DRIVEN TO LEAD

TOYOTA'S MULTI-PATH STRATEGY TO A CARBON NEUTRAL FUTURE

THE ROAD TO THE FUTURE is driven by need, desire, and to a great extent, passion. That passion manifests in diverse ways. For many, it's the imperative to drive vehicles that speak to one's sense of style, safety, connectivity, or self. These days, another imperative – the urgent need to address carbon emissions and environmental sustainability – is driving new car buying decisions. Filling all of these needs has long been Toyota's mission. Turn the page to learn more.

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TOYOTA

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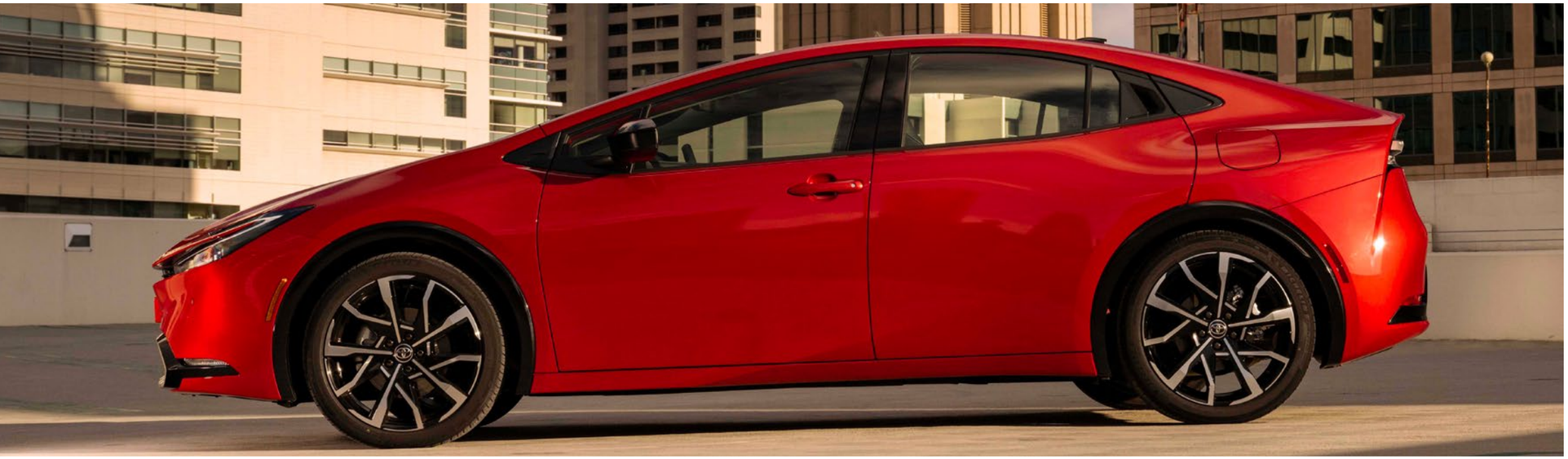
CHANGING THE FUTURE OF CARS

PROVIDING ANSWERS WITHIN REACH OF ALL



A decisive strategy is required to achieve the carbon reductions necessary to drastically reduce the automobile's impact on climate change. In fact, Toyota has an aggressive target of decreasing new vehicle carbon emissions globally by more than by 50 percent by 2035, and has accelerated its efforts to accomplish this. Important to realizing this goal is an expanding multi-path approach to powertrains to meet the distinctive needs of drivers in diverse markets.

"We are committed to reducing carbon emissions as much as possible and as soon as possible," shares Ted Ogawa, president and CEO of Toyota Motor North America. "To achieve this goal, customers must have access to a portfolio of powertrain options that meet their needs now and in the future."

This portfolio approach, which benefits drivers through no- or low-carbon powertrain choices that fit their unique circumstances and budgets, is not new to Toyota. In fact, Toyota's role as a pioneer in advanced technology vehicle powertrains has witnessed more than 23 million of its efficient hybrid electric (HEV), plug-in hybrid electric (PHEV), battery electric (BEV), and hydrogen fuel cell electric vehicles (FCEV) make their way to the world's roads and highways. That's more than all other auto manufacturers combined, and a sign of Toyota's commitment to lead the way with a comprehensive and achievable decarbonization strategy.

IT STARTED WITH THE PRIUS

The 1997 introduction of the Toyota Prius on the world stage was a watershed moment, and a triumph for Toyota scientists and engineers who had been tasked with accomplishing a very difficult mission: Create a highly efficient powertrain that provides an alternative to traditional gas or diesel engines.

The Prius both accomplished the mission and brought about a new way of thinking that's led the auto industry as a whole to embrace gasoline-electric hybrid powertrain technology. At Toyota, the years following the launch of the first-generation Prius have brought more than 23.9 million Toyota HEV/PHEV units globally that have cumulatively reduced CO2 emissions by more than 162 million metric tons. In North America alone, a CO2 reduction of some 82 million metric tons has been achieved by the more than 5.4 million Toyota and Lexus HEV/PHEV units operating on our highways.

Long synonymous with hybrid vehicles, the Prius illustrates how Toyota HEVs have evolved over time to meet the changing needs of the market. Initially introduced as a small four-door sedan and then a five-door hatchback, this year's all-new generation Prius transformed from an iconic model of eco-consciousness to one that retains this quality with up to 57 combined mpg, but with a more refined silhouette and highly acclaimed levels of sportiness, style, and performance.

The importance of these alternative powertrains in Toyota's carbon reduction strategy is underscored by the many, and growing, highly efficient electrified options available within the Toyota and Lexus brands. A plethora of electrified vehicles are offered across a full line-up that includes mass-market passenger cars, SUVs, trucks, luxury vehicles, and even a family-friendly minivan. New models also offer powerful and efficient electrified powertrains like the Toyota Crown and the new generation Toyota Tacoma, Lexus GX, and Lexus TX. Some, like the 2023 Sequoia and Sienna or the coming 2024 Toyota Land Cruiser, exclusively feature hybrid electric power.

CHAMPIONS OF CO2 REDUCTION

Hybrids have become so mainstream it can be easy to overlook their significance in the quest to reduce carbon emissions. Masahiko Maeda, Toyota's chief technology officer, points to Toyota's calculations that indicate three HEVs achieve a nearly equal CO2 reduction effect as one BEV.

This revelation is important since HEVs come at a comparatively affordable price, thus their CO2 reduction effect is realized in massive numbers. Beyond this, the powertrain shows its advantage by allowing

vehicle electrification to be realized in areas where plug-in public charging infrastructure is not readily available, is not easily accessible for those living in multi-unit housing, or where renewable energy is not yet prevalent.

"On the other hand," says Maeda, "Toyota believes that the increased use of all-electric, zero-emissions vehicles, or ZEVs, such as BEVs and FCEVs, is important in regions where renewable energy is abundant."

To this end, Toyota continues to evolve its electrified product lineup and has significantly expanded the pace of its PHEV, BEV, and hydrogen-powered FCEV activities. By 2025, an electrified option is planned for every Toyota and Lexus model globally.

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BUILDING A BETTER FUTURE

POWER OF PERSONAL CHOICE: A SUITE OF ELECTRIFIED OPTIONS

Even as conventional HEVs have been Toyota's most recognizable environmental champions, a new breed of hybrid vehicle has emerged: the plug-in hybrid electric vehicle (PHEV). This innovative eco option was introduced just over a decade ago but is gaining significant interest with consumers of late.

Equipped with the same advanced Hybrid Synergy Drive as the standard Prius HEV while also equipped with a larger traction battery pack, the first generation 2012 Prius PHEV offered a glimpse at all-electric commuting with a range of 15 miles of driving on zero-emission battery power, plus the ability to conquer longer road trips by offering more than 500 miles total driving range in HEV mode. This advanced propulsion technology was a major breakthrough that provided options to drivers, serving the needs of those who wanted to drive electric in a mainstream vehicle during the week and not need a second car for road trips over the weekend.

The electric-only capabilities in Toyota PHEVs have evolved over the years. Today the Prius Prime PHEV features an extended range of up to 44 miles of all-electric driving, nearly three times that of the first-generation Prius PHEV. Another popular vehicle in the segment is the RAV4 Prime compact crossover, which offers 42 miles of battery electric driving, enough to cover the average daily commute in the U.S., and well over 500 miles of overall range. For drivers who travel less than 40 miles per day, this effectively means driving a zero-emission electric vehicle without the need to carry the heavier weight of a full BEV or pay its higher cost. Even if their commute is closer to 40 miles one way, if they can plug-in to charge at their place of business during working hours, they can effectively drive on all-electric power to and from work.

Lexus has also expanded the brand's PHEV offerings to support its expanded electrified vision, which strives to reduce carbon and achieve carbon neutrality with luxurious vehicles that deliver high performance and a thrilling driving experience. Its latest addition is the new RX 450h+, a luxury SUV with up to 35 miles of all-electric driving to complement its hybrid operation. It joins the NX 450h+ subcompact luxury SUV that Lexus has offered over the past several years, which provides up to 37 miles of all-electric driving.

A GROWING LINEUP OF BATTERY ELECTRIC VEHICLES

PHEV technology has become an important part of the powertrain portfolio offered by both the Toyota and Lexus brands. At the same time, an accelerated focus is in place to introduce a comprehensive line of Toyota and Lexus battery electric vehicles (BEVs) in the short years ahead.

The company's electric vehicle strategy took form last year with the introduction of the battery-electric Toyota bZ4X. The first model of a planned global series of mass-produced battery-electric vehicles under Toyota's bZ (Beyond Zero) brand umbrella, bZ4X is replete with the many advanced infotainment and driver assist technologies desired by customers today. bZ4X is a futuristically styled electric crossover SUV featuring an EPA-rated driving range of up to 252 miles and a 119 combined MPGe (miles-per-gallon equivalent) efficiency.

Lexus also released its first all-electric model for the U.S. earlier this year, the Lexus RZ 450e luxury SUV. The RZ 450e is the first of many all-electric vehicles coming to the brand as Lexus aims toward exclusively offering battery electric vehicles globally by 2035. With distinctive style, luxury appointments, and an engaging driving experience synonymous with Lexus vehicles, the RZ 450e blends high efficiency with exceptional performance: 0-60 mph acceleration in just 5 seconds, an electric driving range up to 220 miles, and an EPA-estimated 107 MPGe rating.

These aforementioned BEVs are just the beginning. Toyota is already developing next-generation BEVs designed and engineered on an all-new dedicated EV platform, optimizing everything from their batteries to the way they are manufactured. The first of these will be introduced to the Lexus lineup by 2026.

Overall, Toyota has set a pace to sell a global base volume of 1.5 million BEVs in 2026 and is targeting worldwide sales of 3.5 million BEVs per year in 2030. The plan includes launching 10 all-electric models ranging from compacts to luxury vehicles, as well as commercial vehicles, primarily in the U.S. and China.

A FOCUS ON U.S. EV MANUFACTURING

Toyota has invested more than $8 billion in the company's U.S. manufacturing operations over the past two years, much of this supporting its vehicle electrification activities in North America. By 2030, Toyota's global investment in vehicle electrification will surpass $70 billion.

Starting in 2025, the company's first U.S.-assembled electric vehicle, a new three-row battery electric SUV, will be built at Toyota's manufacturing facility in Georgetown, Kentucky, Toyota's largest manufacturing plant in the world. The company is also planning a new automotive battery plant currently under construction in Liberty, North Carolina, that will come online in 2025.

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EXPLORING THE ROAD AHEAD

ACCELERATING EFFORTS TO REALIZE A HYDROGEN SOCIETY

"We are boldly preparing for the future," says Koji Sato, president of Toyota Motor Corp., as he shares the company's vision for the years ahead. "As one of our efforts, we will do our utmost to develop next-generation BEVs for the era of BEV popularization and create new business models. And we will also accelerate projects for the realization of the hydrogen society that lies just beyond."

An important part of Toyota's hydrogen strategy emerged with the introduction of the Toyota Mirai hydrogen-powered fuel cell electric vehicle (FCEV) in the U.S. five years ago, focusing on select markets where hydrogen fueling stations are available. Mirai, which means "future" in Japanese, is one of the world's first mass produced passenger FCEVs. It is also a high-profile example of how an advanced zero emission future is taking shape on our highways today.

The Mirai, like all FCEVs, generates its own electricity using hydrogen gas as a fuel to power an electric motor rather than relying on a large battery pack. Its Toyota Fuel Cell System (TFCS) creates carbon-free electricity through a chemical reaction in a solid polymer electrolyte fuel cell using stored hydrogen and oxygen from the air. Water vapor is the only byproduct. Filling the Mirai's carbon fiber fuel tanks with compressed hydrogen takes about five minutes – similar to filling up a car with gas. All this brings a familiar driving experience and a zero-emission range up to 402 miles without the need to plug in.

HYDROGEN AT SPEED

Toyota's hydrogen vehicle activities are evident on the track as well as on the highway. Racing allows honing for Toyota's hydrogen technology while pursuing the important goal of promoting carbon neutrality in motorsports. Toyota has fielded a hydrogen-engine Corolla in races over the past several years and used this experience to refine its technology.

The next challenge: Le Mans…in a hydrogen car. Toyota has been competing at Le Mans for decades and with hybrid race cars since 2012. Now, organizers for the legendary 24 Hours of Le Mans have added a new hydrogen category for hydrogen engine and hydrogen fuel cell electric vehicles. Toyota is already gearing up with its hydrogen hybrid GR H2 Racing Concept developed with an aim at future competition.

DELIVERING THE GOODS

While racetracks deliver excitement, commercial vehicles of all sizes deliver everything else. Focusing on the benefits of hydrogen here is important since some 40 percent of the world's automotive CO2 emissions are produced by commercial vehicles.

Fuel cell technology is a good fit for zero-emission commercial trucking. Hydrogen is a lightweight energy/fuel source compared to batteries and can be stored in less space. That means hydrogen fuel cell electric trucks needn't carry heavy stores of on-board energy like batteries to provide power, even over long distances. They can drive hundreds of miles and refuel quickly with hydrogen, allowing a more equivalent payload to conventional diesel trucks.

Toyota is working with global partners like Daimler Truck, Hino Motors, and Mitsubishi Fuso to help create a more sustainable future for commercial vehicles with the use of hydrogen power. In the U.S., Toyota previously partnered with Kenworth to develop Class 8 hydrogen-powered fuel cell electric vehicles that use Toyota fuel cell systems and powertrains scaled for heavy-duty transportation.

Ten of these modified Kenworth T680 FCEVs recently completed a two year "Shore to Store" demonstration project at the Port of Los Angeles, logging 30,000 zero-emission miles while reducing 74 metric tons of CO2 per truck annually compared to baseline diesel trucks. As a next step, Toyota is taking its scaled fuel cell technology from prototype to production later this year as it begins producing fuel cell powertrain modules at Toyota Motor Manufacturing Kentucky for its trucking industry customers. Parent company of Kenworth, PACCAR, recently announced that it will commercialize Toyota's heavy-duty fuel cell powertrain kit in Kenworth and Peterbilt trucks.

HYDROGEN'S UNIVERSAL APPEAL

While its primary focus is on improving transportation across the globe, Toyota has expanded the horizons of its vision of a hydrogen society in general. In recent years Toyota has been involved in a joint project with the Japan Aerospace Exploration Agency (JAXA) as part of "Team Japan" in developing a pressurized lunar rover for manned space exploration. The rover is aptly nicknamed "Lunar Cruiser," alluding to the rugged, go-anywhere Toyota Land Cruiser that's conquered terrain all around our world. Powered by Toyota's hydrogen fuel cell technology, the vehicle is being designed to reliably accomplish its mission of transporting astronauts in a vehicle capable of exploring otherworldly harsh terrain, with hopes that it will arrive on the moon as early as 2029.

MAKING EVER-BETTER CARS

The automotive world is changing in many ways and Toyota is committed to leading the way. Evolving to meet the needs of drivers and society is in Toyota's DNA, just as it was in the 1930s when Toyota strategically expanded from manufacturing textile looms to building cars.

The core values that drivers have embraced for many decades – safety, style, performance, and driving excitement – are baked into Toyota and Lexus models sold around the world. Efficiency, a cornerstone for Toyota, is delivered from advanced manufacturing know-how along with innovations that include advanced engines and electrified powertrains. Connectivity and the integration of advanced electronics, including driver assist and active safety systems, are all available to Toyota buyers. Still, the evolving transportation ecosystem is demanding more, and Toyota is delivering.

BUILDING THE FUTURE

Examples abound, like Toyota's comprehensive Arene software platform and operating system that will lend additional intelligence to Toyota models for interacting with social infrastructure, with plans for implementation starting as early as 2025. There are also next-generation safety technologies, such as the autonomous and driver assist systems now in development, and advanced propulsion R&D projects, including an emphasized focus on batteries that will greatly increase EV driving range and decrease charging times, at lower cost. Toyota is also working with others to develop second use and recycling of batteries, including their materials, to create a closed-loop battery ecosystem for electrified powertrains.

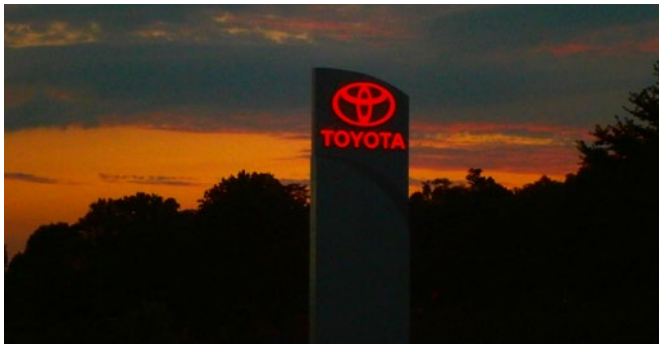
"We are explorers researching ways to make cars better, but we're also discovering what mobility may mean beyond cars," says Dr. Gill Pratt, Toyota's chief scientist and CEO of the Toyota Research Institute (TRI) in California's Silicon Valley. Among TRI's diverse areas of focus is the critical goal of meeting the growing demand for mobility without emitting carbon. Other activities range from investigating bio-inspired technologies and using artificial intelligence to identify optimum catalysts for applications like fuel cells, to capturing CO2 from the atmosphere and converting it into high-value products.

NEW WAYS OF MAKING VEHICLES

Advances are being incorporated in the Toyota Production System, which for decades has been a world standard for efficient, repeatable, and cost-effective manufacturing. Here, production in some Toyota manufacturing plants will see self-driving electrified vehicles move themselves during assembly without requiring a fixed conveyer system, saving costs and adding flexibility to auto manufacturing.

An all-new modular EV structure comprised of front, center, and rear body sections will benefit Toyota's next generation EVs. Giga casting – aluminum die casting – coming to Toyota manufacturing will be capable of creating an entire vehicle section all at once. A dramatic illustration is that giga casting the rear section of an electric bZ4X could be done in a single process, creating a single part, rather than requiring the 33 press processes and 86 sheet metal parts required for this bZ4X section today.

"Growth is about being able to continuously change ourselves in response to ever-changing needs of customers and society," said chairman Akio Toyoda in his earlier years as president of Toyota Motor Corporation. These words still resonate today as Toyota transforms from the world's largest automaker to the world's largest mobility company, one dedicated to bringing a more environmentally sustainable future for us all.



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