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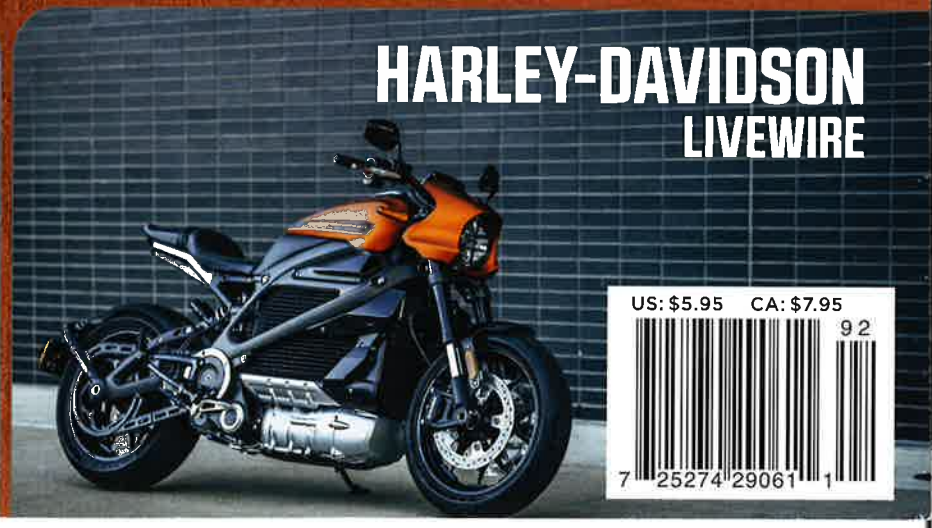

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From the Editor

"Tesla developed a fanatical following not just by delivering technologically advanced cars, but also by providing a fantastic non-traditional buying experience. There is plenty of room for others to innovate in this way."

The business model of selling cars is changing. That's been in evidence for several years now, starting with huge national companies like Penske Motor Group buying up local family-owned dealerships all over the US. AutoNation established a national brand and offered no-haggle pricing. Third-party websites like Autotrader, TrueCar and CarsDirect connect consumers to dealers without the need for expensive TV and print ads. Tesla pioneered selling direct to consumers by establishing "studios" in major shopping malls nationwide. Tesla pioneered again by announcing that they would close those studios and sell direct to consumers online.

Change is not just coming from automakers and auto retailers. Non-traditional players are getting into car marketing even if they are not selling cars directly. Electric utilities don't want to sell cars, they want to sell fuel. But to sell people the kind of fuel they carry, people need to buy a different kind of car. Since traditional automakers and traditional dealers are not all that interested in selling electric cars, utilities need to communicate directly with buyers about the benefits of cars that use electric fuel. So although they are not going to sell you a car, utilities are sophisticated, well financed players entering the discussion about buying a car. They have some compelling arguments, like fuel that costs 75% less than gasoline.

Advocacy organizations are also influencing the business model of selling cars. Electric Auto Association has been advocating for electric cars since 1967. Their tenacity is finally paying off. They co-produce National Drive Electric Week with Plug In America and the Sierra Club. The nationwide series of events, hosted by independent organizers in all 50 states, attracted over 180,000 attendees to 321 events in September 2018.

Electric Car Insider is also adding our shoulder to the wheel, producing Electric Car Guest Drive events in cities all over the United States in 2018 and again in 2019. The events are focused entirely on education, not sales. Attendees get to drive several models from a selection of 12 or more EVs in a single place, in one morning or afternoon. It's a social community, not a commercial marketplace; the event hosts are EV drivers and enthusiasts, not car dealers. Learning about cars from other owners prior to making your mind up about which car to buy is very different than walking around a traditional car lot, trailed by an eager, and often pushy, salesperson.

All of these changes hold the potential to improve the consumer experience of buying cars, which has such a pervasively bad reputation it's cliché.

A more streamlined, faster, lower friction process also has the potential to lower the cost of acquiring a car. That's what Tesla aims to do with their new online-only sales model. At press time, not enough information was available to know exactly how Tesla's process will work, but they've already laid the groundwork for years by offering a very sophisticated web based product configurator and online purchase process. Tesla developed a fanatical following not just by delivering technologically advanced cars, but also by providing a fantastic, non-traditional buying experience. Taking delivery of a new Tesla in one of their service centers was like winning some kind of coveted award. It was fun, fast and there was no haggling, long delays or hassles. The customer experience was first-class. There is plenty of room for others to innovate in this way.

This year, Electric Car Insider will unveil EV Navigator, an entirely new way to learn about, find, and purchase an electric car.

If you're interested in a preview, drop me a line at chris@electric-car-insider.com

It's a great time to drive electric.

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Electric Car Guest Drive

An educational and social gathering

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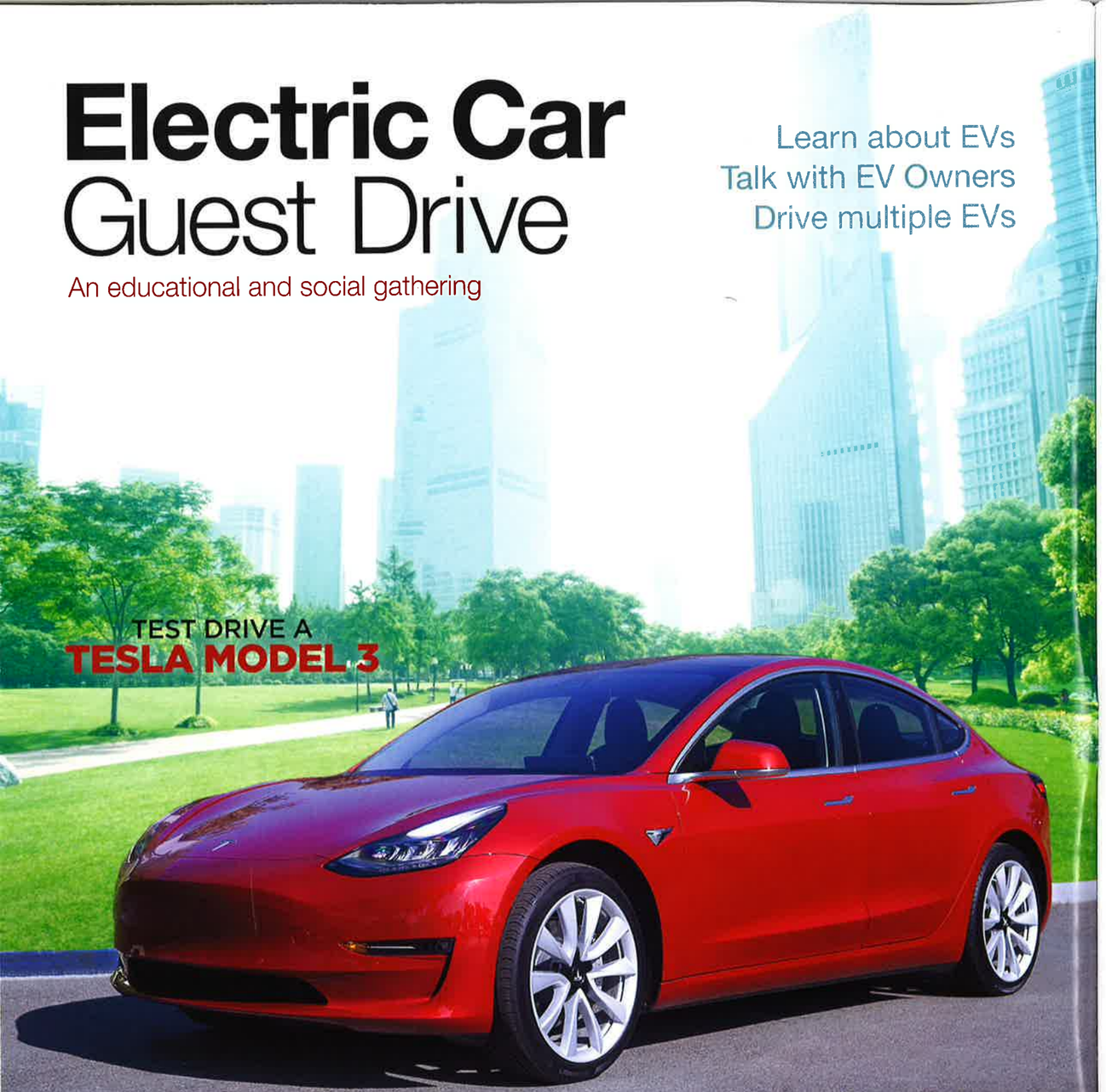
Talk with EV Owners
Drive multiple EVs



For locations and FREE registration:
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Also Available to Drive

Tesla Model S
Tesla Model X
Mitsubishi Outlander
Chevrolet Volt
Chevrolet Bolt
BMW i3




Buyers Guide

Contents

2019 Q1

ELECTRIC CARS

FEATURES

ELECTRIC VEHICLE BUYERS GUIDE

Electric Automobile Matrix

Specification Quick Reference

BATTERY

Make	Model	Yr Intro	Battery kWh	Range (mi)	MPGe	MSRP Base	Fed Tax Cr	Lease	Page
Audi	e-tron	2019	95	--	--	**$74,800**	$7,500	--	16
BMW	i3	2014	42	153	118	**$44,450**	$7,500	$359	28
Chevrolet	Bolt	2016	60	238	128/110	**$37,495**	$7,500	$325	30
Fiat	500e	2013	24	84	121/103	**$32,995**	$7,500	$180	44
Ford	Focus Electric	2012	35	115	118/96	**$29,995**	$7,500	$183	43
Honda	Clarity	2017	25.5	89	126/103	**Lease Only**	$7,500	199	35
Hyundai	Ioniq Electric	2016	28	124	136	**$29,500**	$7,500	$239	40
Hyundai	Kona Electric	2019	39.2-64	186-292	117	**~ $39,000**	$7,500	--	31
Jaguar	I-Pace	2018	90	234	76	**$69,500**	$7,500	--	17
Kia	Niro Electric	2019	--	--	--	**--**	$7,500	--	34
Kia	Soul EV	2014	27	111-210	105	**$33,950**	$7,500	$199	32
Mercedez-Benz	EQC	2020	80	~279	--	**--**	$7,500	--	25
Nissan	Leaf, Leaf Plus	2010	40	151	112	**$29,990**	$7,500	--	33
Porsche	Taycan	2019	--	~310	--	**--**	$7,500	--	11
Smart	Fortwo ED	2013	17.6	58	108	**$24,550**	$7,500	$139	45
Tesla	Model 3	2017	50-75	220-310	--	**$36,200**	$3,750	--	24
Tesla	Model S	2012	90-100	310-355	102-103	**$85,000**	$3,750	$985	10
Tesla	Model X	2015	100	270-295	89-90	**$88,000**	$3,750	$1,036	14
Volkswagen	e-Golf	2014	35.8	125	119	**$32,790**	$7,500	--	42

PLUG IN HYBRID

Make	Model	Yr Intro	Battery kWh	Range (mi)	MPGe/MPG	MSRP Base	Fed Tax Cr	Lease	Page
BMW	330e	2016	12	19/336	71/30	**$44,100**	$4,001	$379	27
BMW	i3 REx	2014	42	97/108	109/35	**$48,300**	$7,500	$329	28
BMW	i8 Coupe/Roadster	2015	11.6	18/292	76/28	**$147,500**	$5,669	$1,299	7
BMW	X5 xDrive40e	2015	9.2	13/527	56/24	**$63,200**	$4,668	$569	19
Chevrolet	Volt	2010	18.4	53/367	106/42	**$34,095**	$7,500	$252	38
Chrysler	Pacifica Hybrid	2016	16	32/520	84/32	**$42,495**	$7,500	$420	23
Ford	Fusion Energi	2013	35	26/610	104/91	**$31,400**	$4,609	$289	39
Honda	Clarity PHEV	2017	17	47/340	110/42	**$34,290**	$7,500	--	35
Hyundai	Ioniq PHEV	2017	8.9	29/630	119/52	**$24,950**	$4,543	$269	40
Hyundai	Sonata PHEV	2015	9.8	27/563	99/42	**$34,600**	$4,919	$356	37
Karma	Revero	2018	20.8	50/250	60/20	**$131,400**	$7,500	$1,299	9
Kia	Niro PHEV	2018	8.9	26/550	105/46	**$28,840**	$4,543	$259	34
Kia	Optima PHEV	2016	9.8	29/581	103/40	**$35,210**	$4,919	$289	36
Mercedes-Benz	C350e	2015	6.2	9/401	51/30	**$47,900**	$3,501	$365	26
Mercedes-Benz	GLE550e	2015	8.8	10/450	43/21	**$67,695**	$4,460	$779	20
Mercedes-Benz	S560e	2015	13.5	31/--	113/--	**~ $100,000**	$4,460	--	12
Mitsubishi	Outlander	2018	60	22/288	74/25	**$34,595**	$5,836	$289	22
Mini	SE Countryman	2017	7.6	12/258	65/27	**$36,900**	$4,001	$339	29
Porsche	Cayenne PHEV	2015	10.8	14/476	47/22	**$79,900**	$5,336	$699	18
Porsche	Panamera 4	2014	14.1	31/--	--	**$99,600**	$6,670	--	8
Toyota	Prius Prime	2017	8.8	25/615	133/54	**$27,995**	$4,502	$148	41
Volvo	S90 T8	2017	9.2	21/389	71/29	**$64,895**	$5,002	$788	13
Volvo	XC60 T8	2017	10.4	18/352	59/26	**$53,895**	$5,002	$585	21
Volvo	XC90 T8	2015	9.2	19/361	62/27	**$64,950**	$5,002	$819	15

Vehicles not available for sale within the next 12 months of printing deadline will appear in subsequent editions of ECI magazine. Subscriptions available at electric-car-insider.com. Dashes in the matrix represent specs not available at time of printing.

Plug-In Hybrid

ACQUISITION
MSRP **$147,500**
60 Month @ 6% est **$2,606**
Lease **$1,299**
Availability **2015**
U.S. Sales Units **4,973**

RANGE
EV/ICE Range **18/292**
MPGe/MPG **76/28**

PERFORMANCE
0-60 mph **4.2/4.4**
Top Speed ..... **155 mph**

BATTERY
Volts **355**
Watts ..... **11.6 kWh**
Cooling ..... **Refrigerant**

DRIVETRAIN (HYBRID)
HP/Lb-ft **141/184, 228/236**
Drive Type ..... **AWD**

CHARGING
Power Rating ..... **7.2 kW**
Charge Time L1 ..... **3 hrs**
Charge Time L2 ..... **3 hrs**
Charge Time DC ..... **2.4 hrs**
Connector **J1772**

CAPACITY
Passengers **4/2**
Cargo ..... **4.7-6.0 cu ft**

DIMENSIONS
Curb Weight ..... **3513 lbs**
Length ..... **184.9 in**
Width ..... **76.5 in**
Height ..... **50.8 /50.7**

2015 - 2019
BMW i8

BMW began delivering the long-teased Roadster i8 alongside a refreshed Coupe in the second quarter of 2018. The two-seat topless version, originally called Spyder, was first shown in 2012 at the Beijing Auto Show.

The futuristic super car plug-in hybrid with AWD drivetrain provides an exhilarating sports car driving experience or, when taking it easy with the accelerator, 76 MPGe. The all-electric eDrive mode limits max speed to 75 MPH, but shift into Sport mode and the electric motor provides immediate torque while the turbo-charged 1.5 liter 3 cylinder engine spools up to provide the car's full performance. The electric motor fills in for turbo lag and between gear changes so the output is consistent throughout the torque curve. Battery capacity was increased in the 2019 year model to 11.6 kWh from the original 7.1 kWh, eking out three extra all-electric miles. The biggier battery enables output from the electric motor to be increased to 141hp with 186 ft/lb torque. .

The i8's LifeDrive architecture, consisting of an aluminum chassis for the powertrain and a Carbon Fiber Reinforced Plastic passenger cell, reduces the frame's weight 50% versus steel. BMW's "Layering" design principal integrates function and form: the channels assist cooling and the achievement of a remarkable 0.26 coefficient of drag. The scissor doors, swinging forward and up, give the i8 an extra cool factor.

Story: Christopher Alan, Photos: BMW

2014 - 2019

PORSCHE
Panamera 4 E-Hybrid

Combining the Stuggart brand's racing DNA with executive-level interior appointments, the Panamera was designed to give enthusiasts of the brand a four-door option. The legendary front end of a 911 smoothly transitions to the long, gently sloping roofline. The extended roof gives rear seat passengers ample room. Few flourishes separate the plug-in Panamera from its gas-only siblings. The only indication that emissions-free driving is available are subtle badging and its green brake calipers. The Panamera 4 E-Hybrid uses an Audi-made 330-hp twin-turbo V-6 and a 136-hp electric motor. When the supercharger kicks in, the car tops out at 172 MPH. Porsche has long been a leader in the technologies leading up to autonomous driving. Marketing the technology as Active Safe, it features adaptive cruise control, lane keeping, and increased braking pressure in an emergency braking situation.

The Panamera 4 E-Hybrid was intended to appeal to drivers looking for sports car performance while preserving environmental integrity. The all-wheel-drive Panamera 4 E-Hybrid is an attractive performer that offers respectable fuel economy primarily when compared to other luxury performance gasoline cars. A long-wheelbase executive edition, stretched 1.3 inches, is offered at a $3,500 premium.

ACQUISITION
MSRP	**$99,600**
60 Month @ 6% est	**$1,760**
Lease	**$1,612**
Availability	**2014**
U.S. Sales Units	**1,784**

RANGE
EV/ICE Range	**31**
MPGe/MPG	**--**

PERFORMANCE
0-60 mph	**4.4 sec**
Top Speed	**172 mph**

BATTERY
Volts	**--**
Watts	**14.1 kWh**
Cooling	**--**

DRIVETRAIN (HYBRID)
HP/Lb-ft	**136/295, 330/331**
Drive Type	**AWD**

CHARGING
Power Rating	**3.7/7.2 kW**
Charge Time L1	**12 hrs**
Charge Time L2	**2.5 hrs**
Charge Time DC	**NA**
Connector	**J1772**

CAPACITY
Passengers	**4**
Cargo	**14.3 cu ft**

DIMENSIONS
Curb Weight	**4784 lbs**
Length	**198.8 in**
Width	**85.2 in**
Height	**56 in**

Story: Christopher Alan, Photos: Porsche

(2011-2012) 2018-2019

KARMA
Revero

When Fisker Automotive introduced the Karma plug-in luxury sedan in 2010, the flowing design by Henrik Fisker, whose credits include the Aston Martin DB9 and BMW Z8, had everyone talking. The sinuous looks and sports car performance held such promise. But quality issues and financial difficulties forced the company to cease production in 2012. After Fisker filed bankruptcy in 2013, the Wanxiang Group purchased the assets and announced their intention to restart production. In 2015 Wanxiang changed the marque from Fisker to Karma, and in 2016 announced the premium performance sedan would relaunch in 2016 as Revero. The reincarnated Karma features 50-miles of all electric range and 40kW DC fast charging, a meaningful improvement from the 2012 Karma's 32-mile electric range. The Karma hybrid's combined range is 300 miles. An innovative 200W solar roof can supply enough charge to the car's main battery pack to provide 500-1,000 miles of sunshine powered travel each year. BMW supplies Karma Automotive with battery charging systems and other hybrid and EV systems. GM supplies the 260-horsepower, turbocharged Ecotec 2.0 liter four-cylinder gasoline engine. Wanxiang also owns the high-performance battery manufacturer A123 who supplies the power pack. Although the Wanxiang Group is a China-based automotive component conglomerate, the company produces the cars in a factory in Moreno Valley, California.

ACQUISITION
MSRP	**$131,400**
60 Month @ 6% est	**$2,321**
Lease	**$1,299**
Availability	**2018**
U.S. Sales Units	**(Fisker 1,600)**

RANGE
EV/ICE Range	**50/250**
MPGe/MPG	**60/20**

PERFORMANCE
0-60 mph	**5.4 sec**
Top Speed	**125 mph**

BATTERY
Volts	**347**
Watts	**20.8 kWh**
Cooling	**--**

DRIVETRAIN (HYBRID)
HP/Lb-ft	**403/981**
Drive Type	**RWD**

CHARGING
Power Rating	**6.6 kW**
Charge Time L1	**10 hrs**
Charge Time L2	**3 hrs**
Charge Time DC	**.4 Hours**
Connector	**SAE Combo CCS**

CAPACITY
Passengers	**4**
Cargo	**6.9 cu ft**

DIMENSIONS
Curb Weight	**5,400 lbs**
Length	**196.8 in**
Width	**78 in**
Height	**52.4 in**

Story: Christopher Alan, Photos: Karma

Battery Electric

2012 - 2019 TESLA Model S

The Tesla Model S and Tesla's Supercharger Network combine to deliver the most revolutionary vehicle on the market. Since its introduction in 2012, a succession of improvements have kept the performance sedan at the top of its class. The company's entry level all-wheel drive S is rated at 518 total hp. Performance models enhanced with the $20,000 Ludicrous Mode are rated at 687 hp total, a staggering amount of power for a 4-door sedan that can haul 5 adults. In tests by *Motor Trend*, it was the fastest sedan they had ever tested and faster than all other street cars except for the Porsche 918 and Ferrari LaFerrari hypercars. In 2013 *Motor Trend* named the Model S Car of the Year. *Consumer Reports* said the Tesla Model S P100D performed better in instrumented tests than any other car. The Model S with Extended Range option achieves 335 miles range.

Tesla continues to advance driver assist technology, promising autonomous driving which nevertheless requires driver supervision. The ultimate viability of this approach remains to be proven, as loss of situational awareness may make sudden human intervention impossible. Cargo space, with front and back trunks, ranges from 31 to 63 cubic feet with the rear seats folded down. Tesla's ground breaking technology, standard setting performance, and its sexy, luxury sport car look have led the market. Although other automakers are now developing premium long range all-electric cars, none are close to delivering the total electric experience Tesla has mastered.

ACQUISITION

MSRP	$85,000
60 Month @6% est	$1,337
Lease	$985
Availability	2012
U.S. Sales Units	122,507

RANGE

EV Range	310-335
MPGe	102-103

PERFORMANCE

0-60 mph	2.4-4.1 sec
Top Speed	130-155 mph

BATTERY

Volts	375
Watts	90-100 kWh
Cooling	Liquid

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	360-532, 387-532
Drive Type	RWD/AWD

CHARGING

Power Rating	11.5-17.2 kW
Charge Time L1	27 hrs
Charge Time L2	4-8.8 hrs
Charge Time DC	0.75 hrs
Connector	UMC

CAPACITY

Passengers	5
Cargo	31.6 – 58.1 cu. ft

DIMENSIONS

Curb Weight	4,647-4,736 lbs
Length	196 in
Width	86.2 in
Height	56.5 in

Story: Christopher Alan, Photos: Tesla

Battery Electric

2019 PORSCHE Taycan

ACQUISITION

MSRP	$95,000-$135,000
60 Month @6% est	$1,836
Lease	--
Availability	2019
U.S. Sales Units	--

RANGE

EV Range	~310
MPGe	--

PERFORMANCE

0-60 mph	3.5 sec
Top Speed	-- mph

BATTERY

Volts	800
Watts	-- kWh
Cooling	Liquid

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	~600/
Drive Type	AWD

CHARGING

Power Rating	-- kW
Charge Time L1	-- hrs
Charge Time L2	-- hrs
Charge Time DC	0.25 hrs
Connector	--

CAPACITY

Passengers	4
Cargo	-- cu. ft

DIMENSIONS

Curb Weight	-- lbs
Length	-- in
Width	-- in
Height	51.2 in

Of all the automakers lining up to take a shot at Tesla's dominance of the all-electric car market, Porsche seems to have the best understanding of the new performance standard that has been set, and the vision to be matched. Porsche is also one of the few legacy manufacturers with the technical chops to make a credible contender.

The Taycan (pronounced Tie-can) was announced with 350kW charging capability, which is 100kW faster than Tesla's 250kW Supercharger speed, announced in March. Porche asserts that its 800v charging system will be capable of providing the Taycan with an 80% charge in as little as 15 minutes. If this ultra-fast rate can be met in the real world, it will be a true breakthrough, although the nationwide roll-out of such exotic infrastructure will undoubtedly take many years.

Performance is always Porsche's strong suit. The Taycan may also raise the bar on battery-electric track performance, with the few high-speed drives permitted to outsiders evoking high praise and barely concealed giddyness upon exit from the vehicle.

Porsche fans may be disappointed that the production Taycan retains few of the stunningly beautiful lines of the Mission E concept that preceded it, but until final photos are available, we'll reserve judgement. ECI has a policy against running photos of pre-production concepts, but photos of the production Taycan were not available by press time. The photos accompanying this profile are of the Mission E concept on which the Taycan is based. Porsche says that the car will be available for sale this year.

Story: Christopher Alan, Photos: Porsche

(2015 - 2018) 2019

MERCEDES-BENZ S560e

For six decades, the S-Class has been associated with the height of class and sophistication. In 2015, it was made available with a plug-in hybrid drivetrain as the 550e. The new S560e, expected to be available in the middle of this year, updates the luxury sedan with slightly more power and range.

The S560e's updated electric motor produces 121 hp, silently pushing the car to a maximum electric-only speed of 68 mph. The larger 13.5 kWh lithium-ion battery pack will sustain zero-emission electric travel for about 25 miles. After that, the S560's 362 hp gasoline 3.0-liter twin-turbo V6 engine and nine-speed automatic transmission take over.

One of the S-Class' distinguishing features is the Distronic self-driving feature, which at low speeds will maintain speed and following distance with adaptive cruise control, hold a lane, and brake when necessary. It will also park itself.

As to be expected from a $100k sedan, the S560e's interior is filled with soft stitched leather, cushioned armrests, and Alcantara lining on the ceiling. With enough back seat room to be comfortably chauffeured between board meeting and the airport, the S560e is a fully functioning office and comes with 3G Internet access, a wireless hotspot, and fold-out table. Rear seat "hot stone" massage function is optional. Exterior styling is a safely conventional rectangular sedan with rounded corners providing a balance of contemporary good looks and improved aerodynamic efficiency.

ACQUISITION

MSRP	~$100,000
60 Month @ 6% est	--
Lease	--
Availability	2015
U.S. Sales Units	1,387

RANGE

EV/ICE Range	~31
MPGe/MPG	~113

PERFORMANCE

0-60 mph	4.9 sec
Top Speed	155 mph

BATTERY

Volts	--
Watts	13.5 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	121/325, 362/369
Drive Type	RWD

CHARGING

Power Rating	7.2 kW
Charge Time L1	-- hrs
Charge Time L2	-- hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	-- cu ft

DIMENSIONS

Curb Weight	-- lbs
Length	206.5 in
Width	74.8 in
Height	58.7 in

Story: Christopher Alan, Photos: Mercedes-Benz

ACQUISITION

MSRP	$64,895
60 Month @ 6% est	$1,142
Lease w/$4k down	$788
Availability	2017
U.S. Sales Units	193

RANGE

EV/ICE Range	21/389
MPGe/MPG	71/29

PERFORMANCE

0-60 mph	-- sec
Top Speed	-- mph

BATTERY

Volts	400
Watts	9.2 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	400/472
Drive Type	AWD

CHARGING

Power Rating	7.7 kW
Charge Time L1	7 hrs
Charge Time L2	2.5 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	13.5 cu ft

DIMENSIONS

Curb Weight	4,579 lbs
Length	200.1 in
Width	79.5 in
Height	57.1 in

2017-2019

VOLVO S90 T8

Volvo enters the luxury sedan market with their all new flagship four door, the S90. The prominent mid body line and classic shape reinforce the brand's heritage while still looking fresh and contemporary. The S90 sedan's T8 variant uses the same plug-in drivetrain from the company's XC90 T8 SUV. The S90 T8 will run on smooth, silent electric power for about 28 miles before the gas engine takes over.

The "twin engine" drivetrain mates its electric motor to a 2.0L 4-cylinder that is both supercharged and turbocharged, which improves fuel efficiency while giving the engine plenty of power throughout its RPM range. The gas engine drives the front wheels while the rear wheels are driven by the electric motor. Adding to the overall efficiency and power of the system is Volvo's crankshaft integrated starter generator (C-ISG). In addition to starting and charging the car, the C-ISG makes the transition from the gas engine to electric motor seamless. It also provides additional power so there is no lag as the supercharger or turbocharger kicks in.

The interior's Scandinavian style is uncluttered and sophisticated. Volvo's soft Nappa leather seats wrap around safety features designed to prevent spine injury in severe crashes. A central 9-inch center touchscreen display provides easy and intuitive access to all of the car's infotainment and climate control features. Vertical air blades on the vents, Orrefors crystal in the shift lever, and diamond cut metal on the knobs are subtle flourishes in an otherwise serene cocoon.

Story: Christopher Alan, Photos: Volvo

Battery Electric

2015 - 2019
TESLA Model X

Unsatisfied with simply taking the game-changing Model S performance sedan and sticking an SUV body on it, Tesla pushed the envelope with the 2016 launch of the Model X. Applying cutting-edge and never-before-seen features to the first all-electric SUV, resulted in a vehicle that enticed consumers with an appreciation of and budget for fine art, disruptive technology and adrenaline-inducing performance.

The Silicon Valley automaker first showcased the prototype Model X in 2012, and with a fitting rockstar product launch in September 2015, showed what a $130,000 electric SUV can be. Since launch, it has improved. It can go 295 miles on a single charge. It can carry seven adults in comfort and style. It can tow 5,000 pounds. Tesla says that the Model X is the safest SUV ever made and the first SUV to earn five stars on every test.

The first thing most people notice on the Model X are the rear Falcon Wing doors, a feature traditionally reserved for exotic sports cars. When the doors are open, it looks like nothing else. But it's not just a superfluous flourish to show off engineering prowess and outside-the-box thinking. The door design allows for easy access to the rear seats. Tesla can send over the air software updates and continues to refine even older models. Cargo space is 88 cubic feet with seats down.

If a premium, high-performance, long range all-electric SUV is on your wish list and within budget, this space ship will reset your standards of what a car can be.

ACQUISITION
MSRP$	$88,000
60 Month@6% est	$1,701
Lease w $10k down	$1,036
Availability	2015
U.S. Sales Units	41,327

RANGE
EV Range	270-295
MPGe	89-90

PERFORMANCE
0-60 mph	2.8-4.7 sec
Top Speed	130 mph

BATTERY
Volts	375
Watts	100 kWh
Cooling	Liquid

DRIVETRAIN (ELECTRIC)
HP/Lb-ft	532/387-713
Drive Type	AWD

CHARGING
Power Rating	11.5-17.2 kW
Charge Time L1	27 hrs
Charge Time L2	7.75-9.66 hrs
Charge Time DC	0.75 hrs
Connector	UMC

CAPACITY
Passengers	7
Cargo	88.1 cu ft

DIMENSIONS
Curb Weight	5,421-5,531 lbs
Length	198.3 in
Width	89.4 in
Height	62 in

Story: Christopher Alan, Photos: Tesla

Plug-In Hybrid

2015 - 2019
VOLVO XC90 T8

ACQUISITION
MSRP	$64,950
60 Month @ 6% est	$1,147
Lease	$819
Availability	2015
U.S. Sales Units	4,522

RANGE
EV/ICE Range	19/361
MPGe/MPG	62/27

PERFORMANCE
0-60 mph	5.7 sec
Top Speed	127 mph

BATTERY
Volts	400
Watts	9.2 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)
HP/Lb-ft	400/472
Drive Type	AWD

CHARGING
Power Rating	7.7 kW
Charge Time L1	8 hrs
Charge Time L2	2.5 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY
Passengers	7
Cargo	85.7 cu ft

DIMENSIONS
Curb Weight	5,105 lbs
Length	194.9 in
Width	84.3 in
Height	69.9 in

The Volvo XC90 is a radical departure from the square Volvo you may have known in younger days. In fact, toss everything you know about Volvo out the window before looking at the XC90 T8 except that they are still practical and safe. But start adding words like "exciting" and "powerful" to your description of Volvo. Powerful isn't actually sufficient to describe the T8 variant of the XC90 lineup. Volvo uses the term "twin engine" to describe the combination of gas engine that drives the front wheels and electric motor which drives the rear wheels. That helps a little but words aren't really sufficient to convey the metamorphosis of this once mild mannered Swedish automaker into a Porsche challenger. Maybe numbers will help: 400 hp. 472 lb-ft. Zero to 62 MPH in 5.7 seconds. A 10.4kWh battery provides all-electric range of 19 miles, 380 with gas.

The brawn is paired with an entirely new level of beauty too. The XC90's interior is Volvo's most luxurious to date. Natural grain wood and Nappa leather accent truly beautiful interior panels and bezels. A large Sensus touchscreen fills the center console, and provides navigation and Apple CarPlay. Hands-free controls are provided by Apple's Siri who will read text messages aloud and provide voice control for the phone and music system. An optional 19-speaker, 1,400-watt Bowers & Wilkins sound system provides inspiring high fidelity.

Volvo has a significant contender with its luxury full-size 7-passenger XC90 T8.

Story: Christopher Alan, Photos: Volvo

Battery Electric

2019 AUDI e-tron

The balance of performance, efficiency, and technology puts the new Audi e-tron in direct competition with Tesla's Model X and Porsche's Cayenne plug-in hybrid. The e-tron comes standard with a 95 kWh battery pack which delivers a credible 248 mile range. Refueling options include 150 kW charging although it will take a few years for these new high speed chargers to become available nationwide through the VW Group's Electrify America division. In the interior of the e-tron, you will notice the lack of any conventional buttons, knobs, or switches, as the dash instrument cluster, center console control panel, and climate control have been digitalized. Virtual exterior mirrors replace conventional glass. An extended flat support with a camera on the end transfers the image to a high-contrast OLED display tucked between the instrument panel and the door. Thanks to the sophisticated image processing, Audi claims the displays provide a significantly better image than conventional mirrors in certain situations, such as driving in direct sunlight. The side view cameras adjust automatically to three driving situations: highway, turning, and parking lot. On the highway, the field of vision is reduced. When indicating to make a turn or change lanes, the view extends the image detail on the relevant side in order to reduce blindspots. When parking, the field of vision is expanded downward. From the high-performance electric motors, to the mostly digitalized cockpit, the 2019 Audi e-tron aims to increase excitement in the all electric SUV market.

ACQUISITION

MSRP	**$74,800**
60 Month @ 6% est	**$1,446**
Lease	**--**
Availability	**2019**
U.S. Sales Units	**--**

RANGE

EV Range	**--**
MPGe	**--**

PERFORMANCE

0-60 mph	**5.5**
Top Speed	**124**

BATTERY

Volts	**396V**
Watts	**95 kWh**
Cooling	**Liquid**

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	**402/414:490**
Drive Type	**AWD**

CHARGING

Power Rating	**9.6kW / 150kW**
Charge Time L1	**--**
Charge Time L2	**9 hrs**
Charge Time DC	**0.5 hr**
Connector	**CCS**

CAPACITY

Passengers	**5**
Cargo	**28.5/57 cu ft.**

DIMENSIONS

Curb Weight	**5,490 lbs**
Length	**193 in**
Width	**76.3 in**
Height	**65.5 in**

Story: Dylon Morales, Photos: Audi

Battery Electric

2018-2019 JAGUAR I-Pace

Comparisons of Jaguar's new I-Pace with Tesla's Model X are inevitable, but the I-Pace does have one slight edge. The I-Pace starts at $69,500, $10k lower than the entry level Model X. The industry's second all-electric SUV shares some important common features with the Model X: a floorpan mounted battery that adds torsional rigidity to the frame and moves the center of gravity five inches lower than its ICE sibling the F-Pace. The ability to place the battery and drive components lower in the chassis allowed the Jaguar design team to start with a clean sheet. The result was a signature EV cab-forward profile and greater interior space. Rear cargo space is 25.3 cubic feet and the front storage compartment provides another 0.95 cubic feet to securely stow small items. A lower roof line than most SUVs, combined with other aerodynamic improvements, reduces drag. The I-Pace achieves 240 miles on a 90 kWh battery, about 50 miles less than the 90kW Tesla Model X. The I-Pace' all-electric drivetrain provides impressive performance for a family wagon. All-wheel-drive supplied by two permanent magnet synchronous electric motors generate an impressive 394 HP and 512 Lb-Ft of torque and yield impressive 4.5 second 0-60 performance. Torque Vectoring by slightly braking the inside wheels increases the car's cornering capability. Adaptive Surface Response (AdSR) provides better traction and stability in adverse weather and on uneven pavement.

ACQUISITION

MSRP	**$69,500**
60 Month @ 6% est	**$1,228**
Lease	**--**
Availability	**2018**
U.S. Sales Units	**--**

RANGE

EV Range	**234**
MPGe	**76**

PERFORMANCE

0-60 mph	**4.5 sec**
Top Speed	**124 mph**

BATTERY

Volts	**--**
Watts	**90 kWh**
Cooling	**Liquid**

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	**394/512**
Drive Type	**AWD**

CHARGING

Power Rating	**7 kW / 100kW**
Charge Time L1	**64 hrs**
Charge Time L2	**12.9 hrs**
Charge Time DC	**85 min to 80%**
Connector	**CCS**

CAPACITY

Passengers	**5**
Cargo	**17.34-40.58 cu ft**

DIMENSIONS

Curb Weight	**4,784 lbs**
Length	**184.3 in**
Width	**84.2 in**
Height	**61.3 in**

Story: Christopher Alan, Photos: Jaguar

Plug-In Hybrid

2015 - 2019

PORSCHE
Cayenne S E-Hybrid

Porsche built its brand by delivering high performance as standard. The Cayenne SUV plug-in lives up to its sporting heritage. With a total of 416 hp and its 435 lb.-ft. of torque instantly available, the S E-Hybrid doesn't disappoint. The utility hasn't been neglected either. The vehicle's 7,716-pound tow rating is sufficient to tow a watercraft or camper. Push the "e-power" button and the Cayenne S E-Hybrid's all electric silent running mode extends up to 78 MPH, making it capable of all driving regimes except the kind you bought a Porsche for. Push the accelerator and the 3.0 liter supercharged V6 will spur the Cayenne from zero to 62 MPH in 5.4 seconds and a top speed of 151 MPH. To deliver sports car performance in an SUV package, Porsche borrowed the Panamera E-Hybrid's 95 hp motor/inverter, Tiptronic S eight-speed automatic transmission and supercharged 3.0-liter V-6.

Like the other plug-in hybrids in the luxury German automaker's stable, the Cayenne S E-Hybrid maintains the line's sleek looks and premium interior appointments. The bright green brake calipers and minimal badging are the only indications of the SUV's eco cred. When introduced, the Cayenne S E-Hybrid's 14 mile all-electric range didn't break any new ground and falls short of the new entries into the segment including the Volvo XC90 T8 and the Mercedes-Benz GLE550e. The Cayenne S E-Hybrid remains a stylish SUV for buyers who put a premium on performance.

ACQUISITION

MSRP	$79,900
60 Month @ 6% est	$1,412
Lease	$699
Availability	2015
U.S. Sales Units	4,426

RANGE

EV/ICE Range	14/476
MPGe/MPG	47/22

PERFORMANCE

0-60 mph	5.4 sec
Top Speed	151 mph

BATTERY

Volts	--
Watts	10.8 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft (E-G)	416/435
Drive Type	AWD

CHARGING

Power Rating	7.2 kW
Charge Time L1	11 hrs
Charge Time L2	1.3 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	20.48-59.68 cu ft

DIMENSIONS

Curb Weight	5,181 lbs
Length	191.14 in
Width	85.2 in
Height	67.4 in

Story: Christopher Alan, Photos: Porsche

Plug-In Hybrid

ACQUISITION

MSRP	$63,200
60 Month @ 6% est	$1,117
Lease	$569
Availability	2015
U.S. Sales Units	12,947

RANGE

EV/ICE Range	13/527
MPGe/MPG	56/24

PERFORMANCE

0-60 mph	6.5 sec
Top Speed	130 mph

BATTERY

Volts	--
Watts	9.2 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	111/332, 240/260
Drive Type	AWD

CHARGING

Power Rating	3.5 kW
Charge Time L1	6 hrs
Charge Time L2	3 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	34.2-72.5 cu ft

DIMENSIONS

Curb Weight	5,220 lbs
Length	193.3 in
Width	76.3 in
Height	69.4 in

2015 - 2019

BMW
X5 xDrive40e

The X5 was designed to deliver the kind of sporty road handling the German manufacturer is known for. Featuring a specially tuned suspension, the X5 gives drivers a sports sedan feel with the higher ride height and cargo space of an SUV. The xDrive40e plug-in gave the midsize SUV the ability to drive 13 all-electric miles. The 2020 year model xDrive45e iPerformance will increase all-electric range to 50 miles.

The new 45e will replace the current 4 cylinder with a twin-turbo 3.0 liter inline 6. The electric motor provides instant torque at low revs compensating for turbo lag. The BMW xDrive intelligent all-wheel-drive provides superb traction in all road conditions. The electronically controlled multi-plate clutch provides fully variable distribution of drive torque between the front and rear wheels. Linked to the DSC (Dynamic Stability Control), the xDrive system counters understeer or oversteer by distributing torque to each wheel for best handling.

The plug-in X5 costs approximately $17,000 less than the Porsche plug-in SUV. The BMW X5 xDrive40e / 45e are great options for drivers who want the sportiness the Bavarian manufacturer has built its brand around while at the same time enjoying the added fuel efficiency of a plug-in hybrid.

Story: Christopher Alan, Photos: BMW

Plug-In Hybrid

2015 - 2019

MERCEDES-BENZ GLE550e 4Matic

The GLE-Class SUV is Mercedes-Benz' direct competitor for the BMW X5. The plug-in GLE550e 4Matic gives the five-passenger SUV 18.6 all-electric miles, on par with the BMW X5 xDrive40e.

Mercedes has the upper hand when comparing HP numbers between its closest competitors. The GLE550e's 3.0L direct-injection twin-turbo V6 gas engine produces a combined system output of 436 hp and 479 lbs-ft of torque. This power is transferred to the pavement via the 7-speed 4Matic all-wheel drive system providing a 0-60 MPH time of 5.3 seconds. The all-electric top speed is a credible 81 MPH. Mercedes-Benz offers 4 driving modes: hybrid drive, which auto selects the best power source option based on driving conditions; E-mode, which is all-electric; E-save, which saves stored energy to be used later as when driving in a zero emission district; and Charge, which uses gas power and charges the electric system.

Muscular and angular, the plug-in GLE delivers power, luxury and AWD in a fuel-efficient package. The new SUV adds another solid option to the growing luxury SUV market. Pricing for the plug-in Mercedes SUV is $4,000 more than the plug-in BMW X5, but $1,500 less than the Volvo XC90 T8.

ACQUISITION

MSRP	$67,695
60 Month @ 6% est	$1,196
Lease	$779
Availability	2015
U.S. Sales Units	828

RANGE

EV/ICE Range	10/450
MPGe/MPG	43/21

PERFORMANCE

0-60 mph	5.3 sec
Top Speed	152 mph

BATTERY

Volts	--
Watts	8.8 kWh
Cooling	--

DRIVETRAIN (HYBRID)

HP/Lb-ft	436/479
Drive Type	AWD

CHARGING

Power Rating	8.8 kW
Charge Time L1	2 hrs
Charge Time L2	-- hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	38.2-80.3 cu ft

DIMENSIONS

Curb Weight	5,490 lbs
Length	189.1 in
Width	84.3 in
Height	70.7 in

Story: Steven Thomas, Photos: Mercedes-Benz

Plug-In Hybrid

ACQUISITION

MSRP	$53,895
60 Month @ 6% est	$952
Lease	$585
Availability	2017
U.S. Sales Units	795

RANGE

EV/ICE Range	18/352
MPGe/MPG	59/26

PERFORMANCE

0-60 mph	5.1 sec
Top Speed	131 mph

BATTERY

Volts	400
Watts	10.4 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	46/111, 87/177, 313/295
Drive Type	AWD

CHARGING

Power Rating	7.7 kW
Charge Time L1	8 hrs
Charge Time L2	2.5 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	63.3 cu ft

DIMENSIONS

Curb Weight	4,638 lbs
Length	184.6 in
Width	83.3 in
Height	65.3 in

2017 - 2019

VOLVO XC60 T8

The XC60 T8 is a thoroughly modern Volvo which compares favorably on every axis with German SUVs. Like the larger XC90, the XC60 has a "twin engine" configuration which is a combination of gas engine that drives the front wheels and electric motor which drives the rear wheels. The 2.0 liter 4 cyclinder engine is both supercharged and turbo-charged to yield an impressive combined 400 hp and 472 lb-ft of torque. Zero to 62 MPH is similarly impressive at 5.1 seconds. Volvo's philosophy for driver assist technologies is to ensure the driver stays engaged in the act of driving. Lane keeping does not keep the car centered in the lane, but will steer off the side of a lane if the car drifts toward the lane marker. It will also gently correct if a car is in the driver's blind spot during lane changes. A 9 inch Sensus touchscreen on the center console is angled slightly toward the driver. The panel provides navigation, Apple CarPlay and 360 degree and rear parking camera. The cross-traffic alert system guards against cars approaching from the side when backing up. Hands-free controls are provided by Apple's Siri. Volvo has incorporated some thoughtful and clever usability features. The rear lift gate can be opened by sweeping your foot under the rear bumper, permitting hand-free entry when loading groceries or packages. Switches in the rear edge of the cargo area fold down the rear seats. Storage areas under the rear seats can be used to store personal electronics safely out of sight. The 5-passenger XC60 T8 has a 3,500 lb towing capacity, 1,500 lbs less than the larger XC90.

Story: Christopher Alan, Photos: Volvo

Plug-In Hybrid

2016 (EU) 2018-2019 (US)

MITSUBISHI Outlander PHEV

Americans finally got to enjoy Europe's best selling EV when US deliveries of the Outlander plug-in started in 2018. The Mitsubishi Outlander PHEV hit these shores with sophisticated new styling and a more powerful hybrid drivetrain. The attractive new front facia and redesigned bumper give the 5-passenger crossover SUV visual appeal.

Equipped with dual 80 hp electric motors and a 2.0L 4-cylinder 117 hp gasoline engine, the system's total output is 200HP and 249 lb.-ft. of torque. The Outlander can operate in either all-electric, series or parallel hybrid modes. In series mode, the engine spins a generator that sends electricity to the front and rear traction motors and can put energy back into the battery. In parallel mode, the engine drives the front wheels though the transmission and the front and rear electric motors drive the wheels. The electric motor assisting the gas engine achieves improved fuel efficiency, earning an EPA rating of 74 MPGe. Unusual for a plug-in hybrid, the Outlander comes with DC fast charge.

This good looking SUV has proven itself capable in other world markets and should appeal to American consumers looking for a tall wagon with great fuel efficiency, all-wheel drive and the ability to haul 5 adults plus their cargo. A towing capacity of 1,500 lbs is sufficent to haul small off-road vechicles and boats. Competition is fierce in the SUV EV market, but the Outlander's MSRP is at least $20k less than options from BMW, Mercedes-Benz and Volvo, making it affordable for many more families.

ACQUISITION

MSRP	$34,595
60 Month @ 6% est	$612
Lease	$289
Availability	2018
U.S. Sales Units	--

RANGE

EV/ICE Range	22/288
MPGe/MPG	74/25

PERFORMANCE

0-60 mph	11 sec
Top Speed	106 mph

BATTERY

Volts	300
Watts	60 kWh
Cooling	Forced Air

DRIVETRAIN (HYBRID)

HP/Lb-ft	80/101,80/144,117/137
Drive Type	AWD

CHARGING

Power Rating	7.2 kW
Charge Time L1	8 hrs
Charge Time L2	3.5 hrs
Charge Time DC	25 min
Connector	CHAdeMO

CAPACITY

Passengers	5
Cargo	30.4-78.0 cu ft

DIMENSIONS

Curb Weight	4,178 lbs
Length	184.8 in
Width	70.8 in
Height	67.3 in

Story: Steven Thomas, Photos: Mitsubishi

Plug-In Hybrid

ACQUISITION

MSRP	$42,495
60 Month @ 6% est	$833
Lease	$420
Availability	2016
U.S. Sales Units	5,422

RANGE

EV/ICE Range	32/520
MPGe/MPG	84/32

PERFORMANCE

0-60 mph	7.8 sec
Top Speed	--

BATTERY

Volts	360
Watts	16 kwh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	198/220, 323/235
Drive Type	FWD

CHARGING

Power Rating	6.6 kW
Charge Time L1	14 hrs
Charge Time L2	2 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	7
Cargo	32 cu ft

DIMENSIONS

Curb Weight	4,943 lbs
Length	203.8 in
Width	79.6 in
Height	69.9 in

2016-2019

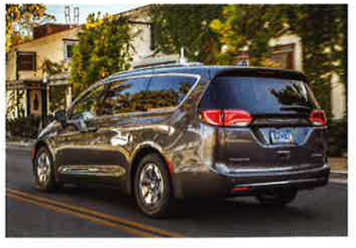
CHRYSLER Pacifica Hybrid

The Pacifica Hybrid is the first minivan to offer a plug-in powertrain and features 33-mile all-electric range. As part of a ground-up redesign of Chrysler's class-leading minivan, the new model features a more sculpted, contemporary body. The Pacifica Hybrid is differentiated from the internal combustion models with a unique grill pattern, wheels and badging.

There is no direct competition for the Pacifica Hybrid. It might be cross shopped by families considering the Mitsubishi Outlander. With better all-electric range, the Pacifica is capable of hauling 8 adults in comfort and has capacity for plenty of gear. Cargo space is listed as 32 cu ft. Because of the battery mounting position, the second row seats do not fold.

Electric power for the plug-in Pacifica comes from a 16 kWh battery mounted beneath the middle seats. The minivan uses the same engine as the non-hybrid Pacifica, tuned to the Atkinson cycle for the plug-in application. The 3.6 liter Pentastar V6 is mated to an all-new electrically variable transmission (EVT). The system uses two electric motors, both of which are capable of driving the vehicle's front wheels.

The cost savings from the plug-in hybrid's 84 MPGe fuel efficiency should make this van cheaper on a total-cost-of-ownership basis compared to any other minivans on the market.



Story: Steven Thomas, Photos: FCA

Battery Electric

2017-2019
TESLA Model 3

Even before Tesla announced in March that they were taking orders for the $35k version, the Model 3 was a sensation. The Model 3 turns heads and makes the pulse quicken. Perfect strangers stop and comment that the car is beautiful and want to know more about it. Almost every one of the thousands of people who have driven Electric Car Insider's ruby-red Model 3 exit the drivers seat with a big smile and comment either that it will be their next car or that even though they need a family wagon, they'd love to own a Model 3. After Tesla fills the half-million order backlog of people who decided that their next car would be a Tesla Model 3, this car will no doubt continue to draw hundreds of thousands of buyers from the ranks of the BMW 3 and 5 series, other performance sedans, and more than a few sports cars.

The Model 3 has the mystique and performance of a mild exotic, but is a practical five seat sedan. Despite being a high sales volume car, due to its unprecedented popularity, it will also likely maintain a high resale value. Because of lower depreciation and much lower fuel and maintenance costs, on a total cost of ownership basis, it will be one of the most affordable cars in its class. This combination of beauty, practicality and economy make it one of the most popular and sought-after cars of this era and have traditional carmakers scrambling to produce a credible long range battery-electric competitor.

ACQUISITION
MSRP ..... **$36,200-$52,200**
60 Month @ 6% est **639.53**
Lease ..... **N/A**
Availability ..... **Dec 2017**
U.S. Sales Units **4,360**

RANGE
EV Range **264-310**
MPGe **116-130**

PERFORMANCE
0-60 mph ..... **3.2-5.6 sec**
Top Speed ..... **130-162 mph**

BATTERY
Volts **375**
Watts ..... **50-75 kWh**
Cooling ..... **Liquid**

DRIVETRAIN (ELECTRIC)
HP/Lb-ft **258/317**
Drive Type ..... **RWD/AWD**

CHARGING
Power Rating ..... **-- kW**
Charge Time L1 ..... **-- hrs**
Charge Time L2 ..... **7.3-8.4 hrs**
Charge Time DC ..... **0.7 hrs**
Connector ..... **UMC**

CAPACITY
Passengers **5**
Cargo ..... **15 cu. ft**

DIMENSIONS
Curb Weight ..... **3,549-3,814 lbs**
Length ..... **184.8 in**
Width ..... **82.2 in**
Height ..... **56.8 in**

Story: Christopher Alan, Photos: Tesla

Battery Electric

2020
MERCEDES-BENZ EQC

With plans to invest more than 11 billion dollars into the EQ portfolio, the launch of the EQC in late 2019 signifies a new era for Mercedes-Benz. The EQC is the first of a growing family of electric and hybrid vehicles offered by Mercedes-Benz. Equipped with the all-new MBUX media system, the EQC turns to artificial intelligence to quickly recognizes patterns. For instance, anyone who often has weekly business calls will receive the contact info as suggestions during their drive home. This feature also includes the radio, offering reminders whenever a favorited program is about to air. Furthermore, the MBUX Voice Control recognizes virtually any command and understands nearly all sentences in the areas of multimedia and vehicle operation. For example, "Where is the next charging station?" as well as "Where can I charge the battery?" are both understood.

The first model launched under the EQ name, the EQC is powered by a newly designed drive system with electric motors at each axel. This allows for the confidence and handling found in all-wheel drive vehicles while optimizing power consumption. The front motor was designed for efficiency in the low to medium load range, while the read motor adds the additional power expected out of a Mercedes. Powering this eligant, yet forcible SUV, is an 80-kWh battery pack that offers an estimated range of 279 miles. The EQC is expected to be available in the US in late 2019.

ACQUISITION
MSRP ..... **--**
60 Month @ 6% est ..... **--**
Lease ..... **--**
Availability **2020**
U.S. Sales Units ..... **--**

RANGE
EV Range ..... **~279**
MPGe ..... **--**

PERFORMANCE
0-60 mph ..... **4.9 sec**
Top Speed ..... **112 mph**

BATTERY
Volts **0**
Watts ..... **80 kWh**
Cooling ..... **Liquid**

DRIVETRAIN (ELECTRIC)
HP/Lb-ft **402/564**
Drive Type ..... **AWD**

CHARGING
Power Rating ..... **7.4 kW**
Charge Time L1 ..... **-- hrs**
Charge Time L2 ..... **-- hrs**
Charge Time DC ..... **0.7 hrs**
Connector **0**

CAPACITY
Passengers **0**
Cargo ..... **0 cu. ft**

DIMENSIONS
Curb Weight ..... **lbs**
Length ..... **187.4 in**
Width ..... **74.2 in**
Height ..... **63.9 in**

Story: Dylon Morales, Photos: Mercedes-Benz

Plug-In Hybrid

2015 - 2019

MERCEDES-BENZ C350e

A plug-in in name only, with only 8 miles all-electric range, the C350e is nonetheless an attractive looking small sedan. The C-Class features dramatic body lines that give the sedan a forward-leaning profile, like a sprinter at the blocks ready to take off at the sound of the gun. This athletic look helps the C350e stand out in a crowd and should make it appeal to buyers of premium sports sedans. The C350e faces off squarely with BMW 330e. The two cars both have short all-electric ranges, and similar 0-60 times and exterior dimensions. The C350e will cost about $5,000 less than the BMW 330e. The C350e's electric motor, which produces 80 HP and 251 lb.-ft. of torque, is mated to a 2.0L 4-cylinder, which produces 208 hp and 258 lb.-ft. of torque. Combined output is 275 hp and 443 lb.-ft. of torque. The electric motor is bolted to the 7-speed transmission's wet clutch. The steering-wheel-mounted shift paddles allow the driver to upshift and downshift through the gears. All-electric range of 8 miles is the shortest of any plug-in EV but contributes to 51 MPGe when driven short distances between charges.

The C350e comes loaded with all the features, safety equipment and options available across the C-Class line. Standard equipment on the C350e includes an air-ride suspension and a pre-trip climate control, which makes it possible to set the interior temperature before hitting the road, cooling in the summer or warming in the winter.

ACQUISITION

MSRP	$47,900
60 Month @ 6% est	$846
Lease	$365
Availability	2015
U.S. Sales Units	1,107

RANGE

EV/ICE Range	9/401
MPGe/MPG	51/30

PERFORMANCE

0-60 mph	5.8 sec
Top Speed	130 mph

BATTERY

Volts	--
Watts	6.2 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	80/251, 208/258
Drive Type	RWD

CHARGING

Power Rating	3 kW
Charge Time L1	8 hrs
Charge Time L2	2.5 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	11.8 cu ft

DIMENSIONS

Curb Weight	3,924 lbs
Length	184.5 in
Width	72.1 in
Height	56.8 in

Story: Steven Thomas, Photos: Mercedes-Benz

Plug-In Hybrid

ACQUISITION

MSRP	$44,100
60 Month @ 6% est	$779
Lease	$379
Availability	2016
U.S. Sales Units	5,291

RANGE

EV/ICE Range	19/336
MPGe/MPG	71/30

PERFORMANCE

0-60 mph	5.9 sec
Top Speed	143 mph

BATTERY

Volts	293
Watts	12 kWh
Cooling	Refrigerant

DRIVETRAIN (HYBRID)

HP/Lb-ft	135/184 180/215
Drive Type	RWD

CHARGING

Power Rating	3.5 kW
Charge Time L1	-- hrs
Charge Time L2	2.2 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	13 cu ft

DIMENSIONS

Curb Weight	3,900 lbs
Length	182.8 in
Width	71.3 in
Height	56.3 in

2016-2019

BMW 330e

BMWs 330e is a plug-in hybrid variant of the popular 3-Series. The 330e has only 14 miles all-electric range, but 71 MPGe on short commutes and a $4,001 tax credit make this more attractive than its gas-only siblings. The drivetrain, which features a turbo 4-cylinder engine mated to an electric motor, promises to live up to the 3-Series' heritage as the original sports sedan by producing 248HP and 310 lb.-ft. of torque launching the sedan from 0-60 in 5.9 seconds. BMW's reputation for excellent driving dynamics with a firm ride is part of the legacy of the 3-Series. A redesigned suspension promises more driver feedback without compromising comfort. An updated steering system and updated stability control continue the tradition of incremental innovation.

The 330e benefits from a recent refresh of the 3-Series line's interior. Fine leather, repositioned chrome highlights and smooth gloss surfaces give the interior a more upscale look. The 330e receives a handful of toggles and switches used in connection with the hybrid drivetrain including the Driving Experience Control switch and the eDrive switch, both of which can be found on the center console.

The 330e should appeal to traditional 3-Series buyers looking for all of the sportiness and luxury associated with the line but with dramatically increased fuel efficiency over its ICE siblings. US Department of Energy estimates fuel cost savings of $5,250 over the life of the vehicle. Combined with the Federal tax credit and ZEV state rebates, this BMW is less expensive to own than the average car purchased in the U.S.

Story: Christopher Alan, Photos: BMW

Electric & PHEV

2014 - 2019

BMW i3 / i3 REx

BMW continues to update the i3, whose next iteration will have 153 miles of all-electric range thanks to a 42 kWh battery. The i3 REx version also has a 650cc two-cylinder gasoline engine, which adds $3,850 to the price tag and more than a hundred miles of extended range using gasoline. The extra weight also adds 0.8 seconds to the 0-60 time.

The i3's standout innovation is the carbon-fiber Life Cell chassis and aluminum Drive frame. This LifeDrive chassis drops 1,200 lbs off the vehicle vs conventional steel construction. That impressive weight savings helps the i3 deliver up to 124 MPGe.

This purpose-built EV was the most fuel efficient car ever at the time of its debut in 2014 and was bested only by the 2017 Prius Prime which eked out an astonishing 133 MPGe in electric-only mode.

Like the exterior, the interior of the i3 is distinctive and modern. The space is stylish with a swooping dash, thin flat-panel display screens and shifter pod mounted next to the telescoping steering wheel. The i3 will appeal to drivers who enjoy the car's appearance, stylish and functional interior, BMW engineering and roundel emblem.

ACQUISITION

MSRP	$44,450, $48,300
60 Month @ 6% est	$785, $853
Lease	$359, $329
Availability	2014
U.S. Sales Units	32,022

RANGE

BEV, EV/ICE	153, 97/108*
MPGe/MPG	118, 109/35

PERFORMANCE

0-60 mph	7.2, 8.0
Top Speed	93 mph

BATTERY

Volts	353
Watts	42 kWh
Cooling	Refrigerant

DRIVETRAIN (ELECTRIC, HYBRID)

HP/Lb-ft	170/184
Drive Type	RWD

CHARGING

Power Rating	7.4 kW
Charge Time L1	15.25 hrs
Charge Time L2	4.9 hrs
Charge Time DC	0.7 hrs-0.7 hrs
Connector	SAE Combo

CAPACITY

Passengers	4
Cargo	15.1-36.9, 9.2-38.8 cu ft

DIMENSIONS

Curb Weight	2,972, 3,234 lbs
Length	158.3
Width	80.3
Height	62.9

Story: Christopher Alan, Photos: BMW

Plug-In Hybrid

2017-2019

MINI COOPER S E Countryman ALL 4

ACQUISITION

MSRP	$36,900
60 Month @ 6% est	$650
Lease	$339
Availability	2017
U.S. Sales Units	780

RANGE

EV/ICE Range	12/258
MPGe/MPG	65/27

PERFORMANCE

0-60 mph	6.7 sec
Top Speed	77/137 mph

BATTERY

Volts	293
Watts	7.6 kWh
Cooling	--

DRIVETRAIN (HYBRID)

HP/Lb-ft	221/284
Drive Type	AWD

CHARGING

Power Rating	3.6 kW
Charge Time L1	3.25 hrs
Charge Time L2	2.25 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	5
Cargo	17.2 cu ft

DIMENSIONS

Curb Weight	3948 lbs
Length	169.8 in
Width	71.7 in
Height	61.4 in

In addition to short-distance all-electric drive capability, the plug-in hybrid version of the Countryman adds all-wheel-drive to the popular small sedan. Intelligent all-wheel drive that adjusts power between the front and rear wheels making the small wagon responsive, sure-footed and agile, and much more economical than a typical AWD vehicle. Zero to 62 mph time is 6.9 seconds yet the S E can still return 65 MPGe when driven gently in all-electric mode.

The front wheels are powered by a 134 hp 3-cylinder gasoline engine through a 6-speed Steptronic automatic transmission. The rear wheels are powered by a 65 kW electric motor through a two-stage single-speed transmission. Together they produce 221 hp with 284 lb-ft of torque. The intelligent part comes from the Dynamic Stability Control (DSC) unit which analyzes road conditions and the driver's accelerator input to provide the ideal blend of traction for maximum stability. For greatest efficiency, under normal operation, only one of the motors supplies power to a single set of wheels. The Countryman PHEV is able to operate on electricity up to a top speed of 77 mph.

The infotainment system uses a 6.5-inch color screen in the center dash. The display shows battery state-of-charge and the hybrid drive mode. An optional technology package includes satellite navigation, and a high-resolution 8.8-inch touchscreen.

Electric range is a minuscule 12 miles, but for folks who have short commutes this Mini PHEV will be an economical option to drive an all-wheel drive EV.

Story: Christopher Alan, Photos: Mini

Battery Electric

2016-2019

CHEVROLET Bolt

When GM CEO Mary Barra unveiled the Bolt prototype in early 2015 at the North American International Auto Show in Detroit, it signaled the beginning of the zero emission automobile era. The Bolt was the first mass produced, affordable, long range electric car and GM beat the Tesla Model 3 to market. The Bolt continues to be a popular, capable, long distance all-electric, but it ceded its first mover advantage to the Tesla Model 3 which outsold it by 6:1 even before the $35k Model 3 was available.

Bolt designers were given a clean slate to create the vehicle. Chevrolet used data and survey feedback collected from drivers who had accumulated more than 1.3 billion miles of EV experience from the Chevrolet Volt to make well informed decisions about what a successful electric car needed to be.

The Bolt is a compact crossover with upright seating for 5 adults and much more cargo room than the current selection of short-range electric hatchbacks. The ability of the Bolt to replace a gas powered car without any inconvenience on the part of the driver, at half the operating cost, is a significant achievement.

Although GM has said it will not build out a high speed charging network like Tesla has, the Bolt can accept 80kW DC Fast Charging from CCS chargers. The current network of chargers generally offer 25-50kW charging, making trips out of town possible, if not as fast and convenient as when using a 120kW Tesla Supercharger.

ACQUISITION

MSRP	$37,495
60 Month @ 6% est	$662
Lease	$325
Availability	2016
U.S. Sales Units	26,477

RANGE

EV Range	238
MPGe	128/110

PERFORMANCE

0-60 mph	6.5 sec
Top Speed	93 mph

BATTERY

Volts	--
Watts	60 kWh
Cooling	Liquid

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	200/266
Drive Type	FWD

CHARGING

Power Rating	7.2 kW
Charge Time L1	
Charge Time L2	9.52
Charge Time DC	90 mi in 0.5 hrs
Connector	SAE J1772

CAPACITY

Passengers	5
Cargo	56.6 cu ft

DIMENSIONS

Curb Weight	3,564 lbs
Length	164 in
Width	69.5 in
Height	62.8 in

Story: Christopher Alan, Photos: Chevrolet

Battery Electric

2019

HYUNDAI Kona Electric

The Hyundai Kona Electric is a small crossover similar to its sibling Kia Niro but without the hybrid gas engine and transmission. Instead, this long-range all-electric is available with two battery options: 39.2 kWh or 64 kWh. US EPA figures are 150-250 miles, making the Kona Electric an interesting competitor. The lower-range version will have about the same range and price as the entry level Nissan Leaf, and the higher-range version will have about the same range and price as the Chevrolet Bolt. The Kona might have an edge on both with popular mini-SUV styling. The front-wheel-drive subcompact also has two different motor specs to match those batteries, 99-kW (133-HP) and 150-kW (201-HP). The higher-output motor produces an impressive 291 pound-feet of torque. Hyundai cites acceleration from 0-62 mph in 7.6 seconds, which will make the electric Kona quicker than the gasoline version. Before-incentive pricing is about $30,000 for the low-range model and close to $40,000 for the long-range edition. Since both will qualify for about $10,000 in incentives in EV-friendly states, the net price of $20,000 - $30,000 will be competitive with similar long-range all-electrics. On a total cost of ownership basis, the Kona Electric will be significantly less expensive than its gasoline powered counterpart, saving about $1,300 per year in fuel costs, about $20k over the life of the car. Add several thousand dollars in savings from never having to change oil, belts and filters or perform tuneups, and this car will be about half as expensive to own compared to any similar gas car.

ACQUISITION

MSRP	~$39,000
60 Month @ 6% est	$689
Lease	--
Availability	2019
U.S. Sales Units	--

RANGE

EV Range	186, 292
MPGe	117

PERFORMANCE

0-60 mph	9.7/7.6
Top Speed	104 mph

BATTERY

Volts	--
Watts	39.2, 64.0 kWh
Cooling	--

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	133, 201/291
Drive Type	FWD

CHARGING

Power Rating	7.2 kW
Charge Time L1	--
Charge Time L2	6.2-9.5 hrs
Charge Time DC	30
Connector	CCS

CAPACITY

Passengers	5
Cargo	11.7-39.3 cu ft

DIMENSIONS

Curb Weight	--
Length	164.6 in
Width	70.9 in
Height	61.8 in

Story: Christopher Alan, Photos: Hyundai

Battery Electric

2014 - 2019

KIA Soul EV

The Kia Soul EV has been a popular alternative to the Nissan Leaf and Volkswagen e-Golf for people who like its quirky boxy styling and live in the coastal states where the car is available for sale.

Kia recently announced that the Soul would soon get the same 64kWh battery pack as its new siblings, which will probably enable about 210-mile electric range (up from 111 last year). DC fast charging makes 200-300 mile trips out of town possible with one 20 minute rest and charging stop.

The Soul EV is a small crossover with a taller ride height and more cargo space than its hatchback competitors. The interior is roomy with seating for five and has 18.8 cubic feet of cargo space with the rear seats in use, and 49.5 cubic feet with the seats folded. Like the Leaf, Kia has sensibly positioned the charge ports in the middle of the front grille for easy access, especially when using public chargers where the cord might have to reach past another parking spot.

With the extra range coming in the next edition, the Soul EV will be a tough competitor to the Ford Focus Electric and Volkswagen e-Golf, but will have a hard time making a case vs the new $35k Tesla Model 3. If boxy crossover styling and extra cargo space are among your requirements, the Soul EV is worth a test drive.

ACQUISITION

MSRP	$33,950
60 Month @ 6% est	$600
Lease	$199
Availability	2014
U.S. Sales Units	5,509

RANGE

EV Range	111:210
MPGe	105

PERFORMANCE

0-60 mph	11.2 sec
Top Speed	90 mph

BATTERY

Volts	360
Watts	27 kWh
Cooling	Air

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	109/210:201/291
Drive Type	FWD

CHARGING

Power Rating	6.6 kW
Charge Time L1	24 hrs
Charge Time L2	4.2-4.8 hrs
Charge Time DC	37 min
Connector	SAE J1772/CHAdeMO

CAPACITY

Passengers	5
Cargo	18.8-49.5 cu ft

DIMENSIONS

Curb Weight	3,289 lbs
Length	163 in
Width	70.9 in
Height	63 in

Story: Christopher Alan, Photos: Kia

Battery Electric

2010 - 2019

NISSAN Leaf & Leaf Plus

Nissan's announcement in 2019 of the Leaf Plus, which boasts a 62 kWh battery capable of 226 miles of all-electric range, gives the Leaf a new lease on life after its sales hit a low point at the beginning of this year. The range improvement follows a styling upgrade in 2018 which brought it into the compact-car mainstream. Seventeen-inch aluminum alloy wheels on the SV and SL models added to the makeover.

Nissan touts the car's new strong regenerative braking as "e-pedal." Unlike some other EVs, releasing the accelerator will bring the car to a full stop.

The Leaf features a color 7-inch touchscreen display. A new user interface and improved connectivity make the entire system more user friendly. Other upgrades include a revised graphic interface and better integrated voice-commands for navigation and audio, HD radio, and SiriusXM Travel Link. Apple CarPlay is available on the SV and SL models. A suite of active driver assist technologies are available.

Nissan provides a 240v Level 2 charge cable with the car, eliminating a $500 expense incurred with comparable EVs. The cable will plug in to standard dryer outlets. A provided cable adapter permits use with standard 120v outlets for charging at 4 mph.

Competition from the 220-mile, $35k Tesla Model 3 will give the Leaf Plus headwinds until its price drops to make it more attactive to entry-level buyers. The Leaf qualifies for a full $7,500 Federal tax credit. For a short time, Nissan can claim a small net price advantage vs the Model 3, but if you test drive the two head to head, not much else.

ACQUISITION

MSRP	$29,990:$36,550
60 Month @ 6% est	$530
Lease	$195:$219
Availability	2010
U.S. Sales Units	106,179

RANGE

EV Range	151, 226
MPGe	112

PERFORMANCE

0-60 mph	10, ~ 6 sec
Top Speed	94, 100mph

BATTERY

Volts	207
Watts	40, 62 kWh
Cooling	Air

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	147/236, 214/250
Drive Type	FWD

CHARGING

Power Rating	6.6 kW
Charge Time L1	35 hrs
Charge Time L2	7.5 hrs
Charge Time DC	40 min
Connector	J1772

CAPACITY

Passengers	5
Cargo	23.6-30 cu ft

DIMENSIONS

Curb Weight	3,433, 3,780lbs
Length	176.4 in
Width	70.5 in
Height	61.4 in

Story: Christopher Alan, Photos: Nissan

2018-2019

KIA
Niro Electric & PHEV

This 5-passenger tall wagon sub-compact will get attention from buyers looking for an affordable plug-in that does not have the heft, price or off-road capabilities of an SUV. Because the Niro PHEV qualifies for a $4,543 federal tax credit, the net cost is about the same as its non-plug sibling and similar rivals. It also earns $1,500-$2,000 cash rebates and an HOV lane sticker in some states. Those benefits are in addition to 105 MPGe electric fuel efficiency. The front-wheel drive five passenger car gets 26 miles all-electric range, enough to cover a lot of daily commutes and grocery runs. The Niro has a 1.6-liter four-cylinder engine mated to a six-speed dual-clutch automatic transmission. Zero-60 mph is a leisurely 9 seconds with both motor and engine working. Keeping the accelerator above the detent, however, will keep drivetrain in electric-only mode. Cargo capacity is 19.4 cubic feet. Although the rear seat doesn't fold completely flat, the batteries do not intrude on the rear cargo area and total storage space is 54.5 cu. ft. with the back seats flipped down. The LX and EX trim level feature a 7-inch touchscreen infotainment system with Apple CarPlay and Android Auto. The EX Premium model has an 8-inch display with built-in navigation. An available Voice-Command Navigation System gives turn-by-turn directions to charging stations. Niro PHEV comes standard with pre-collision warning and braking, lane-keep assist, and adaptive cruise control.

An all-electric Niro will be available in the US in early 2019.

ACQUISITION
MSRP	$28,840:--
60 Month @ 6% est	$509
Lease	$245:$259
Availability	2018
U.S. Sales Units	401

RANGE
EV/ICE Range	239:26/550
MPGe/MPG	105/46

PERFORMANCE
0-60 mph	~9 sec
Top Speed	107 mph

BATTERY
Volts	360 V
Watts	8.9 kWh
Cooling	--

DRIVETRAIN (HYBRID)
HP/Lb-ft	60/125, 104/109
Drive Type	FWD

CHARGING
Power Rating	$0.00
Charge Time L1	9 hrs
Charge Time L2	2.75 hrs
Charge Time DC	NA
Connector	--

CAPACITY
Passengers	5
Cargo	19.4-54.5 cu ft

DIMENSIONS
Curb Weight	3,391 lbs
Length	171.5 in
Width	71.1 in
Height	60.8 in

Story: Christopher Alan, Photos: Kia

2017-2019

HONDA
Clarity Electric & PHEV

Honda's second entry into the battery-electric car market with the 89 mile range Clarity Electric underwhelms with little more range the Nissan Leaf had seven years earlier and a lease price matched by the new 238 mile Chevy Bolt. It does have plenty of passenger room and a full complement of high-tech driver assist features including Adaptive Cruise Control, Lane Keeping Assist, Road Departure Mitigation and Collusion Mitigation Braking Systems.

Honda has created three variations of the Clarity: Battery Electric, Plug-in Hybrid and Hydrogen Fuel Cell. The Battery Electric version is available as a lease-only vehicle with a generous 20,000 mile/year allowance. If you have a commute near 80 miles and workplace charging, this is one of the least expensive cars to lease on a per-mile basis.

The PHEV version of the Clarity offers an additional 20 hp and 47 all-electric miles before the gas engine kicks in, making range concerns moot.

The Clarity Electric breaks ranks with other Asian EVs and offers DC fast charging using the SAE Combo connector. The battery is able to recharge to 80% within half an hour. Standard Level 2 charging is 6.6kW. The Clarity Electric is available only in California and Oregon. The Clarity PHEV is available throughout the U.S.

Honda is working on other electric cars. Given the impressive number of long range all-electrics being introduced by other manufacturers in 2019 and 2020, it's going to need them to avoid being run over in the marketplace.

ACQUISITION
MSRP	Lease, $34,290
60 Month @ 6% est	$605
Lease	$119:$225
Availability	2017
U.S. Sales Units	1,428, 2,378

RANGE
BEV, EV/ICE	89, 47/340
MPGe/MPG	126/103/114, 110/42

PERFORMANCE
0-60 mph	8.1, 7.6 sec
Top Speed	105, 110 mph

BATTERY
Volts	--
Watts	25.5, 17kWh
Cooling	Liquid

DRIVETRAIN (ELECTRIC, HYBRID)
HP/Lb-ft	161/221, 181/232-103/99
Drive Type	FWD

CHARGING
Power Rating	6.6 kW
Charge Time L1	19, 12 hrs
Charge Time L2	3.5, 2.5 hrs
Charge Time DC	0.5 hrs
Connector	SAE Combo

CAPACITY
Passengers	5
Cargo	14.3, 15.5 cu ft

DIMENSIONS
Curb Weight	4,024, 4,052 lbs
Length	192.7 in
Width	73.9 in
Height	58.2 in

Story: Christopher Alan, Photos: Honda

2016-2019
KIA
Optima PHEV

The Kia Optima is a great mix of crisp handling, contemporary good looks and fuel efficiency wrapped in a cost-effective package. A plug-in drivetrain ups the Optima's fuel efficiency by letting drivers travel 29 fossil-fuel free miles before the 4-cylinder 2.0L direct-injected engine takes over.

The plug-in carries over the wrap-around tiger eye LED headlights and smooth flowing lines that have made the Optima a popular model among mid-size sedan buyers. The only visual cues that separate the hybrid from the Optima's gas-powered variants are a smoothed out front grill featuring active grill shutters, special low-drag wheel and a beveled rear bumper. All were designed to optimize aerodynamics, which improves the car's overall efficiency. The plug-in Optima's drag coefficient is a slippery 0.24 Cd, which is equal to the Tesla Model S.

Visually, the Optima plug-in's interior is identical to the gasoline-only model. Leather seating and genuine stitching on the dash and door panels along with real metal accents give the interior an upscale feel. The plug-in features special gauges and hybrid-system-only screens in the center 8-inch touchscreen. The plug-in Optima is a solid contender in the mid-size sedan PHEV class, comparing well to plug-in versions of the Honda Clarity, Hyundai Sonata and Ford Fusion.

ACQUISITION
MSRP	$35,210
60 Month @ 6% est	$622
Lease	$289
Availability	2016
U.S. Sales Units	1,693

RANGE
EV/ICE Range	29/581
MPGe/MPG	103/40

PERFORMANCE
0-60 mph	--
Top Speed	119 mph

BATTERY
Volts	360 V
Watts	9.8 kWh
Cooling	--

DRIVETRAIN (HYBRID)
HP/Lb-ft	66/151, 154/140
Drive Type	FWD

CHARGING
Power Rating	3 kW
Charge Time L1	9 hrs
Charge Time L2	3 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY
Passengers	5
Cargo	9.9 cu ft

DIMENSIONS
Curb Weight	3,788 lbs
Length	191.1 in
Width	73.2 in
Height	57.5 in

Story: Christopher Alan, Photos: Kia

ACQUISITION
MSRP	$34,600
60 Month @ 6% est	$611
Lease	$356
Availability	2015
U.S. Sales Units	5,907

RANGE
EV/ICE Range	27/563
MPGe/MPG	99/42

PERFORMANCE
0-60 mph	7.6 sec
Top Speed	-- mph

BATTERY
Volts	360 V
Watts	9.8 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)
HP/Lb-ft	67, 154/140
Drive Type	FWD

CHARGING
Power Rating	3.6 kW
Charge Time L1	8 hrs
Charge Time L2	2 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY
Passengers	5
Cargo	9.9 cu ft

DIMENSIONS
Curb Weight	3794 lbs
Length	191
Width	73
Height	58

2015 - 2019
HYUNDAI
Sonata PHEV

Zero-emission all-electric drive is a terrific addition to Hyundai's award-winning and best-selling Sonata. The Sonata Plug-in Hybrid Electric Vehicle (PHEV) enables up to 27 miles of driving on electricity before the gas engine takes over and completes the trip. If you have a short commute or mostly local driving pattern, this mid-sized sedan could be a good option for all-electric driving. If you can plug in at work, you could manage a 50 mile all-electric commute with a fuel cost of less than $1 per gallon equivalent and zero tailpipe emissions.

Very little distinguishes the PHEV's exterior other than slight changes to the facia panels and a charge port on the driver's side. A plug-in specific instrument cluster and a charge indicator on the dash, for checking the charge level from outside the vehicle, are the only changes that set the PHEV interior apart from the rest of the Sonata line.

The Sonata PHEV uses an automatic 6-speed transmission with the Hyundai Transmission-Mounted Electrical Device (TMED), an electric motor, in place of the torque converter.

The Sonata has been awarded the IIHS Top Safety Pick, been named a Best Car For The Money by *U.S. News & World Report*, and been Top-Rated by *Edmunds.com*.

Story: Steven Thomas, Photos: Hyundai

Plug-In Hybrid

2010-2019

CHEVROLET Volt

GM will cease production of the Volt in March 2019, bringing a close to the car's starring role in the EV revolution. Inventory will remain on dealer lots for several more months, so for that reason, we include the Volt's profile a final time in this issue.

Since its introduction in 2010, the Volt placed in the top 5 EV sales performers. The Volt is a no-compromise electric car that offers 53 miles of all-electric range. According to Chevrolet, drivers travel in all-electric mode 90% of the time and most will travel 1,000 miles before refilling with gasoline. On online forums, Volt drivers gleefully brag about driving an entire year without filling up at the pump.

The Volt exterior styling, redesigend in 2016, features flowing lines and an aggressive stance. The interior was also given a makeover in 2016, with a cabin simpler and roomier than its predecessor. The addition of a fifth seating position in the middle of the back row made the Volt practical for families with a car seat or kids that don't mind sitting "on the hump." An improved instrument cluster and 8-inch center display gave better access to cockpit controls and infotainment. Conventional HVAC controls are located below the center touch screen.

The Volt's 53 mile all-electric range made the car a standout. The electric motor reduces operating costs significantly when compared to a gasoline car. The cost savings combined with sporty performance and its ability to make long distance trips as easily as any gas powered car gave the Volt a broad appeal and jump-started the PHEV market.

ACQUISITION

MSRP	$34,095
60 Month @ 6% est	$602
Lease	$252
Availability	2010
U.S. Sales Units	135,208

RANGE

EV/ICE Range	53/367
MPGe/MPG	106/42

PERFORMANCE

0-60 mph	8.4 sec
Top Speed	98 mph

BATTERY

Volts	--
Watts	18.4 kWh
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	149/294
Drive Type	FWD

CHARGING

Power Rating	3.6 kW
Charge Time L1	13.25 hrs
Charge Time L2	2.4 hrs
Charge Time DC	NA
Connector	SAE J1772

CAPACITY

Passengers	5
Cargo	10.6 cu ft

DIMENSIONS

Curb Weight	3,543 lbs
Length	180.4 in
Width	71.2 in
Height	56.4 in

Story: Christopher Alan, Photos: Chevrolet

Plug-In Hybrid

ACQUISITION

MSRP	$31,400
60 Month @ 6% est	$555
Lease	$289
Availability	2013
U.S. Sales Units	54,393

RANGE

EV/ICE Range	26/610
MPGe/MPG	104/91

PERFORMANCE

0-60 mph	8 sec
Top Speed	85 mph Electric

BATTERY

Volts	325
Watts	35 KW
Cooling	Liquid

DRIVETRAIN (HYBRID)

HP/Lb-ft	141/129
Drive Type	FWD

CHARGING

Power Rating	3 kW
Charge Time L1	7 hrs
Charge Time L2	2.5 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	4
Cargo	8.2 cu ft

DIMENSIONS

Curb Weight	3,986 lbs
Length	191.8 in
Width	72.9 in
Height	58 in

2013 - 2019

FORD Fusion Energi

The Fusion is a popular mid-size sedan with contemporary good looks which are sometimes compared to an Aston Martin but which Ford calls "Kinetic 2.0." The Fusion Energi competes with other mid-size plug-in sedans. Similar to the Volt in price, dimensions and interior appointments, the biggest difference is that the Volt has 53 miles all-electric range. Ford says the 2019 model year edition will get an extra 4 miles of all-electric range for a total of 25. In addition to spending more on gas, this means that the Fusion gets only $4,007 in tax credits vs $7.500 for the Chevy Volt.

The Fusion has a center stack with standard buttons. The SE Luxury comes equipped with SYNC/Bluetooth hands-free infotainment bolstered by MyFord Touch with an 8-inch touchscreen display, along with a single-CD player, 6 speakers and satellite radio. The Titanium trim level adds standard remote engine start, sport front seats, keyless entry and ignition, and upgraded audio with 12 speakers. Optional equipment includes adaptive cruise control, parking assist, a power moonroof, a heated steering wheel, hard-drive-based navigation, blind-spot-monitoring, and lane-keeping assist. The Fusion Energy offers a cold Weather package with heated cloth seats, all-weather floor mats, and Power Code Remote Start. If your commute will fit within the Fusion Energi's 26 mile all-electric range, or you have access to workplace charging, the Fusion Energi is an electric car that, with a full tank of gas, you can comfortably take on long trips.

Story: Christopher Alan, Photos: Ford

Electric & PHEV

2016-2019

HYUNDAI Ioniq Electric & PHEV

Hyundai is investing in electrification and made a credible market entry with the introduction of the Ioniq Battery Electric and PHEV in 2017. From exterior design to powertrain efficiency, the Ioniq Electric is an impressive entry.

The exterior design of the Ioniq is aggressive, modern, and aerodynamically efficient. The swept-back profile looks like a performance hatchback, and gives the Ioniq a class leading 0.24 Coefficient of Drag. To keep this car as fuel-efficient as possible, Hyundai used aluminum in the hood and tailgate to save weight. The effort has paid off, with the Ioniq's 136 MPGe leading the top contenders in total fuel efficiency.

But the Ioniq's most impressive feature is found deeper than the sheet metal. Propelling the Ioniq down the road is a new 88 kW electric motor that produces 215 lb-ft of torque for instant response. Providing the electrons needed to power that motor is a new lithium-ion battery. The 28 kWh pack gives the Ioniq Electric 110 miles of all-electric range. DC fast charging will fill the battery to 80-percent in 20 minutes.

Hyundai offers a PHEV version of the Ioniq, and a BEV in California. The battery-only Ioniq Electric no longer a very competitive offering in light of the several 200+ mile all electrics now on sale including Hyundai's own Kona Electric. But if you like the Ioniq's styling and are looking to spend less than $30k on an all-electric car, look for steep discounts on this model to get even bigger toward the end of the year.

ACQUISITION
MSRP **$29,500, $24,950**
60 Month @ 6% est .. **$521, $440**
Lease **$239, $269**
Availability **2016, 2017**
U.S. Sales Units **537**

RANGE
BEV, EV/ICE **124, 29/630**
MPGe/MPG **136, 119/52**

PERFORMANCE
0-60 mph ..... **10.8 sec**
Top Speed ..... **115 mph**

BATTERY
Volts **360**
Watts ..... **28, 8.9 kWh**
Cooling ..... **Liquid**

DRIVETRAIN (ELECTRIC, HYBRID)
HP/Lb-ft **118/218, 139/125-109**
Drive Type ..... **FWD**

CHARGING
Power Rating **6.6**
Charge Time L1 ..... **--, 9 hrs**
Charge Time L2 ..... **4.5, 2.4 hrs**
Charge Time DC ..... **23 min**
Connector **J1772/CHAdeMo**

CAPACITY
Passengers **5**
Cargo ..... **23, 23 cu ft**

DIMENSIONS
Curb Weight **3,164, 3,318 - 3,417**
Length ..... **176 in**
Width ..... **71.7 in**
Height ..... **57.1 in , 56.9 in**

Story: Christian Moe, Photos: Hyundai

Plug-In Hybrid

2017-2019

TOYOTA Prius Prime

The Prius line got a serious boost when Toyota introduced the 2017 Prius Prime. With better styling, new interior equipment, and double the range of the old Plug-in Prius (PiP), Toyota finally put a serious EV on offer. The Prius Prime trails other PHEV sedans in both all-electric range and driving dynamics, but is a step up for prior Prius owners who stick with the brand.

The Prime features crisp lines, aggressive angles and futuristic LED lighting. The car is longer, wider and lower than the previous Prius for improved interior space, cargo capacity and sportier handling. The powertrain for the Prius Prime is a hybrid system with an ICE and 8.8 kWh battery. Performance is still decidedly Prius-like, which is to say calm, leisurely and unhurried.

The new aerodynamics and battery mean the Prius Prime has an estimated 25 miles of EV range before needing a charge. This plug-in electric is able to complete an average commute distance within a single charge. Prime drivers with access to a 240v charger will get a full charge in two and a half hours. Five and a half hours will top it off from any standard 120v outlet.

Inside is an 11.6-inch infotainment display, heated seats and automatic climate control as standard equipment. For Prius lovers, this is a Prime opportunity to drive more all-electric miles.

ACQUISITION
MSRP **$27,995**
60 Month @ 6% est **$524**
Lease **$148**
Availability **2017**
U.S. Sales Units **26,904**

RANGE
EV/ICE Range **25/615**
MPGe/MPG **133/54**

PERFORMANCE
0-60 mph **10.6**
Top Speed **84**

BATTERY
Volts **351.5**
Watts ..... **8.8 kWh**
Cooling ..... **--**

DRIVETRAIN (HYBRID)
HP/Lb-ft **121/105**
Drive Type ..... **FWD**

CHARGING
Power Rating ..... **-- kW**
Charge Time L1 ..... **~5.5 hrs**
Charge Time L2 ..... **~2.2 hrs**
Charge Time DC ..... **NA**
Connector **J1772**

CAPACITY
Passengers **4**
Cargo ..... **19.8 cu ft**

DIMENSIONS
Curb Weight ..... **3,365 lbs**
Length ..... **182.9 in**
Width ..... **69.3 in**
Height ..... **57.9 in**

Story: Christian Moe, Photos: Toyota

Battery Electric

2014 - 2019

VOLKSWAGEN e-Golf

It appears that Volkswagen is putting its energy into the soon-to-be released ID Crozz, allowing the e-Golf to trail the all-electric field with a 125 mile 35.8 kWh battery that was last updated in 2017.

The e-Golf will undoubtedly retain some fans who don't need to use the car for long distance travel, but at just $2,000 less than an entry-level Tesla Model 3, the e-Golf is yesterday's news.

The e-Golf shares its popular siblings' good looks, avoiding the polarizing styling common to so many other battery-electrics. 16" polished alloy wheels designed just for the e-Golf round out the style. Standard LED taillights and LED headlights on SEL Premium model help save energy, last longer and look good too.

The 134 hp motor manages a leisurely 9.6 second stroll to freeway speed.

An 8" touchscreen gives drives access to Apple CarPlay and Android Auto with voice command support. The display also shows rear camera images.

The 2019 e-Golf now offers CCS fast DC charging as standard, with 7.2 kW Level 2 charging for charging at home, work, or public L2 stations.

Because it has not kept up with the competiion in range, performance, or high-tech features, e-Golf sales have been at the bottom of the charts for the past few years. Volkswagen has big EV plans though, so keep an eye out for VW news later this year.

ACQUISITION

MSRP	$32,790
60 Month @ 6% est	$539
Lease	$319
Availability	2014
U.S. Sales Units	12,436

RANGE

EV Range	125
MPGe	119

PERFORMANCE

0-60 mph	9.6 sec
Top Speed	93 mph

BATTERY

Volts	323
Watts	35.8 kWh
Cooling	Air

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	134/214
Drive Type	FWD

CHARGING

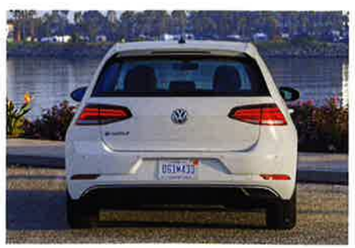
Power Rating	7.2 kW
Charge Time L1	26 hrs
Charge Time L2	5.3 hrs
Charge Time DC	0.5 hrs
Connector	SAE Combo

CAPACITY

Passengers	5
Cargo	22.8-52.7 cu ft

DIMENSIONS

Curb Weight	2,455 lbs
Length	168.1 in
Width	70.8 in
Height	57.2 in



Story: Christopher Alan, Photos: Volkswagen

Battery Electric

ACQUISITION

MSRP	$29,995
60 Month @ 6% est	$530
Lease	$183
Availability	2012
U.S. Sales Units	8,825

RANGE

EV Range	115
MPGe	118/96

PERFORMANCE

0-60 mph	10 sec
Top Speed	84 mph

BATTERY

Volts	325
Watts	35 Kwh
Cooling	Liquid

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	143/184
Drive Type	FWD

CHARGING

Power Rating	6.6 kW
Charge Time L1	30 hrs
Charge Time L2	5.5 hrs
Charge Time DC	33 min
Connector	SAE J1772

CAPACITY

Passengers	4
Cargo	14.2-33.2 cu ft

DIMENSIONS

Curb Weight	3,986 lbs
Length	191.8
Width	72.9
Height	58.2 in

2012 - 2019

FORD Focus Electric

Ford is another manufacturer just "phoning it in" this year, with bigger EV news on the distant horizon. The Ford Focus Electric could have been a serious entry in the EV lineup if its 115 mile range and DC Fast Charging hadn't been delivered several years too late to be competitive. Its cabin is upscale. Coming standard with the same top-spec interior found in the Focus' Titanium trim level, the Electric has a full compliment of features like voice navigation, rearview camera, 9 speaker Sony sound system, and dual-zone automatic heating controls. The Focus Electric uses the Sync 3 touchscreen interface, which features a revamped menu system and recognizes smartphone-like gestures like swipe and pinch-to-zoom. Leather interior is available as an option.

One significant technical difference between the Focus Electric and its competitors Leaf and e-Golf is that Ford opted for a liquid cooled and heated battery pack, which allows the car to be operated in warm climates like Phoenix and the California Central Valley without degrading the battery life. A 6.6 kW on-board charger provides a 3.5 hour charge time. The Focus Electric is a very capable and stylish all-purpose commuter and grocery getter. It's also quite economical: frequent steep discounts are often seen with leases below $200/month. For folks of modest means who qualify for the top $4,500 CA state rebate, that covers 24 of 36 of lease payments after down payment, taxes and license fees. That's a remarkably affordable EV.

Story: Christopher Alan, Photos: Ford

Battery Electric

2013 - 2019

FIAT 500e

The Fiat 500e's iconic Italian styling got a lot of attention when it first debuted. The dimunitive EV provides zippy off the line acceleration beating even Fiat's high performance Abarth model in a 0-30 MPH sprint. But the best performance of the Italian classic might be its price. Leases as low as $79/mo are frequently available, so check local pricing carefully. The $2,500 California clean air rebate is available on the 36 month lease, which will cover the lease payments for the first year or more. Considering fuel cost savings, the rest of the lease payments might be covered too.

The interior is available in black or white with orange accents. The infotainment and navigation system uses a version of Chrysler's Uconnect infotainment standard. Its console-mounted display screen sits in the center of the dashboard.

At 112 MPGe, the 500e is one of the more efficient battery electric vehicles. Better weight distribution and a lower center of gravity than its gas siblings make the 500e the solid all-around performer its sporty looks promise. The 500e has not been updated much in the last few years and will appeal to only to drivers with short commutes who want a small, limited range economy car at the very bottom of the price scale. The 500e is a hoot to drive but unless you're getting one of those "cheaper than my mobile phone bill" lease deals, take a really good look at the competition. Fiat's been asleep at the wheel for a couple of years now.

ACQUISITION

MSRP	$32,995
60 Month @ 6% est	$583
Lease	$180
Availability	2013
U.S. Sales Units	24,791

RANGE

EV Range	84
MPGe	121/103

PERFORMANCE

0-60 mph	8.4 sec
Top Speed	88 mph

BATTERY

Volts	360
Watts	24 kWh
Cooling	Liquid

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	111/147
Drive Type	FWD

CHARGING

Power Rating	6.6 kW
Charge Time L1	24 hrs
Charge Time L2	4 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	4
Cargo	7.0 cu ft

DIMENSIONS

Curb Weight	2,980 lbs
Length	142.4 in
Width	64.1 in
Height	60.1 in

Story: Christopher Alan, Photos: FCA

Battery Electric

2013 - 2019

SMART Fortwo ED

In 2018 the Smart Fortwo ED got a styling refresh but in 2019 retains the distinction of being the only EV less capable than the Fiat 500e. It seems like that would take concentrated effort. Its range actually got shorter by 10 miles versus the previous model's 68 mile range. The 2019 Fortwo still lacks DC fast charging capability, one of the last hold-outs in that regard. A 7kW on-board charger manages charging time of 2.5 hours when plugged into a 240v Level 2 charger.

The Fortwo ED's 11.4 second 0-60 time is two full seconds slower than the Fiat 500e which seems almost wheezing at this stage of the EV performance curve.

The Fortwo's tiny size is an advantage in congested urban streets where parking is scarce. The Smart Fortwo Cabrio ED, with a cloth retractable top, is the only electric cabriolet on the market.

But when compared to other electric cars, which are frequently heavily discounted from their $30k+ MSRPs, the Fortwo may appeal only to those looking for the tiniest price and package available. If the ability to squeeze into the last available parking space is your primary concern, the Fortwo might merit consideration. Otherwise, look hard for discounts on much more capable, comfortable and modern electric vehicles. Three year old off-lease used EVs with longer range, more capacity and fast charging are widely available at about half the price of a Fortwo ED.

ACQUISITION

MSRP	$24,550
60 Month @ 6% est	$434
Lease	$139
Availability	2013
U.S. Sales Units	6,279

RANGE

EV Range	58
MPGe	108

PERFORMANCE

0-60 mph	11.4 sec
Top Speed	81 mph

BATTERY

Volts	--
Watts	17.6 kWh
Cooling	--

DRIVETRAIN (ELECTRIC)

HP/Lb-ft	80/118
Drive Type	RWD

CHARGING

Power Rating	7.2 kW
Charge Time L1	21 hrs
Charge Time L2	3 hrs
Charge Time DC	NA
Connector	J1772

CAPACITY

Passengers	2
Cargo	7.8-12 cu ft

DIMENSIONS

Curb Weight	2,450 lbs
Length	106.1 in
Width	65.5 in
Height	61.2 in

Story: Derek Locke, Photos: Smart

Electric Motorcyle

2019 HARLEY-DAVIDSON LiveWire

Originally introduced as a prototype in 2014, the LiveWire is Harley-Davidson's first production all-electric motorcycle. The signature "Harley Rumble" has been replaced with tone which sounds closer to a mild jet engine. Like all electrics, the LiveWire generates instant power the moment the grip is twisted, which helps it deliver a 0-60 time of under 3.5 seconds with no clutch or gear shifting. The lightweight cast aluminum frame is extremely rigid and provides precise, responsive handling. The permanent magnet electric motor is located beneath the lithium-ion battery, which lowers the center of gravity and improves handling. The bike has fully-adjustable SHOWA front and rear suspension and Brembo brakes. Range in city driving is expected to be 110 miles. Highway speeds will drop that distance to between 70-80 miles. The LiveWire has just two levels of charging, Level 1 (120v house current) and DC fast charging, both delivered through a CCS Combo J1772 connector. Oddly, charging from Level 2 chargers is possible, but at the Level 1 rate, which is about 13 miles per hour of charge. The battery will charge to 80% within about 35 minutes using a DC fast charger. The gauge cluster is presented on a 4.3" color touchscreen with built-in moving-map navigation. With smart phone cellular connectivity now standard for electric vehicles, Harley-Davidson offers H-D Connect Service, which allow the rider to use a smart phone to remotely view battery status, see its location on a map, get security alerts, and locate charging stations. LiveWire will be available in US dealerships this fall.

ACQUISITION
MSRP	$29,799
60 Month @ 6% est	--
Availability	Aug 2019
Global Units	--
Warranty	--

RANGE
Range (miles)	140 city, 88 hwy
MPGe	--

PERFORMANCE
0-60 mph	3 sec
Top Speed	110 mph

BATTERY
Amp/hr	--
Volts	--
Watts	--

DRIVETRAIN (ELECTRIC)
HP/Lb-ft	402/414:490
Drive Type	RWD

CHARGING
Power Rating	--
Charge Time L1	9 hrs
Charge Time L2	9 hrs
Charge Time DC	0.75 hr
Connector	CCS

CAPACITY
Passengers	1
Cargo volume	--
Carrying Capacity	--

DIMENSIONS
Curb Weight	--
Wheelbase	--
Seat Height	--

Story: Dylon Morales. Photos: Harley-Davidson

Electric Plane

2019 PIPISTREL Alpha Electro

Aptly named, Pipistrel's Alpha Electro is the first production all-electric airplane for sale in the United States. The small two seat trainer is designed almost exclusively for flight training in the near vicinity of an airport. The 277 lb, 400 volt battery holds 21kWh, enough for a stated 60 minute flight duration, with 30 minute reserve required by regulation. That's enough to accomplish the typical flight lesson: practice about 10-15 touch and goes in the airport traffic pattern or a 30-40 minute session of maneuvers in a nearby practice area before heading back home. When nearby airports have Pipistrel's proprietary charging systems installed, you'll be able to make flights of up to 80 statute miles (70 nautical miles) to another airport. Recharging will take a bit less than 2 hours using 15kW, the fastest charger Pipistrel sells for the US market. The six battery packs are manually swappable, so spare packs kept on the charger at a nearby airport may be a viable, if pricy, use case. Replacement battery packs are listed at $29,500. The Alpha Electro is based on the company's popular and capable "Virus" model, which is powered by an 80 hp four cylinder Rotax engine. The Electro has similar performance characteristics, if shorter range. After a ground roll of just under 500 ft, initial climb rate is 1,000 fpm. The Alpha Electro's 700 fpm cruise climb consumes about 50kW of power. Cruise is a remarkably efficient 200 watts per mile. This aircraft family is notable for its glider-like performance, with a 37 kt stall speed, 17:1 glide ratio, and flat, docile landing approach. Kudos to Pipistrel for bringing the first electric aircraft to market.

ACQUISITION
MSRP	$137,500
120 Month @ 6% est	$1,526
Lease	--
Availability	2019
U.S. Sales Units	6

RANGE
EV Range	80 mi
Duration	60 min + 30 resv

PERFORMANCE
Stall Speed	37 kts
Top Speed Vno Vne	108-135 kts

BATTERY
Volts	399
Watts	21 kWh
Cooling	--

DRIVETRAIN (ELECTRIC)
HP/Lb-ft	60 kW
Propeller	Fixed Pitch

CHARGING
Power Rating	3-15 kW
Charge Time 3kW	8 hrs
Charge Time 10kW	2.5 hrs
Charge Time 15kW	1.45 hrs
Connector	Proprietary

CAPACITY
Passengers	2
Payload	396 lbs

DIMENSIONS
Empty Weight	814 lbs
Length	21 ft 4 in
Wing Span	34 ft 6 in
Height	6 ft 9 in

Story: Christopher Alan. Photos: Pipistrel

Review

PHOTOS: RIVIAN

Rivian R1T Truck and R1S SUV

Powerful, Long Range Electric Adventure Vehicles

BY CHRISTOPHER ALAN

The R1T has a 6.89 ft bed with tailgate down, and 8.2 inch to 14.2 adjustable ground clearance.

When startup automaker Rivian unveiled their R1T Truck and R1S Sport Utility Vehicle at the Los Angeles Auto Show late last year, they made quite a stir. The capabilities of the vehicles got everyone's attention: 0-60 mph in 3 seconds. Up to 400 miles of all-electric range. The vehicles' rugged good looks also turned heads.

Rivian bills these trucks as "Electric Adventure Vehicles" and has released a series of slick aspirational videos and photos that show them performing admirably in rugged, remote areas. Gleefully drifting through muddy back roads is standard fare for truck ads, but Rivian makes sure you know that they're serious about your being able to get these trucks dirty, with 14 inches of ground clearance and claiming water wading depths of three feet. Sure-footed traction is delivered by a quad-motor system.

These are bold claims, the kind of hoopla that's coming increasingly from a scrum of new electric car manufacturing start-ups taking the field. But Rivian appears to have the talent and funding to make good on those claims and get these vehicles to market.

Founder and CEO RJ Scaringe earned his MS and PhD in Mechanical Engineering from MIT. Executive Director of Engineering and Programs Mark Vinnels was previously the Executive Program Director at McLaren and the head of Vehicle Programs at Group Lotus where he lead product development of all Lotus cars. Chief Strategy Officer Jiten Behl was a senior leader in Roland Berger's global automotive practice. The company's roster of highly seasoned and qualified executives continues on with similarly impressive credentials.

The company has purchased a 2.6-million-square-foot assembly plant in Normal, Illinois to build the cars. The plant was previously owned by Mitsubishi Motors. The company also has engineering centers near Detroit and in San Jose and Irvine California and the UK. The company employs 750 people across all of its locations.

Probably the most impressive fact that signals this company's ability to deliver on these ambitious and notoriously difficult engineering, manufacturing and marketing challenges is its recent announcement of $700 million in financing from Amazon. That's a significant show of confidence from a very sophisticated and tech-savvy investor. Total known investment is roughly $1.2 billion.

Like Tesla and most of the new electric car market entrants, Rivian builds its vehicles around a "skateboard chassis" that places the batteries in a single layer at the bottom of the vehicle. That keeps the center of gravity extremely low – below the wheel centerline – and gives the vehicle handling advantages over internal combustion cars which have to pack a lot of weight under the hood, on top of the front axle. Like Tesla, Rivian uses the space an engine usually occupies as a "front trunk" with a 12 cu ft of extra storage space. The chassis is supported at all four corners by an air suspension system with active roll control and active damping.

Rivian says it will deliver the R1S and the R1T with batteries ranging in capacity from 105 kWh to 180 kWh, the higher number being about double that of Tesla's entry level Model S. Like Tesla, Rivian designs and builds their own using thousands of small cylindrical 21700 cells in a flat single-layer. Tesla's CTO JB Straubel has explained in public forums that Tesla has proven that the massively parallel approach provides superior performance and reliability. Rivian has not yet announced their supplier.

Rivian's "stadium" headlights give the brand an immediately recognizable face. The huge light bar in the middle grille shows the state of charge when plugged in.

Rivian has also created its own "smart" battery management system (BMS), which CEO Scaringe says dynamically adjusts performance parameters based on driving and charging behaviors.

The drive system uses a total of four motors, driving each wheel through a single fixed reduction gear. Each motor has its own digital motor controller. Rivian claims 750 hp from the four motors combined. That much power is enough to enable nearly 1,800 lbs of payload. The truck can tow up to 11,000 lbs and the SUV can tow up to 7,700 lbs. In comparison, the larger Ford F150 XL SuperCrew 3.0L Diesel tows up to 11,400 lbs. The Volvo XC90 T8 SUV can tow up to 5,000 lbs.

Rivian has not said much yet about the vehicle's charging capabilities, or how it intends to support trips between cities or into the back country and back.

The "skateboard chassis" places the batteries in a single layer at the bottom of the vehicle.

The truck has several innovative features that will really delight drivers. A sideways gear tunnel is positioned behind the crew seat which is large enough to stow several snowboards, a couple full set of golf bags, or a large stroller. The gear door flips down horizontally and is sturdy enough to be used as an outside seat to strap on cross-country skis or snow shoes, or simply clean the mud off boots or change shoes prior to getting in the truck. The truck's electric tailgate flips all the way down, pointing torward the ground, to allow easy loading.

Rivian says that the electric truck will be priced starting at $69,000 before tax incentives, and the SUV will start at $72,500. These prices are for the shorter-range versions of the R1T and the R1S. Final pricing was not available at press time for the 400-mile range vehicles, but Scaringe is on record saying a longer range version will be available for less than $90,000. Rivian is targeting buyers of other premium trucks like a fully loaded F150, Land Rover Discovery, Chevrolet Suburban or GMC Denali.

Rivian expects the R1T to be available first, in late 2020. The R1S will follow several months afterward. The company will sell direct to consumers and is taking deposits on its web site.

Review

PHOTOS: PIPISTREL

Electric Aircraft Take Off

First Production Electric Aircraft Arrive in the US

BY CHRISTOPHER ALAN

Battery electric aircraft have finally moved from the research & development phase to commercial production, as evidenced by the Pipistrel Alpha Electro on the cover of this issue. It's a monumental step, and marks the start of a total transformation and revitalization of general aviation industry, which has been in decline for the past four decades.

Instrumentation of the Alpha Electro includes all-digital "glass" primary flight display, moving map GPS and engine monitor.

Although it will take further improvements in battery energy density and charging system deployment to make electric aircraft a practical form of transportation, the dramatically lower operating costs as a result of fuel cost savings will give electric propulsion technology an enormous advantage over piston powerplants.

A majority of per-hour operating costs for aircraft are driven by fuel. Small single engine "general aviation" aircraft use between 5-13 gallons per hour of flight. Aviation gas ("avgas") is also more expensive than regular car gasoline. 100LL avgas was listed between $4.95 – $7.36 at Southern California airports on the day this article was written. The Gas Buddy web site reported auto fuel at $3.09 - $3.89 the same day. Assuming a pilot is frugal and buying $5/gal avgas, fuel costs are $25-$65 per hour of flight. An equivalent one hour flight in the Pipistrel Alpha Electro will consume about 16kWh of electricity. At a national average of 12 cents per kWh, that's a cost of only $1.68 per hour. A $23-63 per hour operating cost advantage means it is simply game over for internal combustion engine in small aircraft as improvements in battery energy density over the next decade make flights of 2-3 hours duration and 300-500 miles range possible.

Dramatically lower maintenance costs will multiply the electric cost advantage. A typical six cylinder aircraft engine costs between $25,000 to $35,000 to overhaul, a process that is usually done every 1,500-2,000 hours of flight. For a busy flight school, this could be more than once per year. That $20/hour cost, called "engine reserve" is built in to the cost of the aircraft rental, which is typically $150-$250 per hour for older or simple aircraft, and can run $350-$450 per hour for sophisticated modern aircraft. Although the Alpha Electro currently has some significant replacement costs for its motor and battery, these components can be made to be very long-lasting and low cost to service. As more manufacturers begin production, the more reliable, less expensive to maintain electric motors will further lower the cost of operating an electric aircraft.

Pipistrel has established a toehold in the market with the Alpha Electro. Its early market entry will enable it to "ladder up" as battery technology improves and range stretches to 200+ miles. This is following the same route as Tesla accomplished with the expensive and limited Roadster, followed by the expensive and capable Model S, followed by the inexpensive and capable Model 3.

Nearly 100 other manufacturers are working on electric aircraft prototypes. One of the most accomplished electric aircraft manufacturers in the United States is Bye Aerospace, who is developing the Sun Flyer 2, a sleek two passenger low wing aircraft they say will be capable of 3 hours flight duration within the next few years. The aircraft has already conducted several test flights and is in the process of FAA "FAR 23" type certification. Bye is also developing the Sun Flyer 4, a similarly styled four passenger aircraft.

For now, Pipistrel will demonstrate the viability of electric aircraft for flight training. They have sold four aircraft to the cities of Reedley and Mendota in Fresno County for use at local airports. A grant for the project was provided by Fresno County Transportation Authority.

The project was initiated by Joseph Oldham and Richard Duncan. Oldham's "day job" is director of the San Joaquin Valley Clean Transportation Center. Duncan was the manager of Fresno Chandler Executive Airport and is now with Alaska Airlines. Oldham and Duncan co-founded the "Sustainable Aviation Project" with community partners to support the use of the aircraft for flight training, primarily for youth from disadvantaged communities in Fresno County. Ultimately, these and other aircraft will be available to rent by licensed pilots.

If you're interested in seeing an electric aircraft at your local Electric Car Guest Drive, drop us an email at chris@electric-car-insider.com.

Clear plexiglass doors give the Pipistrel terrific visibility below and to the sides.

The sleek Bye Aerospace Sun Flyer will have sufficient speed and range to be used for regional personal transportation.

Feature

Electric Auto Association

Achievement Awards for EV Champions

BY CHRISTOPHER ALAN

The EAA was established in 1967, long before driving electric was "cool."

The Electric Auto Association held their 52nd Annual meeting at Google's San Francisco Embarcadero office on January 26th, 2019. In addition to general organization business like electing board members, the organization honored ten people for outstanding achievement in educating and advocating for electric vehicles.

Electric Car Insider dedicates space in each issue to recognize EV advocates who are making a difference in the community. Prior to the announcement of the awards we had planned to review the recipients in full here. ECI is pleased to report that EAA recognized ECI publisher Christopher Alan among the awardees. Gratefully and humbly we include ourselves in the list below.

Ron Freund was honored by the EAA with a **"Lifetime Achievement Award."** Ron is a board member and the former chairman of the Electric Auto Association, having served in that role for 17 years. Ron has driven battery powered vehicles for more than twenty years, totaling over 250,000 miles. He currently serves as a director on the Plug In America board.

Will Beckett was also honored with a **"Lifetime Achievement Award."** Will has served as Membership Chair and as a board member of the EAA. Will has been a member of EAA since 1994.

Christopher Alan was named **"Entrepreneur of the Year"** for producing the Electric Car Guest Drive series, which last year became a nation-wide tour. Twelve electric vehicles were taken all over the country to allow people to experience driving electric. The tour started in San Diego and made stops as far away as Orlando Florida, and Massena New York on the Canadian border. Although the award was presented to Alan, he has accepted on behalf of the entire Electric Car Insider team.

Elaine Borseth was selected for the **"Ambassador Road Tripper Award"** because of her extensive travels totaling over 16,000 miles throughout North America promoting Electric Vehicles. In addition to her independent promotion of EVs, Elaine joined the Electric Car Guest Drive on its coast-to-coast tour, allowing hundreds of people to drive her beautiful performance version Tesla Model S. She serves as the president of the Electric Vehicle Association of San Diego, an EAA chapter.

Tim Benford of Dayton, Ohio was presented with the **MVP Award - Midwest** for his "outstanding involvement in leadership, market impact and creativity." Tim is the leader of the Greater Daytona EVA Chapter, and an EV ambassador for Drive Electric Dayton.

Stuart Ungar of Louisville, Kentucky was presented with the **MVP Award – East** for his electric vehicle advocacy as the president of EVolve KY and his role as co-executive producer of the film "Evolve – Driving a clean future in coal country," which was written and directed by Ben Evans. Stuart, a journalist, has also written for Electric Car Insider.

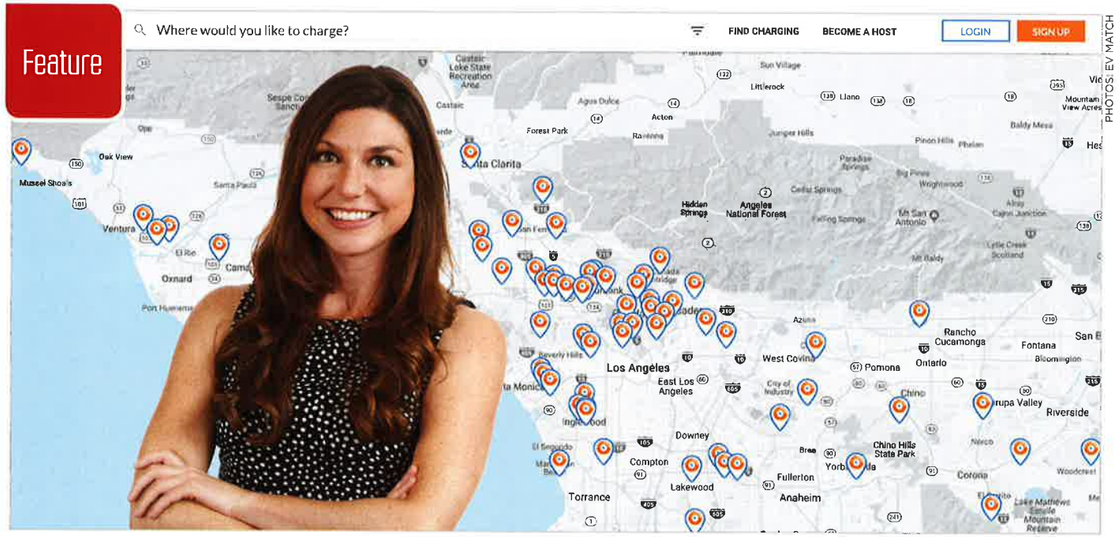
Dale Miller of San Francisco as presented with the **MVP Award – West** for his EV advocacy work as the president of the Golden Gate Electric Vehicle Association. Dale has been driving a Tesla Roadster since 2011 and has only electric cars in the household, including a Model S and Model 3.

Bruce Nyden, founder of the San Juan Islands EAA Chapter, was presented with the **Road Runner Award**, which is for the chapter that grew the fastest. The chapter gained 22 members in 6 months last year.

Matt Ferrell, who lives in the greater Boston area, was honored for producing the **Best Educational Video** for his "Electric Cars Myths vs Facts" video, a skilfully produced, authoritatively sourced, fact based rebuttal of the most common EV disinformation, and straightforward explainer for people new to EVs.

Janelle London and **Matthew Metz** were awarded **"Best Music Video"** for "Gasoline, Gasoline. The World's Aflame." Metz and London are co-Executive Directors of Coltura, a nonprofit whose mission is to "accelerate the transition from gasoline vehicles to clean alternatives through policy and culture."

Feature



PHOTOS: EV MATCH

EVmatch

The Airbnb of Residential and Commercial Charging

BY CHRISTOPHER ALAN

EVmatch is currently available in California and Colorado. EV drivers outside of those areas can pre-register.

California-based startup EVmatch is working to increase public EV charging options using the "sharing economy" business model.

Similar to Plugshare and other charger-locating apps, EV drivers find nearby chargers using the EVmatch app. Unlike the other apps, with EVmatch, drivers can reserve time at a charger. The chargers are rented out by homeowners and businesses.

EV owners who have a charger that is idle part of the day (which is almost all chargers) can list it on EVmatch to earn extra income and provide a useful service to the EV community.

EV Drivers can reserve a charge time using the EVmatch app.

ECI spoke with EVmatch founder Heather Hochrein, who explained that in addition to creating an Airbnb style peer-to-peer community, EVmatch can provide a vital service to EV drivers who lack home charging access. Renters make up over one third of U.S. Households. Renters and other multi-unit dwellers may not be able to easily install chargers with dedicated parking spaces, despite laws in some states that assure their right to install chargers, and multi-tenant dwelling installation programs by companies like EVgo and San Diego Gas & Electric. By creating a marketplace of shared residential charging locations, EVmatch can help solve that problem by connecting neighbors who have, and need chargers.

The EVmatch app can also be useful for people visiting another city or working for a short time out of town.

The EVmatch charging network was launched in 2017. It currently has site hosts in California and Colorado and is working to expand throughout the US.

EVmatch has recently expanded its network to include commercial properties such as hotels, apartment complexes and small businesses. Commercial sites create an EVmatch hosting account, then install a WiFi-capable Level 2 EV charger. The charger connects to the EVmatch servers to authenticate users and handle billing.

Hochrein says creating an EVmatch account can help businesses attract customers and earn passive income during off hours.

EVmatch is available on the Apple App and Google Play online stores.

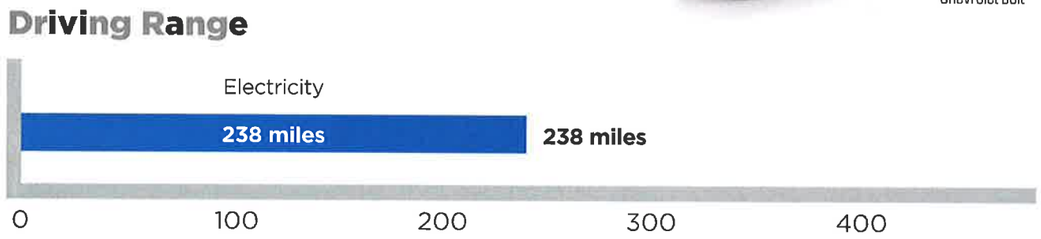
Battery Electric vs Plug-in Hybrid

Types of Plug-in Electric Vehicles

BEV - Battery Electric Vehicle

Battery Electric Vehicles get all of their energy from an electrical circuit. This allows them to operate at a very low cost - electricity generally costs the equivalent of about $1.50 per gallon of gasoline. When the energy is provided by a utility with low cost EV rates, the cost can be even lower.

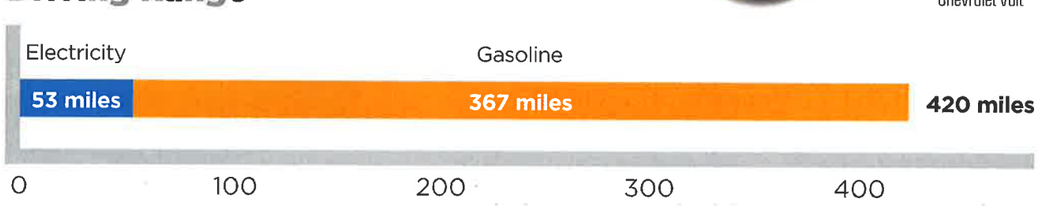
Chevrolet Bolt



PHEV - Plug-In Hybrid Electric Vehicle

Plug-in Hybrid Vehicles use electricity for the first 10-97 miles of travel and then automatically switch over to the gasoline engine. PHEVs offer essentially unlimited range, with the environmental and cost benefits of a BEV for most local driving, like a daily commute.

Chevrolet Volt

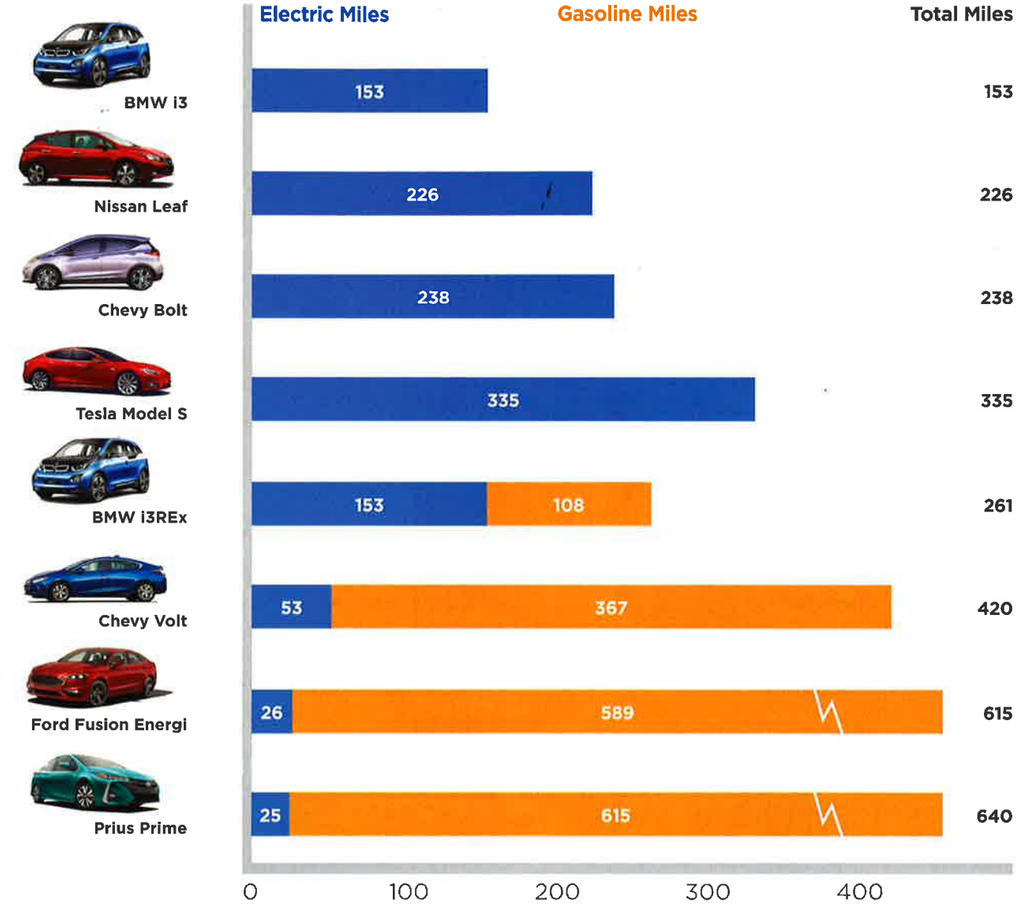


Battery electric cars use only electricity as fuel. Plug-in Hybrid Vehicles use electricity first, then gas for extended range.

How Far Can an EV Drive?

Plug-in Hybrid and Electric Vehicle Range

Battery Electric Vehicles use electricity for all miles of travel. The electricity can be from standard 120V or 240V AC house circuits, 3-phase 208V commercial circuits or 600-850V DC Fast Charge public chargers. Most charging is AC, overnight, at home.



Plug-in Hybrid Vehicles use "mains" electricity for the first 10-97 miles of travel and then automatically switch over to the gasoline engine. PHEVs offer essentially unlimited range with the environmental and cost saving benefits of EVs for most in-town driving.

Each automaker offers a slightly different mix of electric and gasoline ranges.

Refueling at Home

Charging at home can be done with either ordinary house current or a dedicated 240V circuit depending on charging speed needed.

	Outlet	NEMA	Volts/ Amps	kW	Charging Speed
Level 1	NEMA 5-15		120V / 12A	1.4 kW	4 mph
	NEMA 5-20		120V / 15A	1.8 kW	5 mph
Level 2	NEMA 14-30		240V / 24A	5.8 kW	20 mph
	NEMA 14-50		240V / 40A	9.6 kW	32 mph
	Hardwire		240V / 80A	20 kW	57 mph

Level 1

120V 15-20 amp circuit
Ordinary house current
Charge cord supplied with car

Level 2

240V 16-80 amps circuit
Dryer or similar NEMA 240V outlet
50 amps or greater must be hardwired

Maximum Current Rating

National Electric Code requires that the continuous current drawn from a circuit not exceed 80% of the circuit's maximum rating. Charger model numbers usually reflect the type of circuit they require, and supply the lower 80% value. For example the Clipper Creek LCS-30 uses a 30 amp circuit and supplies 24 amps of current at 240V, which is 5.8kW of power. That will allow a typical EV to travel 20 miles after one hour of charging (20 mph of charge). A 50 amp charger using a 50 amp circuit supplies 40 amps, 9.6kW, which is 32 mph of charge.

Plug-In vs Hardwire Installation

Almost all residential EV chargers can be purchased with a plug and installed as easily as any other appliance – simply mount it on the wall with the provided screws and mount plate and plug it in to an existing or newly installed 240V outlet. The exception is high power chargers like the 80 amp Tesla HPWC. Chargers 50 amps or greater need to be installed by an electrician and hard-wired to a dedicated circuit.

Almost all residential EV chargers can be purchased with a plug and installed as easily as any other applicance.

Refueling at Work

Many employers offer workplace charging to their employees to encourage the use of zero emission vehicles.

Level 1

Offering Level 1 charging to employees can be as simple as installing a row of 120V outdoor outlets in a parking lot.

Another option is installing low cost fixed-in-place chargers.

Level 2

UNMETERED
Simple Access Control
i.e. Key

NETWORK MONITORED
Billable Access Control

Types of Access Controls

ACCESS CARD-BASED

BLUETOOTH APP BASED

Many employers offer workplace charging to their employees to encourage the use of zero emissions vehicles.

Refueling on the Road

Level 2 Charging Stations

Level 2 charging stations are located throughout communities. Sometimes retail businesses provide charging for free to customers.

Battery electric cars usually recharge at a rate of 20 miles of range per hour of charge. Plug-in Hybrid cars usually charge at about 10 miles per hour, but do not require public charging because longer drives can be completed using the gasoline engine.

DC Fast Charging Stations

Quick Charge stations are located at major malls, transportation hubs and other high traffic locations. There are three DCFC standards: CHAdeMO, SAE Combo (CCS) and Tesla Supercharger.

- Most Asian cars use CHAdeMO
- Most European and American cars use SAE Combo
- Tesla cars use the Supercharger network and CHAdeMO with an adapter.

Many charge stations have two connectors, one for each standard so all cars that have Quick Charge ports can be charged. Tesla has its own proprietary charge standard called Supercharger, but also offers a CHAdeMO adapter. Cars that are not made by Tesla can not use Tesla Superchargers.

Most cars will charge to 80% within 30 minutes using DCFC. That will provide 60-80 miles of range. Most Tesla cars can gain 200 miles of range with 45 minutes of charging.

Some retail businesses provide electric refueling free of charge as a way to attract customers and reward loyalty.

Electric Car Cost Savings

Total Cost of Ownership - Electric Vehicle (EV) vs Internal Combustion Engine (ICE)

A lifetime TCO comparison between an electric vehicle (Ford Focus Electric) and an internal combustion vehicle (Ford Focus Titanium) over 12 years shows total savings of $24,515 for EV.

Purchase Price

EV Savings
$4,955
incl. Federal/State tax credits

Fuel Cost

EV Savings
$12,912
$3.70 gal vs $0.12225 kWh

Maintenance Cost

EV Savings
$6,648
no oil changes, tuneups

The tables below show the annual operating costs and savings for a number of electric vehicles compared to internal combustion vehicles over three and five years.

Electric Vehicles

		Annual Cost of Operation			TCO		EV Savings	
Make	Model	Fuel	Maint	Pymt	3 yr	5 yr	3yr	5yr
Ford	Focus Elec	$455	$670	$3,824	$14,846	$24,744	$7,863	$13,105
Toyota	Prius Prime	$455	$750	$4,220	$16,274	$27,124	$4,580	$7,633
VW	e-Golf	$455	$680	$3,963	$15,293	$25,489	$5,508	$9,179

ICE Vehicles

		Total Cost of Operation			TCO		Savings	
Make	Model	Fuel	Maint	Pymt	3 yr	5 yr	3yr	5yr
Ford	Focus Titanium	$1,531	$1,224	$4,815	$22,710	$37,849	$0	$0
Toyota	Prius	$854	$888	$5,210	$20,854	$34,757	$0	$0
VW	Golf	$1,531	$1,084	$4,319	$20,801	$34,668	$0	$0

Electric cars provide substantial monthly operating cost savings. Discounts, tax credits and rebates may also make acquisition costs lower.

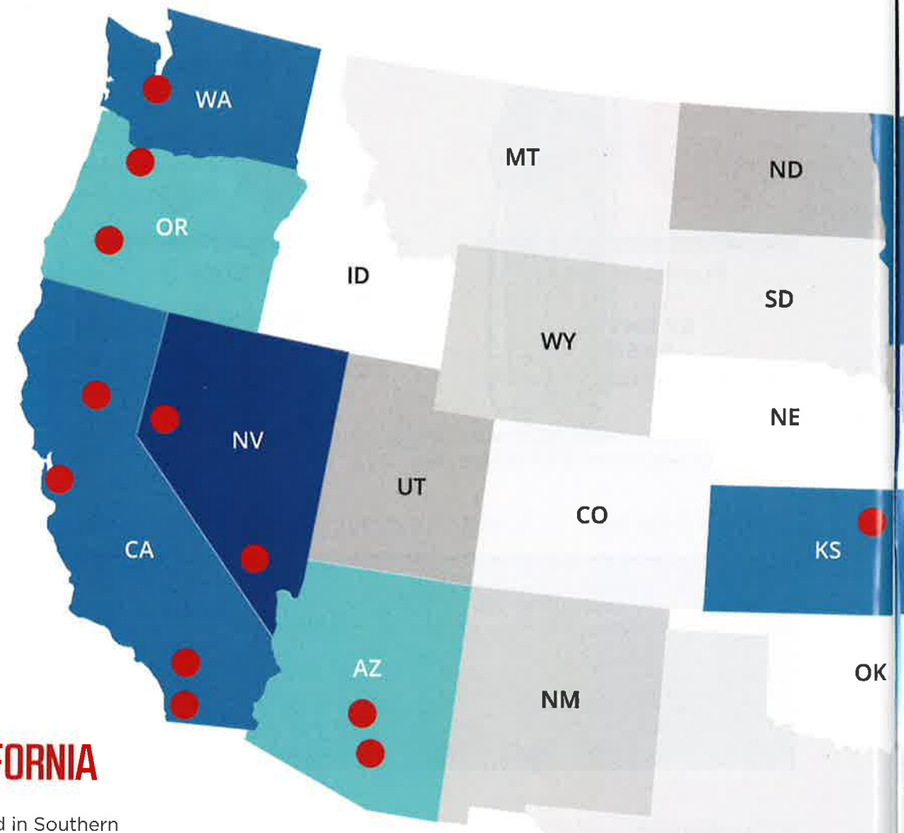
Electric Car Guest Drive

Learn from EV Owners Before You Go to a Dealer

BY CHRISTOPHER ALAN

NORTHWEST

Portland is one of our favorite places because, well, Portland. Who in the world does not fall crazy in love with Portland after the first night? We did. Because we used to live in Seattle, we know to visit the Northwest in the summer, so that's when we'll be in the region. When it's sunny. Mostly anyways.



SOUTHERN CALIFORNIA

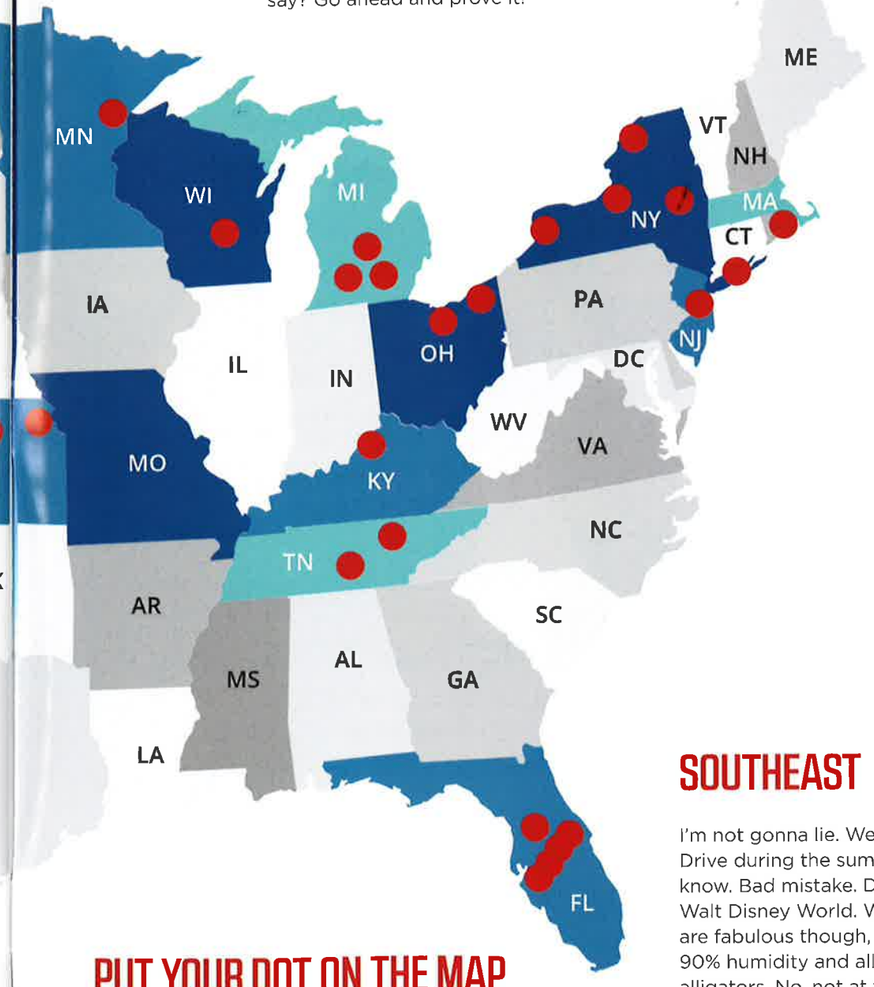
Electric Car Insider is based in Southern California, so it's no surprise that our 2019 Electric Car Guest Drive tour started here in January. Although it was a rainy morning in Burbank California, several hundred people turned up to drive 18 electric cars including the Tesla Model 3, Model S and Model X and Mitsubishi Outlander. These cars, which can all be ordered with all-wheel-drive, did just fine in the rain. One old lady with a hook nose and an evil cackle did melt though.

SOUTHWEST

After a pretty rainy winter in SoCal, we're looking forward to being back in sunny Tucson, Phoenix, Las Vegas and Reno this year. Weather in the fall for last year's event was perfect. We made lots of friends we want to see again. Keith won't put beets in the chili this time, promise!

UPPER MIDWEST

Another place that's great to visit in the summer. Here we come Detroit! And surrounding cities that want everyone to know they are not also Detroit! What do we know, we're from California. Teslas are made here. Btw, I heard that the earth's magnetic north started shifting pretty radically a few years ago. Not related you say? Go ahead and prove it!



PUT YOUR DOT ON THE MAP

Don't see your city on the tour? Call or email to chat about how to make it happen: chris@electric-car-insider.com, 619-559-8613

NORTHEAST

Talk about falling in love. We fell in love with Upstate New York and it wasn't even Fall. We stayed in a 160 year old stone farmhouse. People drove by in horse drawn wagons. They are not exactly zeros emissions, we saw evidence of that on the side of the road. At least it's biodegradable. Unattended road side vegetable stands everywhere, stocked with fresh veggies! People who have trustworthy neighbors! Is it possible to be adopted by a Mennonite family? Can I keep my electric car? It's quiet, well behaved and does not poop.

SOUTHEAST

I'm not gonna lie. We held an Electric Car Guest Drive during the summer in Orlando. I know, I know. Bad mistake. Did not even get to go to Walt Disney World. What the heck? People there are fabulous though, so that made up for the 90% humidity and alligators. Yes, we saw alligators. No, not at the zoo. They looked hungry. We're going in the winter this year. We do learn from our mistakes like that.

EV Educational Resources

for Individuals, Groups and Organizations

Electric Car INSIDER

EV Buyers Guide

Compare electric cars with comprehensive full page profiles

Discount Pricing Guide App

Save thousands of dollars on EV purchases and leases

Educational Exhibits

Large scale interactive exhibits for indoor and outoor events

Electric Car Guest Drive

Test drive the latest EVs and learn from EV owners

EV Navigator

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

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

sales@electric-car-insider.com **619-559-8613**