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NADA Used Car Guide

PERSPECTIVE

Driverless Cars:

Consumer Perception of Future Autonomous Mobility

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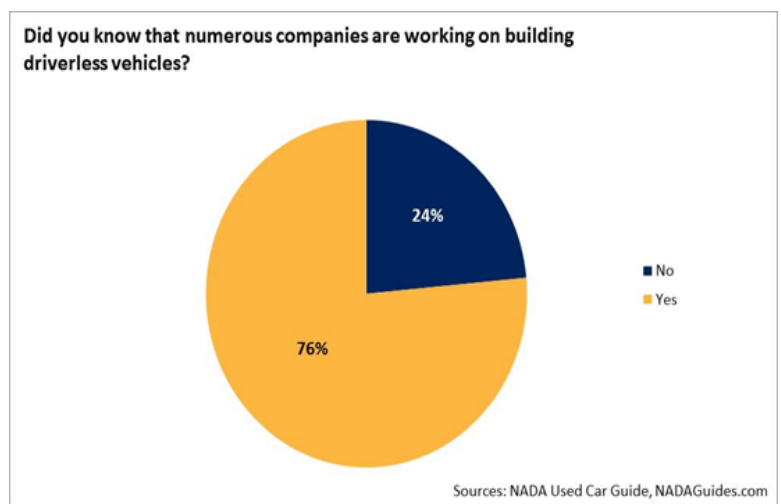
Driverless Cars: Consumer Perception of Future Autonomous Mobility

Introduction

In collaboration with [NADA Guides](#), NADA Used Car Guide conducted a driverless vehicle survey to gain a better understanding of what consumers know about automated driving, its current progress and future direction, and their feelings toward allowing the vehicle to “take the reins” in the driving process. Over 2,100 individuals participated in the study. Responses suggested an interest in the idea of autonomous mobility, while maintaining apprehension to the means of travel as a realistic alternative to today’s status quo. July’s Perspective highlights the survey results, provides insight into the state of automated driving, and identifies what challenges exist in the push toward this advancement in mobility.

Did you know that numerous companies are working on building driverless vehicles?

With nearly 77% of survey participants acknowledging they are aware many companies are developing driverless vehicle technology, it is apparent the vast majority of consumers are cognizant of the next frontier of automotive transportation. It is not only automakers getting involved in the technology; suppliers as well as organizations from outside the automotive industry are taking part in this mission. Automotive supplier DENSO collaborated with the Massachusetts Institute of Technology (MIT) AgeLab and Touchstone



Evaluations to establish the [Advanced Human Factors Evaluator for Automotive Distraction \(AHEAD\) consortium](#).

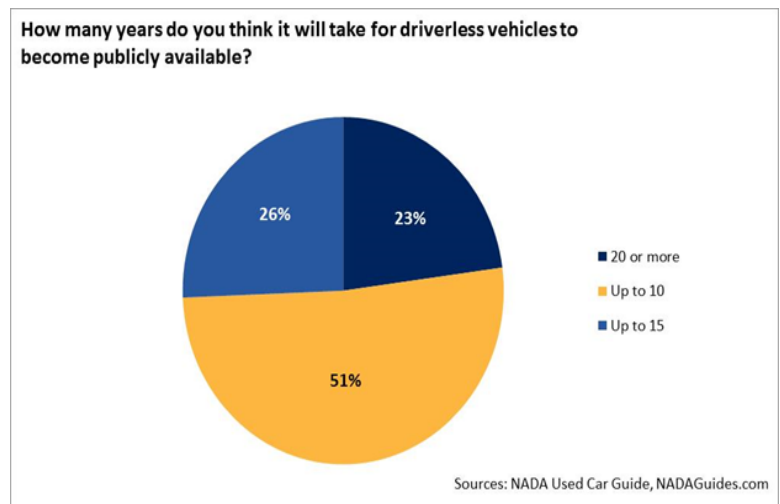
As there are a number of technologies that affect driver attentiveness—and a wide variety of approaches on how to solve issues regarding driver distraction—it is vital to understand driver workload. The AHEAD consortium—comprised of Honda R&D America, Inc.; Subaru Research & Development; and Jaguar Land Rover—is working to establish holistic and objective methodologies in the measurement of driver workload and Human Machine Interface (HMI) technologies. Humans have taken on much, if not all, of the driving responsibilities for decades, but the advent of HMI technologies has begun to help alleviate driver workload. Many organizations are focused on understanding how such technologies will act as a bridge from today’s paradigm to tomorrow’s world of self-driving cars. However, the HMI approach is just one of a few in the quest to develop automated cars; there are companies with designs to remove humans from the driving process altogether.

How many years do you think it will take for driverless vehicles to become publicly available?

Over half of survey participants believe driverless vehicles will be publicly available within 10 years, while 23% of respondents anticipate it taking 20 or more years for self-driving vehicles to become a reality for the general public. While the majority see autonomous vehicles happening sooner than later, it is likely a participant’s survey response has a lot to do with whether they believe the relationship between a human and an automobile can be eliminated completely

According to the Society of Automotive Engineers International (SAE), there are six levels of driving automation. Ranging from “No Automation” (level 0) to “Full Automation” (level 5), levels 4 and 5 represent human-like artificial intelligence (AI).

The following summary outlines the transfer of driving duties from the human driver to the automated driving system across the different stages of automation (and HMI playing a major role along the way). However, by employing alternative strategies in product development, other companies are aiming to change the game entirely.



SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes

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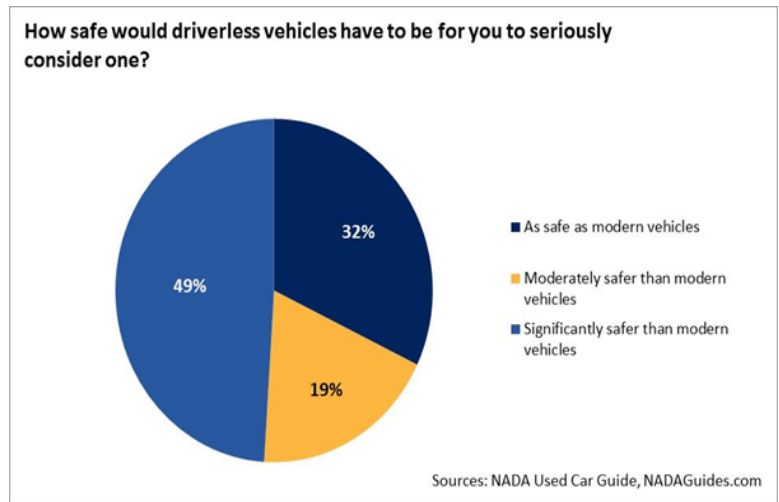
Of non-automakers, Google is arguably the most recognizable company interested in entering the automotive arena. The search giant is busy engineering its own [self-driving automobile](#) and plans to offer the product by 2020. The tech powerhouse launched its self-driving car project six years ago in Silicon Valley by designing a prototype vehicle from the ground up. This year, for the first time ever, the [company began extensive testing of its software outside its Mountain View, California home](#). Swapping its own Google car for modified Lexus RX450h crossover vehicles, the streets of Austin, Texas have become another test laboratory.

Delphi, a major automotive parts supplier, also developed and tested its own autonomous car by embarking on a cross-country journey this past spring. Traveling from San Francisco to New York City, [Delphi's autonomous vehicle](#) took nine days to drive 3,400 miles through 15 states. The vehicle successfully performed the journey while driving itself for 99% of the time.

According to Cruise Automotive, a tech startup founded by a group of MIT graduates, the wait for automated vehicles is already over. For owners of 2012 model year or newer Audi A4 and S4 vehicles, the company can [convert a normal car into an automated one](#) for only \$10,000 by installing its RP1 highway autopilot system. While Cruise Automotive used Audi models as test subjects for the new system during its development, the technology fits for use on any car. This possibility presents a third path toward autonomous vehicles beyond HMI and cars developed specifically for automated driving.

How safe would driverless vehicles have to be for you to seriously consider one?

When it comes to considering the use of driverless vehicles based on their safety, 68% of respondents require autonomous cars to be safer than modern vehicles, with 49% adamant the cars be significantly safer than normal cars built today. Only 32% of survey participants expressed interest in self-driving vehicles so long as they provide the same amount of safety as modern cars. The remaining respondents require higher levels of safety beyond what is provided by automakers currently. One of the reasons why many automakers are taking the HMI route toward automated driving is due to concerns regarding consumer acceptance of such emerging technologies.

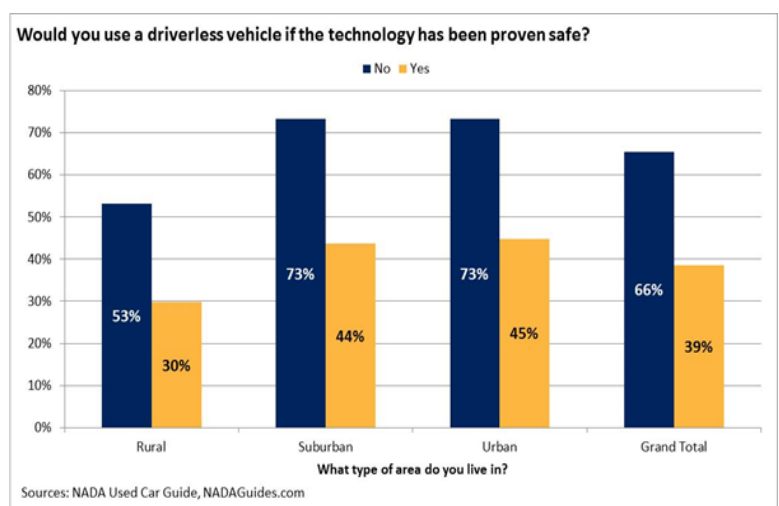


Many within the auto industry believe the jump to autonomous cars cannot bypass HMI technology altogether since a seamless relationship between humans and their machines is a foundational condition toward consumer acceptance. The challenges wouldn't end at HMI either as the V2X (vehicle-to-vehicle/-infrastructure/-pedestrian), cloud, and satellite technologies that complete the automated connected vehicle environment require significant advancement if automated cars are to offer significant safety beyond what's presently available.

Would you use a driverless vehicle if the technology has been proven safe?

Approximately 57% of respondents expressed interest in allowing their cars to drive themselves. Among suburban and urban drivers—likely those faced with driving in heavier traffic conditions regularly—62% and 58%, respectively, voted they would be in favor of utilizing sufficiently safe self-driving cars. The preference of rural drivers was more akin to the odds of a coin toss, as only 51% would welcome using the technology themselves.

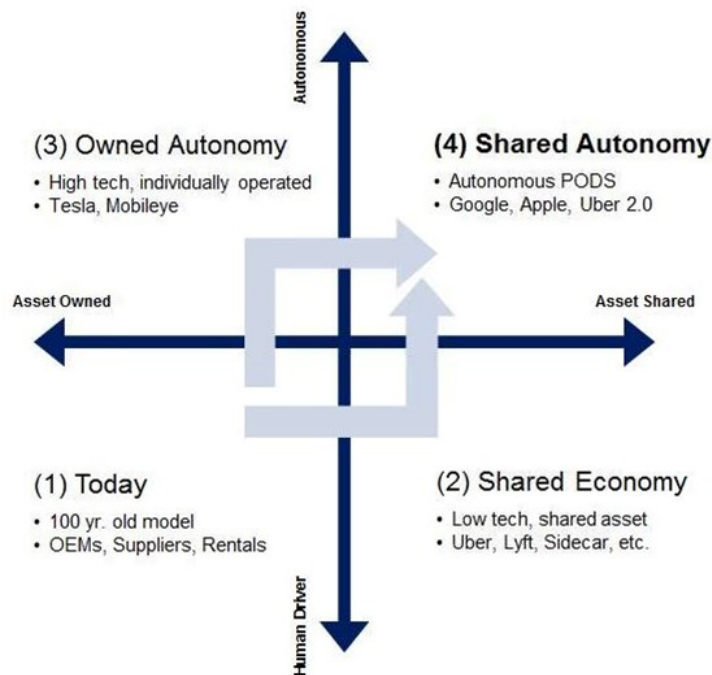
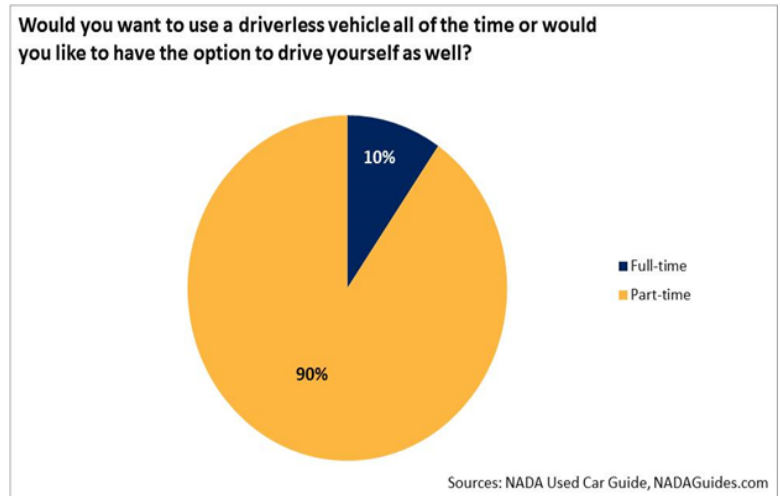
Interestingly, when participants were prompted to provide examples of the most significant benefits they anticipate receiving from the use of driverless



vehicles, many were focused on safety—or, more precisely—fewer accidents. Not having operators behind the wheel could potentially eliminate many of the safety concerns individuals have when commuting, such as driver fatigue, distracted driving, human error, and impaired driving. Positive side effects of driverless vehicles potentially include improving traffic flow, faster travel, and improved fuel economy.

Would you want to use a driverless vehicle all the time or would you like to have the option to drive yourself as well?

Perhaps the most interesting result of the survey, over 90% of survey participants said they would prefer a part-time automated car as opposed to a full-time vehicle. Whatever the public’s reasons for wanting to drive are, it is clear they envision both scenarios in which they would use the car’s self-driving capability, as well as others in which they would choose to drive themselves. This outcome is striking since it indicates consumers are unwilling to adjust their lifestyles if it means they completely relinquish the opportunity to own and drive a car. For those not harboring the same sentiment, a “shared economy” already exists, where companies such as Uber, Lyft and Sidecar provide ride-sharing services.

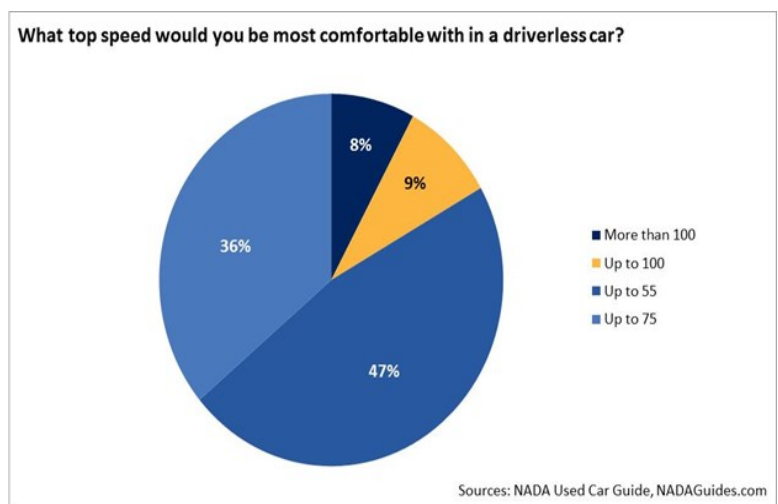


In an “owned autonomy” environment, where drivers step aside and let computers assume complete control, McKinsey & Company, a strategic management consulting firm, speculates certain changes occurring in the auto industry. For example, car insurers may potentially shift their business model away from consumer coverage (involving the risk of accidents caused by human error) toward insuring OEMs (original equipment manufacturers) from liabilities (caused by malfunctioning of their self-driving cars). Also, the rise in free time from not having to drive could increase business opportunities in digital media, since riders would be able to consume more entertainment on the go. In tandem, accident rates could possibly drop by as much as 90%, saving tens of billions of dollars in the United States alone.

Meanwhile, Morgan Stanley automotive analyst, Adam Jonas, takes it a step further by [predicting a future “shared autonomy”](#) where people no longer drive or share cars. Instead, commuters would utilize fleets of autonomous “pods” that operate at all hours of the day to meet their transportation needs. Though the auto industry may reach a stage in which “shared autonomy” exists, it’s critical to consider the importance of consumer acceptance before jumping to such conclusions. The responses from both Questions 4 and 5 clearly indicate the level of buy-in for self-driving cars is nowhere near unanimous, which means a combination of the four quadrants in the chart above is more likely than a total commitment to any sole quadrant in the future. It is probably fair to reason every aspect of the industry will change once autonomous vehicles become prevalent, however it may be somewhat unrealistic to assume wholesale changes in consumer preferences will occur.

What top speed would you be most comfortable with in a driverless car?

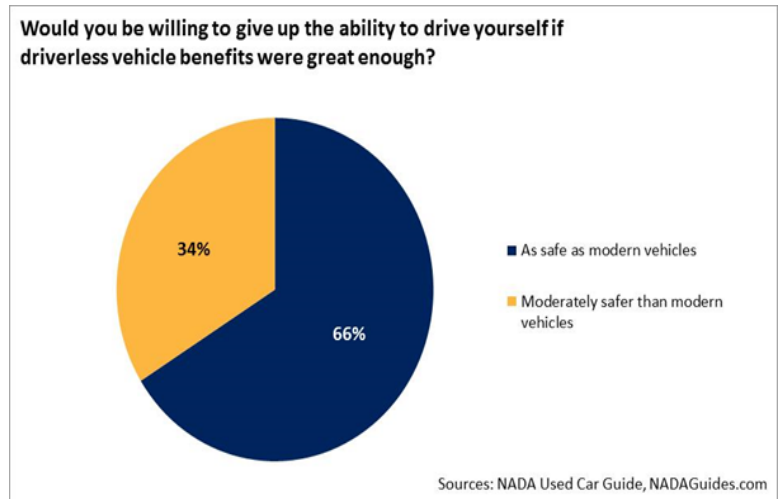
When it comes to the top speed in which passengers would be most comfortable in a driverless vehicle, 47% of respondents favor 55 mph or lower, while 36% think 75 mph or less is acceptable. Less than 17% believe speeds above 75 mph are satisfactory, yet many of the responses are similar to current speed limits on major highways today. The [Solomon Curve](#) indicates a U-shaped relationship between crash incidence and vehicle speed, with variability in speed playing a major role in the occurrence of car accidents. With autonomous vehicles eliminating most of the variability in speed as well as human error, many people predict a significant decrease in accident rates, while increased traffic flow and efficiency allow vehicles to travel even faster. Nevertheless, from a safety standpoint, it appears survey participants would



rather continue to commute at today’s familiar speeds until they become comfortable with the ability of automated cars to manage driving at high speeds.

Would you be willing to give up the ability to drive yourself if driverless vehicle benefits were great enough?

While there is much speculation about a world full of autonomous vehicles being attractive for commuters and providing numerous benefits to society, when asked if they’d be willing to give up the ability to drive (so long as driverless vehicle benefits were great enough), 66% of survey participants said, “No.” The fact only about a third of the respondents are comfortable with adopting a new “shared autonomy” alludes to a vast majority of people not being interested in fully surrendering the option to drive—no matter how amazing the advantages of autonomous vehicles are. This implies drivers believe there is definite opportunity cost involved, and the ability to drive oneself is an enormous benefit that outweighs all of the collective benefits offered by self-driving vehicles.



Many technology companies are determined to offer automated cars to the public as soon as possible and have been very secretive about the development of these products thus far. NADA Used Car Guide’s findings imply people are not as head-over-heels about self-driving cars as one might think. Most of the players within the auto industry are taking a slow-and-steady approach with HMI technology to create a gradual bridge to autonomous driving, and it looks like consumers are in favor of this methodology. However, if major innovations from organizations such as Google or Apple prove to be popular, automakers and suppliers may find themselves in a vastly different-looking automotive landscape. In just a handful of years, we may find out the answers to all of these questions, but if the voice of modern day drivers is any indication, humans are going to choose to get behind the wheel of their cars for many years to come.

AT NADA USED CAR GUIDE

What's New

The NADA Appraisal Suite is launched! Tired of the back and forth? Turn your entire appraisal process into something your customers can truly understand. Select NADA Appraisal, starting at \$99/month with an annual subscription, or upgrade to NADA AppraisalPRO to include additional market data from trusted industry sources. Both provide you with an official appraisal document, backed by NADA, which gives customers the confidence to sign. Learn more at nada.com/appraisal or call 866.974.6232.



On the Road

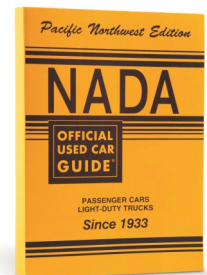
Stop by our display in Las Vegas and meet Doug Ott at the 38th Directors and CEOs Leadership Convention, August 4 – 7.

Say, “Hi” to Doug Ott at the International Association of Assessing Officers Conference in Indianapolis, September 13 – 18.

Doug Ott will attend the Virginia Commissioner of the Revenue Annual Conference in Portsmouth, Virginia, September 19 – 23

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Since 1933, NADA Used Car Guide has earned its reputation as the leading provider of vehicle valuation products, services and information to businesses throughout the United States and worldwide. NADA’s team collects and analyzes over one million combined automotive and truck wholesale and retail transactions per month. Its guidebooks, auction data, analysis and data solutions offer automotive/truck, finance, insurance and government professionals, the timely information and reliable solutions they need to make better business decisions. Visit nada.com/b2b to learn more about solutions for your business and nada.com/usedcar to stay abreast of the latest used and new vehicle market trends.



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NADA CONSULTING SERVICES

NADA’s market intelligence team leverages a database of nearly 200 million automotive transactions and more than 100 economic and automotive market-related series to describe the factors driving current trends to help industry stakeholders make more informed decisions. Analyzing data at both wholesale and retail levels, the team continuously provides content that is both useful and usable to the automotive industry, financial institutions, businesses and consumers.

Complemented by NADA’s analytics team, which maintains and advances NADA’s internal forecasting models and develops customized forecasting solutions for automotive clients, the market intelligence team is responsible for publishing white papers, special reports and the Used Car & Truck Blog. Throughout every piece of content, the team strives to go beyond what is happening in the automotive industry to confidently answer why it is happening and how it will impact the market in the future.

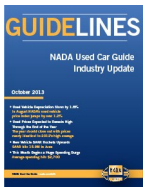
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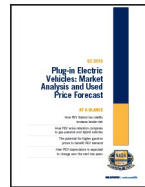
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Guidelines

Updated monthly with a robust data set from various industry sources and NADA’s own proprietary analytical tool, *Guidelines* provides the insight needed to make decisions in today’s market.



White Papers

NADA’s white papers and special reports aim to inform industry stakeholders on current and expected used vehicle price movement to better maximize today’s opportunities and manage tomorrow’s risk.



NADA Perspective

Leveraging data from various industry sources and NADA’s analysts, *NADA Perspective* takes a deep dive into a range of industry trends to determine why they are happening and what to expect in the future.



Used Car & Truck Blog

Written and managed by the Market Intelligence team, the Used Car & Truck Blog analyzes market data, lends insight into industry trends and highlights relevant events.

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