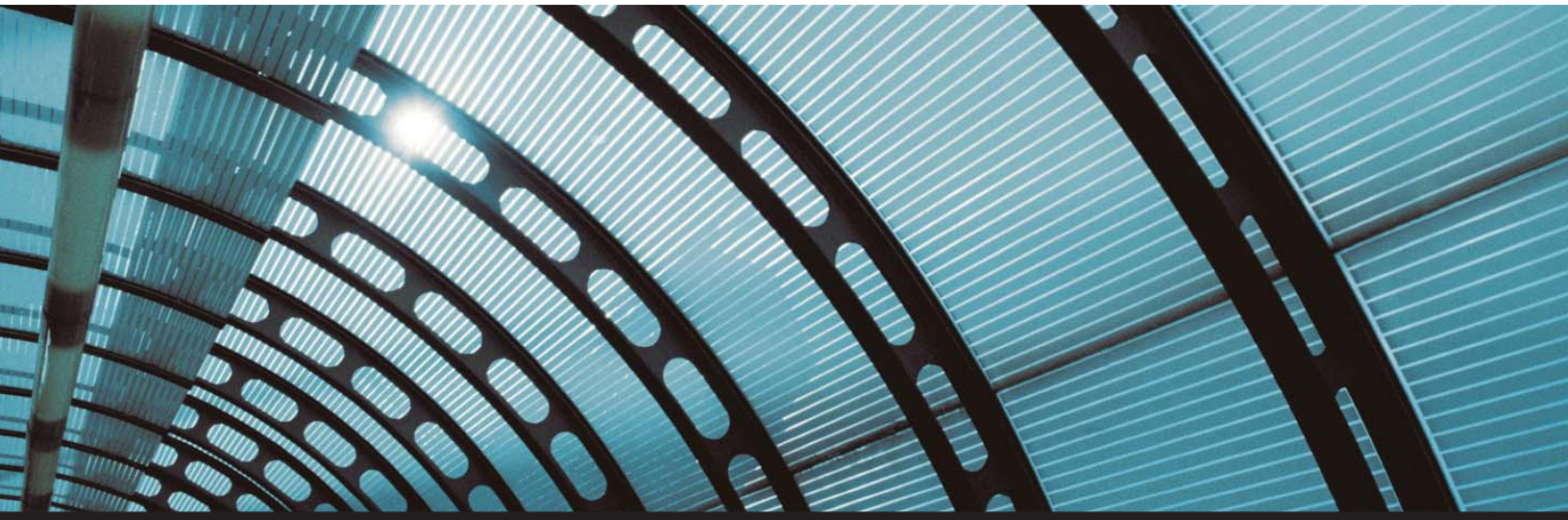
The Emergence of Hybrid Vehicles

- We see hybrid-power vehicles as an innovative, game-changing technology that will have a major impact over the next couple of decades
- Hybrid models will eventually become the new automotive standard
- The hybrid trend will have profound investment implications for many industries and companies



AllianceBernstein
Investments

About Research on Strategic Change

Most fundamental research analysts cover an industry and the companies within it. AllianceBernstein's Research on Strategic Change group seeks to find investable ideas that stem from economic or technological changes powerful enough to profoundly influence corporate performance across multiple industries. *The Emergence of Hybrid Vehicles* is the group's fourth report. Prior publications include *Broadband: The Revolution Underway*, 2004; *China: Is the World Really Prepared?*, 2004; and *The New Industrial Revolution: De-Verticalization on a Global Scale*, 2005.

Hybrid-Power Vehicles Will Change the Game

Hybrid-power vehicles are moving from the fringe to the mainstream. Hybrids, as we'll call them, use electric motors to boost the fuel efficiency of the conventional gasoline-powered internal-combustion engine. They get very high mileage, sharply reduce operating costs, and help the environment by significantly lowering emissions. They also enhance performance, particularly acceleration.

A Major Transition with Big Implications

Hybrids aren't a new idea—they've been around for a few years already—and they haven't yet become a standard offering from vehicle manufacturers. So why get excited about them now?

Our research concludes that the world is on the verge of a major transition to hybrids. This trend is gathering momentum and will ultimately transform road travel, entire industries, and the usage of oil as a transportation fuel.

We see hybrids as an innovative, game-changing technology that will have a major impact over the next couple of decades:

- They'll essentially replace the traditional gasoline-powered internal-combustion engine, amounting to a technological revolution.
- They'll help push transportation-related demand for oil dramatically lower than mainstream long-term forecasts.
- They'll affect the profitability and growth prospects of many industries and companies, which will change the investment landscape.

The emergence of hybrid-powered vehicles will have a major global impact on the automotive business, oil consumption and the investment prospects of many industries and companies.

Fuel Efficiency: The Foundation of Hybrids' Appeal

Superior fuel efficiency is what will compel consumers to start switching from gasoline-powered vehicles to hybrids. Widespread use of fuel-efficient hybrids will help consumers save money by keeping high fuel costs in check.

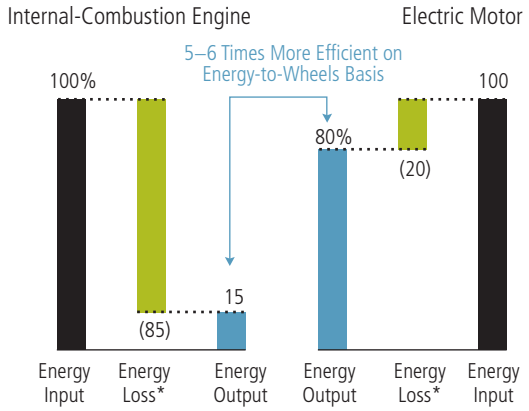
Hybrids improve fuel efficiency primarily by exploiting the capabilities of the electric motor as they reduce the usage of the gasoline-powered engine. They do this in several ways:

- The motor, not the engine, is used during acceleration and low-speed cruising;
- A smaller engine can be used without sacrificing performance;
- The engine is shut off when the car is stopped; and
- The battery is charged both by the engine and by recapturing energy usually lost when braking.

Hybrids Integrate the Benefits of Electric and Gasoline Power

While internal-combustion engines use only 15% of the energy they receive, with around 60% of it consumed by heat loss alone, electric motors use about 80% of the energy they receive. The hybrid integrates the benefits of each to boost the efficiency of conventional vehicles. We project that fuel efficiency for vehicles worldwide could nearly double by 2030, mainly as a result of hybrid technology.

Electricity Far More Energy-Efficient than Gasoline



* Energy loss includes loss due to heat, idling, driveline and electric resistance.
Source: Toyota, U.S. Environmental Protection Agency and AllianceBernstein

We believe that the mass adoption of hybrid-power vehicles will end the dominance of the gasoline-powered internal-combustion engine. Given the gas engine's historical supremacy in the transportation industry, this will amount to a technological revolution.

Hybrids' superior fuel efficiency will drive their widespread acceptance by consumers.

Plug-ins: The Next Phase in the Hybrid Evolution

"Plug-in" vehicle models are likely to be the next phase in the hybrid evolution. They derive their name from the fact that they can charge their batteries when plugged in to standard electrical outlets.

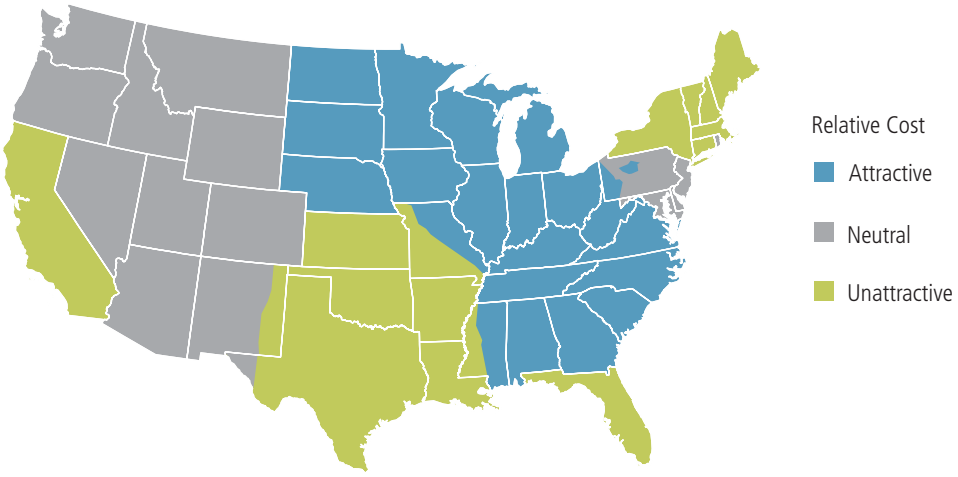
The plug-in feature will be truly game-changing: it delivers enormous fuel efficiency to drivers not only because they're using electricity to replace much gasoline, but also because electricity itself is generated from multiple fuel sources.

For plug-ins to achieve commercialization, the capabilities of existing batteries need to expand and their costs need to fall. The development of high-energy lithium batteries should help to overcome these obstacles. We believe that these batteries will be available within the next five years or so.

The U.S. already has ample capacity in place to accommodate the projected electricity demand from plug-ins, although costs vary by region.

Imagine "refueling" your car by plugging it into an electrical outlet. This could become reality within the next few years.

U.S. Plug-In Capacity: Ample Electricity, but Costs Vary



"Attractive" reflects likely availability of surplus low-cost, baseload capacity and marginal costs of under $40 per megawatt-hour. "Unattractive" reflects likely unavailability of low-cost, baseload capacity and marginal costs of more than $90 per megawatt-hour. "Neutral" reflects neither attractive nor unattractive. Analysis assumes natural gas prices remain at currently high levels.

Source: Energy Velocity, GlobalView, North American Electric Reliability Council, Prudential Securities and AllianceBernstein

What Will Drive the Mass Adoption of Hybrids?

Hybrid-power vehicles have barely made a dent in the marketplace thus far, so our optimism about their prospects might seem unwarranted. But we see a combination of strong competitive advantages and increasingly favorable economics that should drive the growing adoption of hybrids in the next few years.

Hybrids Offer Significant Competitive Advantages

Increased fuel efficiency isn't the only advantage that hybrids offer versus comparable conventional vehicles.

Emissions are much lower, for example. Acceleration is faster. The use of a larger battery means that the vehicle can more easily integrate numerous safety and luxury electronic systems. And using more electricity and less gas means that operation is much more convenient and less burdensome.

Hybrids also offer a more attractive set of benefits than vehicles powered by other alternative fuel sources like diesel, ethanol and 100% electricity. For instance, unlike diesel-powered vehicles, hybrids don't sacrifice performance to gain fuel efficiency. Unlike vehicles powered by biofuels like ethanol, hybrids don't require special pumps at gas stations. And unlike all-electric vehicles, hybrids don't limit driving range.

Hybrids offer significant competitive advantages versus conventional gas-powered vehicles. They stack up well versus other alternative-fuel vehicles, too.

Hybrids Far More Attractive than Alternatives

Factor (Representative Model)	Hybrid (Toyota Prius)	Diesel (VW Jetta)	Ethanol/Flex-Fuel (GM Monte Carlo)	100% Electric (Toyota RAV4 EV)
Fuel Efficiency	●	◒	○	●
Performance (acceleration)	●	◒	◒	◒
Emissions/Air Quality	●	○	◒	●
Convenience (range, refueling)	●	◒	◒	○
Initial Cost	○	◒	●	○
Cost per Mile	●	◒	○	●

● High ◒ Medium ○ Low

Comparisons based on commercially available vehicles
Source: AllianceBernstein

The Economics of Hybrids Are Becoming More Favorable

The economics of hybrid ownership will become increasingly favorable to consumers over the next few years. We expect the improvement to stem from so-called "high-travel" vehicles like taxicabs and police cars, which are purchased in large fleets and accumulate far more mileage than average. Because they're driven farther, they'll save more fuel over their lifetimes.

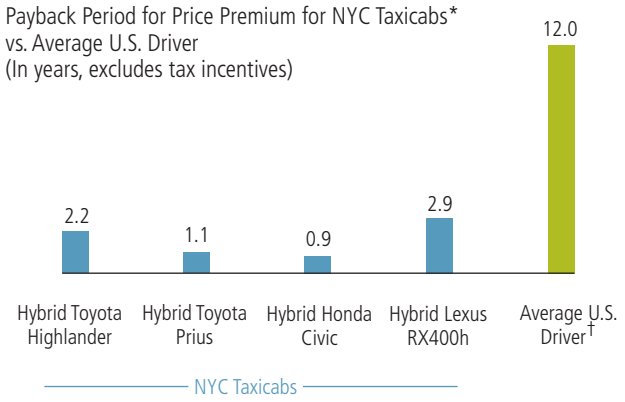
Since high-travel vehicles are currently best positioned to reap the benefits of hybrid technology, we expect them to dominate hybrid sales for the next few years.

Early adoption of hybrids by high-travel vehicle fleets should give automakers a solid opportunity to ramp up production volumes, which would allow them to develop economies of scale and thus price hybrids more attractively for the average consumer. This translates into a lower price premium and shorter "payback" period (i.e., to recoup the price premium) compared to conventional vehicles.

We think that the price premium for hybrid vehicles should fall to about $2,000 by 2010 from $4,500–6,000 currently. At the $2,000 level, the payback period would significantly shorten for most drivers, and people would likely be much more willing to pay the premium to get hybrids' many advantages.

Hybrids will become much more affordable to consumers as adoption by high-travel vehicle fleets leads to greater economies of scale.

Payback Period Shorter for High-Travel Vehicles



*The NYC Taxi & Limousine Commission assumes each taxi travels 43,992 miles per year.

†Assumes 12,250 average annual miles driven, $5,000 average price premium, 50% average fuel efficiency gain and gasoline price of $2.97 per gallon

Source: *Consumer Reports*, New York City Taxi & Limousine Commission and AllianceBernstein

Hybrids Will Reduce Transportation's Oil Dependency

We believe that the emergence of hybrid vehicles will reduce the global transportation sector's oil dependency in the long term. To understand this more fully, it's important to understand how dependent transportation is on oil today.

While many industries have raised their energy efficiency by substituting other fuels for oil, transportation mostly hasn't. Consequently, transportation accounts for just over half of global oil consumption today, up from one-third in 1971 and less than half in 2002, and the International Energy Agency (IEA) projects consumption to rise modestly by 2030.

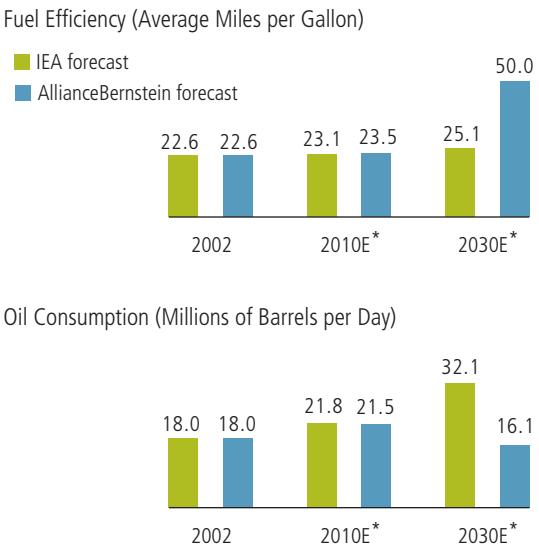
Fuel Efficiency Should Soar for Light-Duty Vehicles

This should change gradually with the emergence of hybrids. Fuel efficiency among "light-duty" vehicles such as passenger cars, SUVs, minivans and light trucks—which account for more than 45% of the transportation sector's total oil consumption—should soar in the long term.

Since transportation accounts for such a big portion of oil consumption, the gains in efficiency from widespread adoption of hybrids will push global transportation-related oil demand to a level far below long-term mainstream forecasts. We acknowledge that this prediction may seem rather contrarian at a time when many experts are predicting a devastating oil shortage, but the depth and breadth of our analysis give us the conviction to stand firmly behind our conclusions.

In short, the growth of hybrids into a much larger presence should have a particularly big impact in terms of reducing transportation-related oil consumption.

Light-Duty Vehicles: Fuel Efficiency Soars and Oil Consumption Drops



*E = estimate

Installed base, sales and mpg estimates are derived from the IEA/SMP base case model, in which the IEA/SMP held vehicle miles traveled constant for 30 years. In order to correlate these estimates to subsequent references from the agency, AllianceBernstein estimated the increase in this variable.

Source: International Energy Agency, Sustainable Mobility Project and AllianceBernstein

As hybrids become a much bigger proportion of new-vehicle sales and total vehicles on the road worldwide, they'll drive fuel efficiency up and force transportation-related oil consumption down.

Compelling Evidence Supports Our Oil Consumption Estimate

Our research has yielded compelling evidence to support our out-of-the-box estimate of transportation-related oil consumption:

- Hybrids should greatly boost global fuel efficiency. We project that hybrids' fuel efficiency will rise to about 62 miles per gallon (mpg) in 2030 from about 40 mpg in 2004. Since we estimate that hybrids will ultimately represent over 70% of the cars on the road worldwide, they'd more than double global fuel efficiency for light-duty vehicles.
- Hybrids' share of the global vehicle market should greatly exceed mainstream forecasts. We believe that hybrids will represent 85% of all new-vehicle sales and 72% of the vehicles in use globally by 2030. By contrast, the IEA forecasts that hybrids will remain a niche product in the same time frame.

Which Industries Will Be the Winners and Losers?

As a research-driven investment firm, we strive not only to identify and explain important trends like the mass adoption of hybrid vehicles, but also to translate these trends into active investment ideas.

We expect the hybrid trend to have profound implications for many industries and companies.

Industry winners. Industries that should benefit most from the emergence of hybrids include automakers and parts suppliers with hybrid expertise; electric utilities and their equipment providers; and technology companies (especially producers of semiconductors and other electronic components).

Industry losers. Industries that stand to lose the most include automakers and parts suppliers without hybrid expertise, whose market share will fall; and oil and gas (especially refiners and distributors).

Investors take note: long term, the proliferation of hybrids will bring big gains to some industries and big pain to others.

Affected Industries: Prospects for Winners and Losers

	Near Term	Long Term	Comments
Hybrid-Battery Manufacturers*	+++	+++	Significant demand acceleration
Automotive Suppliers (Electronic)	++	+++	Market acceleration
Power-Semiconductor Suppliers*	+	+++	Significant demand acceleration
Traditional Semiconductor Suppliers	+	+	Modest demand increase
Electric Utilities	NA	+++	Transition to plug-ins may lead to increased demand; load-balancing opportunities
Automakers	+++/–––	+++/–––	Market share shifts intra-sector
Automotive Suppliers (Traditional)	+/–––	+/–––	Market share shifts intra-sector, but decelerates overall
Fuel-Cell Providers	–	–	Delay demand
Oil and Gas Exploration and Production Firms	NA	––	Slower demand growth
Oil and Gas Refiners and Distributors	NA	–––	Slower demand growth

+++ Highly Positive ++ Very Positive + Positive – Negative –– Very Negative ––– Highly Negative

*No publicly traded pure-play investment opportunities available at this time

Source: AllianceBernstein

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- Retirement Services

[1] As of December 31, 2006

[2] Institutional Investor News awards honor the organizations that made an impact on the financial services industry in 2005. Although nominations are solicited from the industry, award winners are researched and selected by the editorial staff. The breadth of the awards includes 10 categories, each with three nominees from across the global pension industry.

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