I put the key in the ignition, but there's just silence — not a sputter of an engine turning over. Instead, a sign on the dashboard that says "ready" indicates the car is set to drive. This is a zero-emitting fuel cell car powered by hydrogen, and goes nearly 250 miles on a charge and takes just three minutes to refuel — far better than any electric car. This environmentally-friendly package is housed in a top-of-the-line vehicle: a Mercedes-Benz. And it carries many of the luxury badges of the auto maker — plush, heated leather seats, automatic climate control, a built-in navigation system, iPod connection, and a diagram showing where the car is currently drawing its power. Called the F-cell, it's being road tested among 20 drivers in Southern California.

Slideshow: 7 Best Luxury Eco Cars

It used to be that the most environmentally-friendly vehicles were found in the small and mid-sized segment, vehicles costing around $18,000 to $20,000. But no more. Luxury carmakers have gone green, recognizing that even high-end consumers value fuel economy. This trend is expected to further fuel what many see as the beginning of a comeback for the long beleaguered auto industry. The Center for Automotive Research predicts 170,000 new jobs in the auto industry by 2014.

In addition to young, environmentally conscious drivers, the luxury car consumer is an important target for car companies, says Michael Robinet, managing director at IHS Automotive Consulting. According to Moody’s Analytics, 5 percent of the richest households account for 37 percent of consumer spending, and a recent study by American Express Platinum found that wealthy Gen Xers spent 18 percent more than baby boomers on luxury goods annually. "Why wait until one is 45-years-old to buy a luxury product?" says Robinet.

Michelle Krebs, a senior analyst at Edmunds.com, says the high-end car consumer is important to car companies because, as the economy emerges from the recession, the luxury segment will grow. They are one of the first demographics to start spending again. The luxury market is also important for image; it has a halo effect over the rest of the automaker’s range, she says. And in a sluggish economy, people don’t necessarily want to flaunt a luxury car in front of their unemployed executive neighbor, she says. "So to be able to brag that your luxury car is environmentally friendly may be a good excuse."

Related: The 8 Hottest Cars at the 2012 Detroit Auto Show
With the exception of hybrids from Lexus and Infiniti, luxury cars have hardly been known for their high mileage. Many super high-end vehicles costing $150,000 or more, including the Bentley Continental GTC and the Mercedes-Benz S600, both of which have a combined 14 miles per gallon fuel economy, top the Energy Department's list of least efficient vehicles.

Luxury makers are now on board in delivering environmentally friendly vehicles because they don't have to compromise the horsepower most coveted by a luxury car buyer. This theme was apparent at the 2012 North American International Auto Show during the press preview last week, where virtually every car maker — luxury makers included — touted the environmental perks of their vehicles.

"People who have money tend to like to hold onto it," so they appreciate the value that an environmentally-friendly vehicle provides, says David A. Champion, senior director of auto testing for Consumer Reports. He says that all buyers — luxury purchasers included — are concerned about fuel costs. A November 2011 survey by Consumer reports shows that nearly two-thirds of consumers who have at least one car expect their next vehicle purchase to have better fuel economy. Another factor fueling the trend is federal requirements which require all car makers achieve an average of 35 miles per gallon by 2016 and 54 miles per gallon by 2025, standards that can't be met without increasing fuel efficiency across the board.

So even the uber-luxe carmakers are getting into the act. In unveiling the 2013 Bentley Continental GT V8, Bentley Motors chairman and chief executive Wolfgang Durheimer touted his best fuel economy offering yet, with a 40 percent fuel economy improvement over its 12 miles per gallon city, 19 miles per gallon highway numbers in previous models. Yet it still gets 500 horsepower and goes from zero to 60 miles per hour in 4.6 seconds, packing plenty of punch for car enthusiasts. Paying a premium for a hybrid isn't as big a deal when you're shelling out an initial price of $180,000 for a Bentley. Fisher unveiled its Karma, an extended range electric vehicle due out this year that will retail between $90,000 and $100,000 and will be the first super luxury EV.

Mercedes unveiled the E400, a hybrid, due in the second half of this year, while Acura debuted its ILX luxury concept sedan, which will be offered in both a gasoline and hybrid version in the spring of this year. It also unveiled the NSX Supercar concept, a hybrid sports car that is due within three years. It will be "a supercar that is also mindful of the environment," said Sara Pines, an Acura spokesperson. She said that because of its Honda affiliation, Acura tends to attract younger luxury buyers. "These consumers tell us they're interested in fuel economy," she said.

BMW showcased is ActiveHybrid 5 and ActiveHybrid 3. The ActiveHybrid 3 is the first-ever hybrid among the compact sports sedans of the premium segment. With combined city/highway fuel economy of 36.7 miles per gallon, it's 12.5 percent more fuel efficient than the comparable gasoline-powered vehicle. In a January 10th panel discussion at the auto show in Detroit entitled, "ECONomics," Tom Baloga, vice president of engineering for BMW North America, said the company's goal is to develop products that get improved fuel economy, reduce
greenhouse gases, and yet are still fun to drive. BMW customers expect advanced fuel economy "just like they expect a high level of safety" in their car, he said.

As of now, these latest new luxury offerings still fall short of the cleanest cars, and have a ways to go before they make a significant dent environmentally, says Dan Becker, director of the Safe Climate Campaign for the Center for Auto Safety. Still, "there is a benefit to having people recognize that hybrids and electric vehicles can be cool and sexy and elegant," he says. "It adds potential luster to a hybrid market even though it doesn't cut emissions much."