LiveWire wasn't slapped together at 4:55pm on a Friday and it shows. My biggest gripe is with the switchgear, levers, and mirrors. The switches and binnacles are bog-standard Harley parts bin bits with add-on buttons for the new LiveWire-specific systems. Their layout sucks and is completely counter-intuitive. I eventually just stopped using everything but the turn signals (and even then I had to keep looking for them) because nothing was where it should have been. In addition to the parts bin switches, the mirrors and levers are standard H-D fare, too. Seriously, Harley? Seriously? You're gonna put the same handlebar controls on your 30K, high-po, hot rod halo bike as the ones I can get on a Sportster? Or on a Street 500? That's some seriously bad form right there.

Overall, I was deeply impressed with the LiveWire. I did a whole lot of whooping and demented cackling in my helmet as I thrashed it around the twisties outside of Portland. That's



about as good a recommendation as I'll give any bike. LiveWire is fun. Fun and cool in a way that, in my opinion, many of the Motor Company's products are not. Is that enough, though?

Denouement

Friends, I have some seriously mixed feelings about the LiveWire. It's not the bike itself that's the problem, though. Like I said earlier, it's a fantastic achievement and everyone involved with the project should be proud. It's just... I don't know. Who the hell is this bike for? During the pre-ride presentation, the presenters told us a whole lot about the marketing and target audience without actually saying anything. Harley claims the LiveWire's target demographic is "Youngish, wealthy, urban early-adopters who enjoy being on the cutting edge with a highly developed personal style and a desire to be associated with luxury and/or premium brands". That's a paraphrase, but you get the gist of it.

I'm going to write a longer opinion piece soon about this whole target demographic situation, but suffice to say that now I'm not sure LiveWire has an audience and I'm not sure it'll find one. I want the LiveWire to succeed because it deserves it and so does its

development team. Will Harley let it succeed is my question. Will the company give the bike the support it needs (and will it give the select dealers who will carry LiveWire the training that they will need to sell it), or will this be a Buell and/or VROD situation all over again? Time will tell, I guess. Until then, let's wish Harley and LiveWire all the luck in the world, because both are going to need it.

Rider: Jason Marker

Height: 6'1"

Build: Shops for clothes in the "husky" department.

Gear:

Helmet: Shoei GT Air-II

Jacket: Dainese Bardo Perforated Leather Jacket

Gloves: FIRST Mfg. Co. Hutch

Pants: Rev'It Lombard 2 with add-on armor

Boots: Dainese Tan-Tan Boots



In accordance with Title 17 U.S.C. Section 107, this material is distributed without profit to those who have expressed a prior interest in receiving the included information for research and educational purposes.

<https://www.rideapart.com/photo/4222201/2020-harley-davidson-livewire/>

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

2019 Bolt LT vs Premier



This 8:20 long 2019 Chevy Bolt EV feature summary with prices for both the LT and the top of the line Premier package, is concise, covering a total breakdown of the entire product offering.

https://www.youtube.com/watch?v=gqJ_EsAv2ws



Arnold Schwarzenegger Stars In a New Ad Plugging Electric Cars



Arnold is back as Howard Kleiner. This time he's promoting electric cars in partnership with California non-profit Veloz. Go undercover with Arnold as he highlights the benefits of going electric – by trying to sell the opposite. Howard Kleiner is intent on selling gas-guzzling cars to unsuspecting electric car customers. By the end of the video, even Howard might know the benefits of going electric. Join us at electricforall.org.

https://www.youtube.com/watch?time_continue=25&v=rXodSqMpuUQ



The Truth About Tesla Model 3 Batteries: Part 2



This is part 2 of a Tesla Model 3 battery system, in great depth including all the salient data that makes up the unique battery system. Both the Standard Range (Plus) and the Long Range are covered, and the advances made in the Model 3 are compared to the earlier cars. Well done, pleasing to watch and absorb the nuances that set this product apart from other approaches.

<https://youtu.be/TdUqQZC2dcE>



Electric Vehicle Outlook 2019



High-level findings in this [Electric Vehicle Outlook 2019](https://about.bnef.com/electric-vehicle-outlook/), <https://about.bnef.com/electric-vehicle-outlook/> while not a video, BloombergNEF's report is "clickworthy", with all of its additional pages being revealed only by clicking on the right side of the image.



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

Why Ford's New Pickup Truck Could Change Pickups... Forever...



For the past decade, Nikki Gordon-Bloomfield has covered the automotive industry with a focus on EVs on her Youtube channel, Transportation Network Evolved (TEN). Notably absent on her reports is any discussion of a OEM pickup truck offering. As reported here, that will hopefully soon change. She mentions Atlis (a startup based in Phoenix area, that is slowly ramping their development efforts), and Rivian, which is beginning to assemble chassis parts. Her main point: an EV truck will surely be a hit given the ICE market for such in consumer and professional circles. The next few years will be interesting as we watch products being introduced.

<https://youtu.be/A5HNubCiSLk>



Watch an Electric Ford F-150 Tow Over a Million Pounds

Ford is wooing its base with the promise of mammoth torque.

Ford is trying to show its rabid pickup truck fans that EVs aren't just for latte-sipping Tesla pilots. In an impressive demonstration of torque, an electric F-150 prototype towed 10 double-decker rail cars stuffed with 42 current-model F-150s, weighing over a million pounds (500 tons) in total. That shows promise that it could beat Ford's current towing champ, the 2019 F-150 with a 3.5L twin-turbocharged V6, that's rated to tow 13,200 pounds (6.6 tons).

It's just a technology demo and of course there's a big difference between rated and maximum towing capacity. It does show, though, how electric motors can develop more torque than ICE engines, even at zero RPMs. There's a reason, after all, that most train locomotives are diesel electric, with the diesel engine acting as a generator and the electric motor actually driving the train.

Left unsaid in all this, of course, is that while an electric F-150 might be able to pull more weight than a gas-powered model, it wouldn't be able to do so for nearly as long. The ICE model has a (non-towing) range of 720 miles with the optional 36-gallon tanks, while the longest-range EV out there, the Tesla Model S 100D, can go 370 miles. Ford has yet to reveal the battery



capacity of the electric F-150, nor when it will hit the market.

When the F-150 EV does arrive, it will have to contend with Tesla, which is set to launch its own "cyberpunk" EV pickup pretty soon. CEO Elon Musk has also bragged about towing capacity, tweeting that Tesla's model will be able to tow 300,000 pounds.

An electric F-150 will also be competing with Rivian, which recently unveiled the impressive looking R1T electric truck. However, that should be a more friendly rivalry, as Ford has invested \$500 million into the startup. The automaker plans to build an "all-new" electric vehicle using Rivian's platform, on top of the F-150 and its other EV projects. Ford also recently announced that it was collaborating with Volkswagen, and will use VW's MEB platform for its own electric cars.



<https://www.engadget.com/2019/07/23/electric-ford-f-150-tow-over-a-million-pounds/?guccounter=1>



Welcome to Membership in The Electric Auto Association!

Educating and Advocating for EVs since 1967

Electric Auto Association (EAA) is *the* oldest and largest electric vehicle non-profit. EAA has a network of chapters across the United States and the globe. Our members promote and support electric vehicle acquisition and ownership to create a better future.

Membership Dues:

Regular Member: \$35

Supporting Members:

Charged Up: \$60

Supercharged: \$120

Supercharged Plus: \$240

High Voltage: \$500

Benefits and Bonuses

12 months of full color, 40+page E-Magazine "Current EVents"(CE)
Chapter meetings, speakers, meet EV owners,.
Help increase public awareness by volunteering.

In addition to the above:

"Current EVents" Personal Listing, "Electric Car Insider Guide"

EAA Polo Shirt, "Current EVents", Supercharged Personal or
Business Supporter listing (one issue)

EAA Polo Shirt, "Current EVents" , Supercharged plus Personal or
Business Supporter listing two issues)

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!

www.electricaauto.org



Keep Up on all Auto Shows & EV Related Conferences

US and International Events

**AUTONOMOUS VEHICLES, DETROIT,
MICHIGAN 08/21/19 - 08/23/19**

**PEBBLE BEACH CONCOURS D'
ELEGANCE 08/18/19 - 08/18/19**

**SALON PRIVE
PUBLIC DATES: 09/05/19 - 09/08/19**

**MOTOR TREND INTERNATIONAL AUTO
SHOW - LAS VEGAS
09/13/19 - 09/15/19**

**OKLAHOMA STATE FAIR AUTO SHOW
09/12/19 - 09/22/19**

**FRANKFURT INTERNATIONAL MOTOR
SHOW 09/12/19 - 09/22/19**

**CENTRAL FLORIDA INTERNATIONAL
AUTO SHOW 09/20/19 - 09/22/19**

**STATE FAIR OF TEXAS AUTO SHOW
PUBLIC DATES: 09/27/19 - 10/20/19**

**ORANGE COUNTY INTERNATIONAL AUTO
SHOW 10/03/19 - 10/06/19**

**MEMPHIS INTERNATIONAL AUTO SHOW
10/04/19 - 10/06/19**

**SACRAMENTO INTERNATIONAL AUTO
SHOW 10/18/19 - 10/20/19**

**NASHVILLE INTERNATIONAL AUTO
SHOW 10/18/19 - 10/20/19**

**TOKYO MOTOR SHOW
10/24/19 - 11/04/19**

**SEMA PUBLIC DATES: N/A
EDMUNDS.COM COVERAGE DATES:
11/05/19 - 11/08/19**

**DUBAI INTERNATIONAL MOTOR SHOW
11/14/19 - 11/18/19**

**CENTRAL CALIFORNIA AUTO SHOW
11/15/19 - 11/17/19**

**TAMPA BAY INTERNATIONAL AUTO
SHOW 11/15/19 - 11/17/19**

**EDMUNDS.COM COVERAGE DATES:
11/18/19 - 11/21/19**

**CHARLOTTE INTERNATIONAL AUTO
SHOW 11/21/19 - 11/24/19**

**ARIZONA INTERNATIONAL AUTO SHOW
11/28/19 - 12/01/19**

**SAN FRANCISCO INTERNATIONAL
AUTO SHOW 11/28/19 - 12/02/19**

**LOS ANGELES AUTO SHOW
11/22/19 - 12/01/19**

**INDIANAPOLIS AUTO SHOW
12/26/19 - 01/01/20**

**HAMPTON ROADS INTERNATIONAL
AUTO SHOW 01/10/20 - 01/12/20**

**SOUTH CAROLINA INTERNATIONAL
AUTO SHOW 01/10/20 - 01/12/20**

**MONTREAL INTERNATIONAL AUTO
SHOW 01/17/20 - 01/26/20**

**UTAH INTERNATIONAL AUTO EXPO
01/17/20 - 01/20/20**

**WEST VIRGINIA INTERNATIONAL
AUTO SHOW 01/17/20 - 01/19/20**

**HOUSTON AUTO SHOW
01/22/20 - 01/26/20**

**ST. LOUIS AUTO SHOW
01/24/20 - 01/27/20**

**CINCINNATI AUTO EXPO
02/05/20 - 02/09/20**

**QUAD CITY REGIONAL AUTO SHOW
02/07/20 - 02/09/20**

**CHICAGO AUTO SHOW
02/08/20 - 02/17/20**

**NORTH CAROLINA INTERNATIONAL
AUTO EXPO 02/13/20 - 02/16/20
VIRGINIA INTERNATIONAL AUTO SHOW
PUBLIC DATES: 02/14/20 - 02/16/20**

**CANADIAN INTERNATIONAL AUTO
SHOW 02/14/20 - 02/23/20**

**PORTLAND INTERNATIONAL AUTO
SHOW 02/20/20 - 02/23/20**

**GREATER MILWAUKEE AUTO SHOW
02/22/20 - 03/01/20**

**THE WORK TRUCK SHOW
03/03/20 - 03/06/20**

**GENEVA MOTOR SHOW
03/05/20 - 03/15/20**

**AMELIA ISLAND CONCOURS
D'ELEGANCE 03/12/20 - 03/15/20**

**ZAGREB AUTO SHOW
PUBLIC DATES: 03/31/20 - 04/05/20**



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
Contact: Jerry Brandstatt
530-343-0331

EVA OF SAN DIEGO (EVAOSD)

Web Site: www.evaosd.org
Contact: Elaine Borseth
858-395-8181

EVA OF SOUTHERN CALIFORNIA (EVAOSC)

Web Site: www.evaosc.org
Contact: Leo Galcher, 949-492-8115

GOLDEN GATE EVA

Web Site: www.ggeva.org
Contact: Dale Miller, 415-472-0378

MAMMOTH LAKES EASTERN SIERRA ELECTRIC VEHICLE ASSOCIATION (ESEVA)

Contact: Don Condon, President
EasternSierraEVA@gmail.com
Cell: 510-414-9948

NORTH (SF) BAY EAA

Web Site: www.nbeaa.org
Contact: Alan Soule, 707-477-1299

SACRAMENTO EVA (SacEV)

Contact: Guy Hall, 916-717-9158

SAN JOSE EAA

Web site: rotorodesign.com/sjeaa
Contact: George Stuckert
408-377-5037

SILICON VALLEY EAA

Web site: www.eaasv.org
Contact: Tom Sidle, 408-446-1538

COLORADO

DENVER ELECTRIC VEHICLE COUNCIL (DEVCC)

Web Site: www.devcc.info
Contact: J David McNeil
719-633-4924

CONNECTICUT

NEW ENGLAND EAA

Web Site: www.neeaa.org
Contact: David Oliveria
860-526-1460

DELAWARE

COASTAL CAROLINA WILMINGTON

Contact: Blair E. Brown, 910-617-1643

FLORIDA

CENTRAL FLORIDA EVA (CFEVA)

Website: www.centralfloridaeva.org
Contact: Larry Wexler 407-256-6244

GOLD COAST EAA (GCEAA)

Contact: David Kerzel, 954-785-2184

NORTHWEST FLORIDA EAA

Contact: Nathan Kercher
850-472-0341

SUN COAST EAA

Web Site: www.suneva.org
Contact: Don Bouquet
941-739-2868

TALLAHASSEE AREA EVA

Web Site: www.taeva.org
Contact: Gillian Smith
954-829-1125

GEORGIA

EV CLUB OF THE SOUTH

Web Site: www.evclubsouth.org
Contact: Anne Blair 404-849-7929

HAWAII

BIG ISLAND EVA

Web Site: BigIslandEV.org
Contact: Noel Morin 808-987-7428
nmorin99@yahoo.com

IOWA

IOWA EVA

Web Site: www.evohinc.com
Contact: Jeff Hove 515-250-2966

IDAHO

PANHANDLE EV ASSOCIATION PEVA

Website: www.panhandleev.org
Contact: Gordy Ormesher
208-660-8539

ILLINOIS

FOX VALLEY EAA

Web Site: www.fveaa.org
Contact: Michael Willuweit
contactfveaa@fveaa.org

INDIANA

HOOSIER EVA

Web Site: HoosierEVA.org
Contact: Richard Steiner,
317-987-4890

KANSAS

MID AMERICA CHAPTER

Contact: Al Pugsley Jr, 913-381-1091

KENTUCKY

EvolveKY

Web Site: www.evolveky.org
Contact: Jon Tyson, 502-644-1719

MASSACHUSETTS

DRIVE ELECTRIC CARS NEW ENGLAND EAA

Web Site: neeaa.org
Contact: Mark Scribner
860-336-7295

PIONEER VALLEY EAA

Web Site: pveaa.org
Contact: Karen Jones

MICHIGAN

MICHIGAN EAA

Web Site: michiganEAA.org
Contact: Larry Tuttle, 734-995-9904
eea.mich@gmail.com

MINNESOTA

MINNESOTA EAA

Web Site: www.mneaa.com
Contact: Tom Helin, 651-246-5730

MISSISSIPPI

MISSISSIPPI EAA (MSEAA)

Contact: Luke Lundemo
601-981-6925

MISSOURI

GATEWAY EV (GEVA)

Web Site: gatewayev.org
Contact: Wayne Garver, 314-359-9626

NEVADA

EAA NORTHERN NEVADA

Web Site: www.lveva.org
Contact: Chuck Swackhammer
530-479-0269

LAS VEGAS EVA

Web Site: www.lveva.org
Contact: Lloyd Reece, 702-524-3233

NEW JERSEY

EASTERN ELECTRIC VEHICLE CLUB

Contact: Oliver H. Perry, 609-268-0944

NEW JERSEY EAA (NJEEA)

Web Site: njeaa.org
Contact: Michael Thwaite
908-405-8688

NEW MEXICO

NEW MEXICO EVA (NNMEV)

Contact: Richard Dunn, 505-672-1095

NEW YORK

GREATER HUDSON VALLEY EAA

Contact: Seth Leitman, 914-703-0311

GREATER NY EAA

Web Site: lieaa.org
Contact: Carl Vogel, 516-443-1715

NORTH CAROLINA

BLUE RIDGE EV CLUB

Contact: Joe Baum, 828-645-1412

CHARLOTTE EAA

Contact: Jess Montgomery
704-302-4156

TRIAD EVA

Web Site: www.tevaNC.org
Contact: Jack Martin, 336-213-5225

TRIANGLE EAA

Web Site: www.rtpnet.org/teaa
Contact: Deanne Mott, 919-783-8439

OHIO

CENTRAL OHIO EV ASSOCIATION (COEVA)

Contact: George Anderson
614-487-9671

OKLAHOMA

EAA CHAPTER OF OKLAHOMA (TULSA)

Contact: Doug Duke, PE
918-260-8350

EAA OF NORTHWEST OHIO

Contact: Michael Hall 419-691-1569

GREATER DAYTON EV ASSOCIATION (GDEVA)

Web Site: CleanFuelsOhio.org
Contact: Tim Benford 937-604-3158
tbenford@me.com

OREGON

EMERALD VALLEY ELECTRIC VEHICLE ASSOCIATION

Contact: Phil Barnhart phil@barnhart.us
541-912-5412

OREGON EVA

Web Site: soheva.net
Contact: John Christian 503-524-0873

OREGON SOHEVA

Web Site: oeva.org
Contact: James Stephens
541-552-9393

PENNSYLVANIA

THREE RIVERS EVA

Web Site: www.threeriverseva.org
Contact: Jonathan Belak
724-387-8210

TENNESSEE

CHATTANOOGA EVA

Contact: Randy Whorton, 423-822-1840

KNOXVILLE EVA

Web Site: www.knoxev.org
Contact: Gary Bulmer
gpbulmer@gmail.com

TEXAS

ALAMO CITY EAA

Web Site: www.aceaa.org
Contact: Craig Egan, 210-542-7707

AUSTIN AAEAA

Web Site: www.austinev.org
Contact: Aaron Choate, 512-453-2710

HOUSTON EAA

Web Site: www.heaa.org
Contact: Kevin Douglass, 713-927-6997
houstonxeaa@gmail.com

NORTH TEXAS EAAWeb Site: www.ntaaa.org

Contact: Ron Swanson, 214-352-8180

UTAH**WASATCH EVA**Web Site: www.wasatcheva.org

Contact: Brian Flock, 760-271-8761

brian@flockgroup.com

VIRGINIA**DRIVE ELECTRIC RVA**

Contact: Charles Gerena, 804-560-3471

RENEWABLE ENERGY & EVA, DIY PROJECT CLUBWeb Site: www.reevadiy.org

Contact: Mark Hanson, 540-473-1248

WASHINGTON**MID-COLUMBIA EVA**

Contact: Garrett Brown, 509-713-0806

NORTH SOUND EVAWeb Site: www.northsoundeva.orgContact: Jason Thompson,
360-920-0287**SAN JUAN ISLANDS EVA**

Contact: Bruce Nyden, 707-494-6693

SEATTLE EVA (SEVA)Web Site: SeattleEVA.orgContact: Jay Donnaway
President@seattleeva.org**TACOMA EVA (TACEVA)**

Contact: Stanley J. Lee, 253-383-4371

WENATCHEE EVA (WEVA)Web Site: www.pluginncw.com

Contact: Jack Anderson, 509-784-1747

WASHINGTON D.C.**EVA OF WASHINGTON DC**Web Site: evadc.orgContact: Ron Kaltenbaugh
240-586-0014**WEST VIRGINIA****WEST VIRGINIA ELECTRIC AUTO ASSOCIATION (WVEA)**Web Site: www.wveaa.org

Contact: Marty Weirick, 304 610-1617

WISCONSIN**WISCONSIN EAA**Contact: Benjamin J. Nelson
262-567-9348

The 2022 BMW i4 Could Be the Tesla Model 3's Biggest Threat Yet

This fully electric sports sedan is likely to come standard with all-wheel drive and offer a driving range of up to 350 miles.

- BMW is working on an electric sedan called the i4 that will be a competitor to the Tesla Model 3.
- Based on the same platform as the 3-series and 4-series, the i4 will likely have two electric motors providing all-wheel drive and an electric driving range of up to 350 miles.
- Look for the i4 to arrive in 2021 with a starting price around \$50,000.



Ben Summerell-YoudeCar and Driver

By Jens Meiners

The upcoming BMW i4 is a fully electric sports sedan, a low-slung four-door fitted with one or two motors. It promises to be the closest competitor yet to the Tesla Model 3, with the added benefit of having the build quality of a seasoned carmaker.

The i4 won't get its own EV platform: but will instead be based on the 3-/4-series' underpinnings known as the Cluster Architecture, or CLAR. While a one-motor version is conceivable, we expect the i4 to have two motors providing standard all-wheel drive. Expect BMW to offer several power and price levels. The largest battery should last about 350

miles between charges and put up zero-to-60 times in the four-second range. Top speed will likely be governed at a low 125 mph to save juice.

The Bavarians were wide of the mark with their last attempt to jump-start the EV era. Both of BMW's carbon-fiber battery-powered early adopters, the lunchbox i3 and the plug-in i8 pseudo-supercar, were very cool but a little too weird for most people. With premium appeal, practicality, and affordability, the i4 will attempt to put BMW back on track. Spy photos of the i4 show a fairly conventional shape similar to that of the current 4-series Gran Coupe, and the styling will be inspired by the i Vision Dynamics concept from 2017.

Set to arrive in 2021 as a 2022 model, the i4 is likely to start around \$50,000.

Can this BMW challenge the Model 3 for real?



<https://www.yahoo.com/news/2022-bmw-i4-could-tesla-170000387.html>

Original article from Car and Driver: <https://www.caranddriver.com/news/a28119924/bmw-i4-future-electric-car/>

CHARGING YOUR NEW ELECTRIC VEHICLE



DOWNLOAD E-BOOK

Your utility customers are purchasing electric vehicles, but they have lots of questions. They aren't sure where to charge their cars while traveling, how to charge at home, or even which charger they need. We developed this comprehensive guide to all-things EV to make their lives easier and to position you as their trusted adviser.



Our latest e-book, Charging Your New Electric Vehicle, breaks down frequently asked questions for first-time electric vehicle owners. It takes a deep dive into the different types of chargers, how to charge at home, and it even offers helpful hints for charging on the go! This e-book is just one example of the assets we have available in our customizable content library to help make our client's marketplaces a success!



http://info.amconservationgroup.com/ev-ebook?utm_campaign=Electric%20Vehicles&utm_source=Utility%20Dive



Introducing the HCS-60R and HCS-80R Ruggedized EV Charging Stations

Ultimate durability for the toughest conditions

LEVEL 2 | 240 Volt | 48 or 64 Amp | 25 Foot Cable

Impact and crush resistant overmolded connector

Field replaceable latch

5 year warranty



HCS-60R

Ruggedized HCS

\$100
option

In addition to \$899 base price
Total \$999 as shown



Learn more call 877-694-4194

RELIABLE
POWERFUL
MADE IN AMERICA