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Pictures: Eleven Electric Cars Charge Ahead, Amid Obstacles

Tesla Model X

Photograph by Tim Rue, Corbis

Its doors hoisted like raptor wings, an all-electric Tesla Model X basks in the spotlight at the company's design studio in Hawthorne, California. The Model X, which Tesla Motors plans to begin building in 2013 for sales starting early 2014, is just one of the new electric models scheduled to descend onto the market in the year ahead.

Already, owners of more than 2,300 electric Tesla Roadsters have logged nearly 27 million miles on battery power since 2008. Some 37,000 Nissan Leaf owners around the globe have covered more than 100 million miles. Last Sunday, tens of thousands of people attended events organized in 65 U.S. cities for the second annual National Plug-in Day, and this weekend, electric models are sure to gain attention at the Paris Motor Show.

(Related Quiz: What You Don't Know About Cars and Fuel)

Yet today many industry watchers harbor only cautious hope for the future of a technology more than 100 years in the making. "A lot of the early adopters have kind of gotten out of the way, but the costs are not low enough to be affordable for a mass market," said Mike Holman, research director for the market research firm Lux Research.

On Tuesday, Tesla disclosed that the company will be forced to raise at least $128 million and change the terms of its $465 million loan agreement with the U.S. Department of Energy. Deliveries of Tesla's second-generation car, the Model S sedan (priced from $58,570) have fallen at least a month behind schedule, and the Energy Department has granted a waiver for Tesla to delay next month's payment until February (the rest of the 10-year loan is to be repaid early).

As Cosmin Laslau, an electric vehicle analyst with Lux Research, wrote in an email, Tesla "is struggling in its (admittedly heroic) undertaking of starting a car company from scratch, and an EV-only one to boot."

(Related: "Pictures: Cars That Fired Our Love-Hate Relationship With Fuel") *—Josie Garthwaite*

Nissan Leaf

Photograph by Rick Bowmer, AP

A cherry-red Nissan Leaf plugs in at a public charging station in Portland, Oregon, topping off a battery that can power the car for up to 73 miles (118 kilometers) on one full charge.

An estimated 40,000 plug-in vehicles sold in 2011, including nearly 9,700 Nissan Leafs. To put that in perspective, consider that the last major new powertrain technology to come on the market—hybrid electric vehicles like the Toyota Prius—debuted in the late 1990s and took six years to cross the 40,000-unit mark. Together with its French partner, Renault, Nissan aims to deliver 1.5 million electric vehicles by 2016. (Just 1.4 million to go!) But after a promising start last year, Leaf sales slowed and the company is now behind in attaining its goal to sell 20,000 units in 2012.

Renault and Nissan aren't the only ones reaching for ambitious EV goals. To achieve combined government targets for 20 million electric vehicles on the world's roads by 2020, the International Energy Agency wrote in its most recent clean energy progress report, "sales must nearly double each year between 2012 and 2020, cost must continue to decline, infrastructure needs to develop, and consumer choice and confidence requires a boost."

For Nissan and its chief executive, Carlos Ghosn, the Leaf presents a crucial test of the company's $5.6 billion bet on electric vehicles, said Laslau. The new version of the Leaf, debuting in January with batteries built at a newly revamped plant in Smyrna, Tennessee, as well as future iterations "must meaningfully lower costs and improve range," he added, "otherwise Nissan's EV experiment is in trouble."

Ford Focus BEV

Photograph from Car Culture/Corbis

Quietly parked on a tree-lined street in Los Angeles, the Ford Focus BEV looks at first like just another conventional car. But peer more closely—you might notice an oddly placed fuel pump door. Behind that door lurks a charge port, which a typical driver would use four times a day when juicing up a little here and a little there—at work, at home, or around town.

Plugged into a home charging station that connects to a standard a 240-volt outlet, the car's lithium-ion battery pack is designed to fully recharge in four hours. With a full charge, the battery could power an estimated 76 miles (122 km) of travel. That would be more than enough to drive from London to Oxford, in the United Kingdom, or to make a dozen trips between Arlington, Virginia, and Washington, D.C., while enjoying 105 mpg-e (miles per gallon-equivalent) efficiency and burning not a drop of gasoline.

Since launching U.S. sales in June, Ford says it has sold approximately 100 Focus BEVs per month. The automaker aims to increase that tenfold by the end of the year, and start selling the electric Focus in Europe in 2013—all supporting a larger pledge to triple production capacity of hybrid, plug-in hybrid, and battery electric vehicles by next year.

(Related: "Range Anxiety: Fact or Fiction?")

BMW i8

Photograph by Spencer Platt, Getty Images

Slip behind the wheel of a plug-in hybrid BMW i8, scoot around town in the all-electric i3 (coming in late 2013), or spy the new plug-in hybrid Concept Active Tourer at the Paris Motor Show, which opens Saturday, to catch a glimpse of BMW's answer to what greener cars can mean for a luxury brand built on sporty performance.

Among the signatures are premium price tags (more than 100,000 euros—$128,740—for the i8 four-seat coupe, slated to begin sales in 2014), super lightweight carbon fiber to balance out the extra weight of the battery pack, direct online sales targeted at young drivers, and plenty of features linked to mobile devices, like an app that lets motorists monitor and control battery charging from their smartphones. And a new three-cylinder engine—smaller and more efficient than four- and six-cylinder options—fueled with gas or diesel will step up when the batteries in the plug-in hybrid models peter out.

Laslau calls the i8 a "halo" vehicle for BMW, a model intended to demonstrate "technical excellence, but not resulting in high volumes or revenues."

(Related: "Cheap Renewable Power Key to BMW's Electric Megacity")

Chevrolet Spark

Photograph by Stan Honda, AFP/Getty Images

A Chevy Spark glows green at the New York International Auto Show in April. In August, the first full month on the U.S. market for this inaugural minicar from General Motors, the car found more than 2,600 buyers—beating GM's goals. It's the smallest car ever released by Chevrolet, and now, an electric version is in the offing for a limited rollout in 2013.

California's zero-emission vehicle requirements provide much of the impetus for the Spark EV. But for both the plug-in Spark and the gasoline version, GM has city dwellers in mind. With the gas version, easy parking is a major selling point for a four-seater that stretches just three feet longer than the Smart Fortwo. With the electric version, GM is stressing the car's fit for urban driving habits.

"The Spark EV offers customers living in urban areas who have predictable driving patterns or short commutes an all-electric option," Chevy's chief engineer for electric vehicles said in a statement about the car, which is expected to come equipped with nanophosphate lithium-ion batteries from A123 Systems.

(Related: "To Curb Driving, Cities Cut Down on Car Parking")

Coda EV

Photograph by Bret Hartman, Reuters

Daniel Weiss, an investor in the upstart electric car company Coda Automotive, drives his electric Coda sedan (from $38,145) away from an event at the Westfield Century City Mall in Los Angeles. Rated for 88 miles (142 km) of driving on a full charge, the Coda can theoretically cover more than the average distance traveled each day by American motorists with just two hours of charging (Coda says the battery requires two hours to store energy for up to 50 miles, and up to seven hours for a full charge).

Coda is one of the new companies that have seized electric vehicle technology as an opportunity to break into the long entrenched automotive market. It's one of only a few such startups to survive more than a few years and actually manage to put vehicles in the hands of paying customers.

Even Toyota, which played its cards so successfully in the hybrid game, has suggested it overestimated the window of opportunity for pure electric vehicles. On Tuesday, the company revealed plans to dramatically scale back electric vehicle production targets, saying it "misread the market and the ability of still-emerging battery technology to meet consumer demands."

Honda Fit EV

Photograph by Reed Saxon, AP

A royal blue subcompact 2013 Honda Fit EV makes its debut at the Los Angeles Auto Show in 2011, nearly 15 years after Honda unveiled its first battery electric vehicle, the short-lived EV Plus. Rated at 118 miles per gallon-equivalent (50 kilometers per liter-equivalent) and an 82-mile (132-kilometer) range, the 2013 Fit EV's battery is designed to charge up in less time than you'd spend grabbing dinner and a movie, or watching a few episodes of "Downton Abbey" (about three hours at a 240-volt circuit).

For any electric car, the source of its electricity determines just how green the car's operation will be. Simply plugging in rather than tanking up can reduce the smog-forming pollution and greenhouse gas emissions associated with driving, even when coal and natural gas are part of the electricity grid mix. Electric motors are also more efficient than internal combustion engines, and using wind- or solar-generated electricity to power an electric vehicle can result in almost no greenhouse gas emissions. However, the Union of Concerned Scientists warns, "the use of coal-generated electricity releases significant amounts of global warming emissions, similar to those from an average gasoline vehicle."

And so cities around the world are seeking to pair electric vehicles with renewable energy. Stockholm, which generates 90 percent of its electricity from hydro systems or nuclear, aspires to have 1,500 electric vehicles on the road by 2015, while eliminating reliance on fossil fuels throughout the region by 2050. Amsterdam, meanwhile, has set out to have nearly all driving powered by electricity from windmills, solar panels, and biomass plants. By 2015, the city aims to have 10,000 electric vehicles traveling its roads.

Such ambitions aside, however, Honda foresees only a bit part for the Fit EV in the coming years. With 1,100 units planned for production over three years, and no option to buy rather than lease, some critics dismiss the model as a "compliance car" being built only to satisfy California mandates. By requiring large automakers to have plug-in or fuel-cell vehicles make up a minimum percentage of their sales in the state, California estimates 1.4 million zero-emission vehicles will travel its scenic Pacific highways and notoriously jammed freeways by 2025.

(Related: "Driving the Limit: Wealthy Nations Maxed Out on Travel?" "Going "All The Way" With Renewable Energy?")

Fiat 500 Elettra

Photograph by John MacDougall, AFP/Getty Images

A Fiat 500 Elettra sips electrons at an event organized by the utility RWE in Berlin, Germany, where budget shortfalls have slashed funding intended for electric-vehicle research and development projects.

Fiat plans to begin manufacturing the electric version of its 500 subcompact later this year—but not without complaint, and not profitably. "Their C.E.O., Sergio Marchionne, has been outspoken about the electric 500 being a compliance car, and is unhappy they're being forced to make it," said Laslau. With the 500 Elettra, Marchionne has said, Fiat will lose about $10,000 per car.

The company doesn't have much to spare. This year Fiat is expected to lose as much as 700 million euros ($901 million) in Europe. And Fiat is the only major car manufacturer in the EU that will not present a new model at the 2012 Paris Motor Show when it opens this weekend.

Toyota RAV4 EV

Photograph by Bradley Berman, New York Times/Redux

The Toyota RAV4 EV rises again, making an appearance in Los Angeles in August a decade after Toyota first sold electric versions of the model to meet California's zero emission vehicle mandate.

Initially, at least, the car is slated once again for California, where it began sales on September 24. Toyota aims to sell a total of 2,600 RAV4 EVs within three years—nearly eight times the number rolled out to consumers in 2002.

While the 2002 model used nickel-metal hydride batteries warrantied for up to 60,000 miles, the new RAV4 EV employs lighter-weight lithium ion batteries warrantied for up to 100,000 miles. Built with a battery pack and electric motor developed by Tesla Motors, it's one of a handful of electric vehicles boasting a triple-digit range—103 miles on a full charge, according to the U.S. EPA rating.

Even so, Toyota says better batteries are needed for electric cars to take hold. The automaker's vice chairman and development chief, Takeshi Uchiyamada, made headlines this week, telling reporters, "The current capabilities of electric vehicles do not meet society's needs, whether it's the distance cars can run, or the costs, or how long it takes to charge."

(Related: "Pictures: Seven Ingredients for Better Electric Car Batteries")

As a result, the company has decided to scrap mass production plans for its eQ electric city car, slashing the sales goal to just 100 units in the United States and Japan. Toyota is placing its bets on gas-electric hybrid technology instead, with new plans to roll out 21 hybrid models by 2015.

Smart Fortwo Electric Drive

Photograph from Daimler AG via DAPD/AP

A pint-sized Smart Fortwo Electric Drive coasts past an outdoor cafe with the trademark silence of battery electric cars.

Capable of speeds up to 125 km/h (about 77 mph), the two-seat runabout sells for 18,910 euros in Germany (nearly $25,000). That makes it one of the most affordable EVs on the market. It's slated to debut in the United States in the spring of 2013, eventually reaching more than 30 markets. "From the beginning, Smart was designed as an electric vehicle," Smart chief Annette Winkler told Blooomberg News recently. "That's now paying off."

Smart has adopted an unusual tactic to cut the price tag: excluding the battery, the most expensive part of the vehicle. In Germany, drivers can rent the battery for 65 euros (about $81) per month. For the whole shebang—car and battery included—pricing starts at 23,680 euros, or just over $30,430.

"Fundamentally, the Smart's form factor and purpose—a small city car—is well-matched with EVs' strengths: sufficient range for around-town usage," said Laslau. "However, Smart's execution has been spotty in the past, and is lacking so far on EVs."

Mitsubishi I

Photograph by David Crosling, European Pressphoto Agency

Melbourne's Webb East Dock takes in 20 of the very first electric vehicles ready to go to market in Australia. This shipment of bean-shaped Mitsubishi i electric cars arrived in August 2010.

Next on deck from Mitsubishi is the 2014 Outlander PHEV, which will draw on the Mitsubishi i technology and repackage it into the world's first plug-in hybrid SUV.

Yet the mood around electric vehicles has sobered in the years since automakers and governments began pouring billions of dollars into the technology. "There were concerns about gas prices, and also the price of carbon and the impact of carbon emissions," Holman said, until the recession shifted the focus, slashed financial resources, and rearranged priorities. "The trends of wanting and needing to be more fuel efficient and use less gasoline, those are very real trends," Holman said. "But there are just more economical ways to meet those needs. There's cheaper ways to save gas."

Nonetheless, as many as 20 different plug-in models could be on the road before 2013 ends. Automakers still face tightening fuel economy and emission standards. And from 120,000-yuan (about $19,000) subsidies for domestically produced electric cars in China, to stickers allowing solo drivers of EVs access to car-pool lanes in California, incentives can still be found for cleaner cars running on domestic energy sources.

And so, as automakers release their EV technology into the wilds of the open road and the urban traffic jam, "We're certainly going to learn a lot over the next couple years," said Holman.

(Related Story: "China's Electric Car Drive: Impressive, but Not Enough"