

THE U.S. ELECTRIC CAR RACE: What Do Consumers *Really* Want?

Today's GM-Nissan race to own the mass market for electric cars provides a fascinating opportunity to observe two companies pursuing distinct paths – one betting consumers are ready to do without an essential feature, the other betting consumers will insist upon it.

By Edward Tuttle and Brian Gorin of Analysis Group



As automakers continue to unveil plans for small (and eventually larger) fleets of plug-in hybrid or pure electric vehicles in the U.S. market, two of the major companies stand out. General Motors, with its Volt “extended range electric vehicle” (EREV), and Nissan, with its all-electric Leaf, will both launch mass-produced cars at the end of this year, and plan to sell tens of thousands such vehicles in 2011.

These two companies are, however, pursuing markedly different strategies. GM has followed a development path demanding significant engineering innovation to create an electric vehicle that uses a gasoline-powered back-up generator to meet today's mainstream consumer needs for driving range and

refueling convenience. Nissan has followed a faster and more opportunistic commercial path that appears to rely on a fundamental shift in consumer behavior while falling short of mainstream expectations. Which ploy is riskier – GM's “engineering bet” that a no-compromise electric car is viable or Nissan's “marketing bet” that consumers will buy a product lacking an attribute they demand today?

The Volt and Leaf are expected to hit the market at the same time and to sell in comparable volumes during their first year. Both cars are propelled solely by their electric motors, are intended to be plugged in at night, and rely on lithium ion battery technology. But one of the

History contains examples of seemingly less viable products succeeding (think personal computers) because consumers are often surprisingly willing to forego a presumably essential performance attribute in favor of greater accessibility, convenience, simplicity, reliability, or lower cost.

Volt's key innovation is the inclusion of a small gasoline motor to serve as a back-up generator, supplying electricity to keep the car going when the batteries are drained. The smaller, simpler Leaf design includes a larger battery for greater electric-only range but has no

provision for back-up power, and therefore, a much shorter total driving range. The Leaf also uses more of its battery capacity to achieve its range and employs a less complex battery conditioning and management system. GM's less stressed battery is likely to last longer, although Nissan has matched GM's announced battery warranty terms.

Other global automakers are largely pursuing Leaf-style battery-electric options but at a slower pace, investing less rapidly ahead of demand. Nissan's CEO Carlos Ghosn, however, is bullish. “We have a completely different vision,” Ghosn declared. “We see it [all-electric] as mass market.”¹ GM would appear to disagree, having bet that mass market

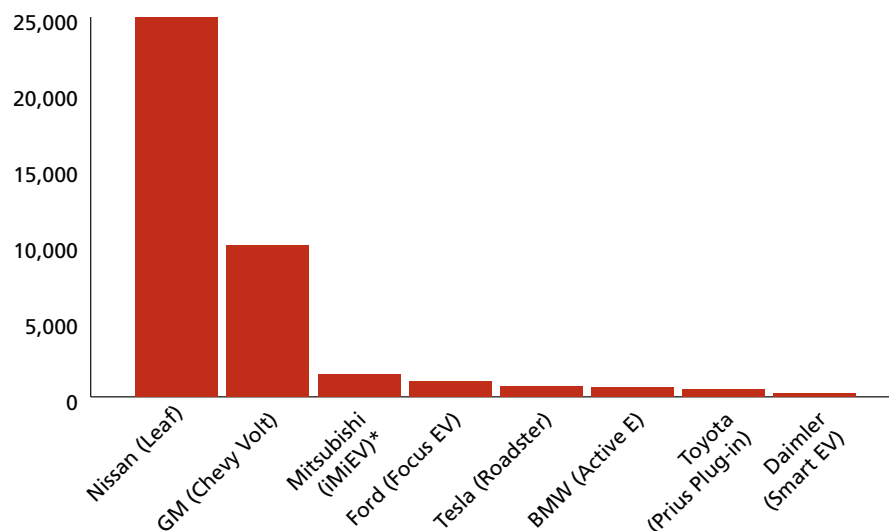
adoption will require a vehicle that does not ask consumers to compromise conventional expectations about driving range or refueling time.

So which strategy is riskier? Nissan is committing massive capital to a product

that, even with subsidies, asks consumers to pay a premium for a sub-compact car with only a claimed 100-mile range, far below the minimum offered by any mass market car in decades. Recharging will take hours, if a charger is available. GM, on the other hand, is offering consumers the electric experience in a somewhat larger car, plus a likely 400-mile range and the convenience of gas station refueling if the back-up generator is needed for a long trip. If consumer purchase criteria match GM's assumptions – that buyers want all the attributes they get in today's cars, plus the benefits of electric drive for a (hopefully modest) price premium – the Volt should indeed dominate. GM has recently confirmed long-rumored pricing of approximately \$41,000 for the Volt, meaningfully higher than Nissan's announced pricing of a little under \$33,000 for the Leaf. GM is offering more car – more mainstream attributes – but also asking a larger price premium over non-plug-in alternatives than Nissan.

GM's current-generation hybrid experience with its Tahoe may provide some useful insight. Slower than Toyota to the hybrid market, GM pursued a highly rational engineering solution: develop a

Anticipated Plug-in Sales United States, 2011



Source: Analysis Group Research. * Mitsubishi plans a volume as high as 8,500 worldwide in 2011.

hybrid electric motor-transmission system flexible enough to fit in existing products and scaled large enough to save fuel in the company's gas-guzzling full-sized trucks and SUVs. The resulting product was seamless in operation and impressive in results: with equivalent power and acceleration, the 2009 4WD Chevrolet Tahoe Hybrid achieved more than 40% better fuel economy, 20MPG vs. 14MPG for its non-hybrid twin. In terms of actual fuel savings, the Chevrolet customer who

chose the hybrid could expect to use 7.4 barrels (30%) less petroleum in a year.²

Yet GM sold only 3,300 Tahoe Hybrids in 2009, compared with approximately 70,000 non-hybrid Tahoes – a take rate of about 4%.³ The contrast with Toyota's Prius is stark. Toyota sold nearly 140,000 Priuses in the U.S. in 2009 and nearly 500,000 worldwide.⁴ The Prius has no direct non-hybrid twin, but Toyota's Prius sales worldwide are more than half the worldwide volume of the similarly sized and much cheaper Corolla, Toyota's (and the world's) best-selling car.

Of course, the success of the Prius owes to the fact that its purchasers are not shopping for a more fuel efficient, more expensive car *in the same class*. The Prius has been able to appeal to consumers of larger and more expensive cars who concluded they did not need the space and appreciated the unique fuel economy benefits. The typical Tahoe buyer, it turns

Chevy Volt and Nissan Leaf: How Do the First Mass-Market Plug-ins Stack Up?

	Volt	Leaf
EPA size class	Compact	Compact
Battery technology	Lithium ion	Lithium ion
Battery capacity	16kW-hr	24kW-hr
Projected range on a full charge	40 miles	100 miles
Back-up generator	Gasoline	None
Projected range with back-up	400 miles	100 miles

out, is not willing to pay more for greater fuel economy despite equivalent performance, space, and towing.

With the Tahoe Hybrid, GM sought to give its most profitable customers (large SUV buyers) everything they already got in the product, plus dramatic fuel savings and environmental benefit – albeit for a premium. While the engineering-intensive solution has great technical merit, the

Slower than Toyota to the hybrid market, GM pursued a highly rational engineering solution.

product has not been a commercial hit. The Volt is a product of the same culture and decision-making process that produced the sluggish-selling Tahoe Hybrid. The Volt team has pushed to deliver electric benefits in a “real car” as measured by current customer preferences, unlike all pure electrics, such as the Leaf, which fall short on that dimension. With its range-extending generator and “real car” messaging, GM has explicitly targeted the anxieties of mainstream purchasers. So how will the Volt fare commercially? Much rides on this question, including the \$43 billion U.S. taxpayers have yet to recoup from their 61% stake in the company.

The difference between GM’s and Nissan’s approaches is a fundamental one, based on what each company believes about the customer: that electric car buyers will be drawn to a full-fledged car that meets today’s mainstream needs, and largely looks and acts like a main-

stream car; or that buyers will opt for a product that offers less capability, somewhat lower cost, and, perhaps, projects a more radical image.

While initial sales volumes in 2011 will be important to both companies’ reputations and bottom lines, each product represents a long-term bet on new vehicle architecture. U.S. taxpayers should root for the success of the Volt, which would energize

the new GM. And consumers should be delighted with a product that offers the reassuring combination of a plug-in electric experience and a back-up generator. Widespread industry adoption of the Volt architecture would give GM the kind of intellectual property and internal know-how lead that Toyota has enjoyed with its current generation of hybrids. None of GM’s competitors has made a remotely comparable investment in solving the challenges of a vehicle with electric drive and a back-up generator.

But if consumers reveal a willingness to change long-standing habits in order to enjoy the simplicity and relatively lower cost – and unambiguous eco-conscious messaging – of a pure electric, GM’s engineering solution could end up headed to the graveyard of technically brilliant but commercially underperforming innovations. ■

EDWARD TUTTLE IS A MANAGING PRINCIPAL IN ANALYSIS GROUP’S MENLO PARK OFFICE; **BRIAN GORIN** IS A MANAGING PRINCIPAL IN THE FIRM’S BOSTON OFFICE.

RESEARCH CONTRIBUTED BY ASSOCIATE JONATHAN BORCK AND VICE PRESIDENT ADAM DECTER.

1. Greimel, Hans, “Nissan Unveils New Electric Car for U.S. Called ‘Leaf,’” *Automotive News*, August 3, 2009, <http://www.autonews.com/apps/pbcs.dll/article?AID=/20090803/OEM/308039761>.
2. U.S. Environmental Protection Agency “Energy Impact Scores” for the 2009 Chevrolet Tahoe 1500 4WD and the 2009 Chevrolet Tahoe Hybrid 4WD, <http://www.fueleconomy.gov/feg/2008car1tablef.jsp?column=1&id=25776> and <http://www.fueleconomy.gov/feg/2008seleeng1f.jsp?year=2009&make=Chevrolet&model=Tahoe%20Hybrid%204WD>.
3. O’Dell, John, “2009 Hybrid Sales: Toyota Slows as Competition Gains; Ford is Big Winner,” January 7, 2010, <http://blogs.edmunds.com/greencaradvisor/2010/01/2009-hybrid-sales-toyota-slows-as-competition-gains-ford-is-big-winner.html>; and “Auto Industry Believes 2009 Close Bodes Well for 2010,” *Edmunds AutoObserver*, January 5, 2010, <http://www.autoobserver.com/2010/01/auto-industry-believes-2009-close-bodes-well-for-2010.html>
4. “December 2009 Dashboard: Year-End Tally,” January 20, 2010, <http://www.hybridcars.com/hybrid-sales-dashboard/december-2009-dashboard.html>; Voelcker, John, “Two-Mode Hybrid System: GM’s Larry Nitz on Lessons Learned,” June 15, 2010, http://www.greencarreports.com/blog/1044337_two-mode-hybrid-system-gms-larry-nitz-on-lessons-learned.