

# THE NEW TOYOTA PRIUS

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**TOYOTA**

ALWAYS A  
**BETTER** WAY





# TABLE OF CONTENTS

## THE NEW TOYOTA PRIUS

|           |  |           |   |
|-----------|--|-----------|---|
| <b>4</b>  | THE REBIRTH OF THE PIONEER                                 | <b>32</b> | INTERVIEW: WASSIM KANOUN, MARKETING MANAGER |
| <b>10</b> | INTERVIEW: KOUJI TOYOSHIMA, CHIEF ENGINEER                 | <b>34</b> | GREATER DRIVING APPEAL                      |
| <b>12</b> | THE THREE PILLARS OF THE NEW PRIUS                         | <b>40</b> | SPECIFICATIONS                              |
| <b>24</b> | INTERVIEW: VINCENT DEWAERSEGGER,<br>SENIOR PRODUCT MANAGER | <b>42</b> | IMAGE BANK                                  |
| <b>26</b> | HIGH-TECH THEN, NOW AND ALWAYS                             |           |   |

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# THE REBIRTH OF THE PIONEER

The introduction of the all-new fourth generation Prius is the next milestone in the history and achievements of Toyota's hybrid power technology.





## THE REBIRTH OF THE PIONEER

**THE NEW PRIUS BUILDS** on the strengths and achievements of its predecessors and establishes new benchmarks in fuel economy, emissions and efficiency. Each successive Prius has delivered improvements in these areas, but the new Prius makes the biggest leap yet, with CO<sub>2</sub> emissions falling to a historic low of 70 g/km.

This achievement is only one aspect of a car that has evolved to acquire new capabilities, more engaging styling and new fun-to-drive character, adding new and compelling dimensions to its customer appeal.

Powered by a new generation of Toyota's full hybrid powertrain, the new Prius makes significant advances in fuel economy (combined cycle fuel economy from 3.0 l/100 km) and provides a much more rewarding driving experience. Acceleration is smoother and more responsive, quieter and has a more linear feel that is better aligned to engine speed.

The new car's dynamic capabilities are rooted in its use of the first platform developed under the Toyota New Global Architecture (TNGA) philosophy. At a stroke, this endows the car with a lower centre of gravity (~2.5 cm), securing better handling response and stability. It has also given the designers a freer hand to craft a car that has richer visual appeal, with lower lines overall and a more athletic profile. TNGA also helps define the "peace-of-mind" interior, with its excellent packaging, a lower and more engaging driving position and higher comfort levels. Load space is improved thanks to the use of a smaller, more energy-dense hybrid battery that is located entirely beneath the rear seats and a new double wishbone rear suspension system – features which do not intrude in trunk capacity.

The Prius remains Toyota's technological ambassador, a showcase for new, relevant technologies that raise levels of safety, convenience, performance and comfort.

Safety remains a priority, with the TNGA-based chassis optimised for excellent impact performance. The scope of the Toyota Safety Sense package is extended in the new Prius with addition of radar-managed Adaptive Cruise Control with Full Speed Range Following Function and a Pedestrian Detection function for the Pre-Collision Safety system.

The full hybrid powertrain has undergone extensive revisions to improve efficiency, reduce weight and sharpen performance. Detailed design changes to the engine have resulted in a 40 per cent thermal efficiency – a world-best performance for a petrol unit. Other hybrid

**THE NEW CAR'S DYNAMIC CAPABILITIES ARE ROOTED IN ITS USE OF THE FIRST PLATFORM DEVELOPED UNDER THE TOYOTA NEW GLOBAL ARCHITECTURE (TNGA) PHILOSOPHY.**

system components have been made lighter and smaller and have been repositioned for optimum packaging, further contributing to the car's lower centre of gravity. The new nickel-metal hydride hybrid battery is more compact than in the previous generation model, with an even better durability and charging performance.

In combination, these changes and innovations confound the popular notion of what an eco-car should be like to drive and to look at. They reflect how, now that hybrid technology has moved in 15 years from the fringes to become a mainstream choice, customers expect more than exceptional environmental performance – they equally require a car that offers style, ease of use and real driving pleasure. The new Prius demonstrates the genuine rewards that remain to be enjoyed from Toyota full hybrid technology, together with appealing new characteristics in terms of performance, convenience and fun-to-drive quality, advantages that will steadily feed through to new generations of other Toyota hybrid models.

### **PRIUS HERITAGE**

In 1997 the original Toyota Prius was launched with the declaration “just in time for the 21<sup>st</sup> century”. As the world's first mass-produced hybrid-powered car, it was true to the Latin roots of its name in being ahead of its time.

That first car was a compact four-door sedan, powered by a new hybrid system featuring a combination of 1.5-litre VVT-i Atkinson cycle petrol engine and 33 kW electric motor. Headline efficiency figures were 120 g/km CO<sub>2</sub> emissions and an average 5.1 l/100 km fuel consumption. This initial package was comprehensively redesigned and improved in the second generation model in 2003, with considerable gains in power and efficiency, plus a larger, more stylish, comfortable and practical hatchback design. The improved hybrid system adopted a smaller and lighter hybrid battery with a higher energy density. The fuel economy improved by 15 per cent to 4.3 l/100 km and CO<sub>2</sub> levels fell to a new low of 104 g/km.

The 3<sup>rd</sup> generation Prius made its debut in 2009, delivering an even stronger combination of power and efficiency. The hybrid system's output was now more than a third greater than in the original model, while at the same time CO<sub>2</sub> emissions had fallen by a quarter and fuel consumption was 23 per cent better.

The first generation Prius created the hybrid vehicle market, the second generation raised the model's popularity with a more advanced image, and the third generation secured mass-market success, helping Toyota progressively roll out hybrid power into its mainstream model ranges.

In its first 18 years, the Prius has reshaped the motoring landscape, bringing hybrid technology into the mainstream market and helping focus the attention of industry and consumers on how cars can be made cleaner and more efficient. The way in which people have come to understand, appreciate and adopt Toyota hybrid power is witnessed by more than eight million cumulative sales of Toyota hybrids worldwide since 1997, including more than 3.5 million Prius. The growth rate has accelerated



## THE REBIRTH OF THE PIONEER

in line with the technology's higher visibility and the availability of an increasing range of vehicles covering different market segments.

The fourth generation Prius will add further impetus to hybrid's market appeal, achieving its strongest environmental performance yet, while delivering much improved styling and driving dynamics.

Toyota's experience with the Prius has been central to its development of hybrid as a foundation technology for alternative powertrains, not just with conventional petrol and diesel engines, but with biofuels and hydrogen fuel cells as well. The basic technical premise that gave Toyota its breakthrough with Prius continues to support development of new mobility solutions, from the all-electric urban i-ROAD to Mirai, Toyota's first hydrogen fuel cell sedan.

### THE MARKET

The new car market has changed greatly in the 18 years since Toyota introduced the original Prius and set in motion its hybrid technology programme. Growing awareness of environmental issues and the need to protect natural resources have not only shifted people's perceptions of how a vehicle should perform, they have been reinforced by national and international legislation requiring manufacturers to reduce vehicle emissions.

These changes have helped Toyota hybrids establish themselves in markets worldwide and have also given impetus to other manufacturers in the development of rival hybrid systems and other alternatives to conventional petrol and diesel engines, such as all-electric vehicles and plug-in hybrids.

Hybrid has become Toyota's key competitive advantage, the principal quality that differentiates it from other manufacturers and which gives it a specific strength in the marketplace. This is reflected in the fact Toyota hybrids make up more than 50 per cent of all the alternative powertrain vehicles sold in Europe – more than all the other hybrids, plug-in hybrids and electric vehicles combined.

The way in which hybrid has become a driver for Toyota's success in Europe's core new car market segments is evidenced by sales figures for 2015 which show hybrids accounted for 55 per cent of all Auris sales and 36 per cent of Yaris sales. Furthermore, hybrid is bringing more new customers to Toyota, with these models attracting significantly high levels of conquest sales from other brands – up to 63 per cent for Yaris Hybrid and 51 per cent for Auris Hybrid.

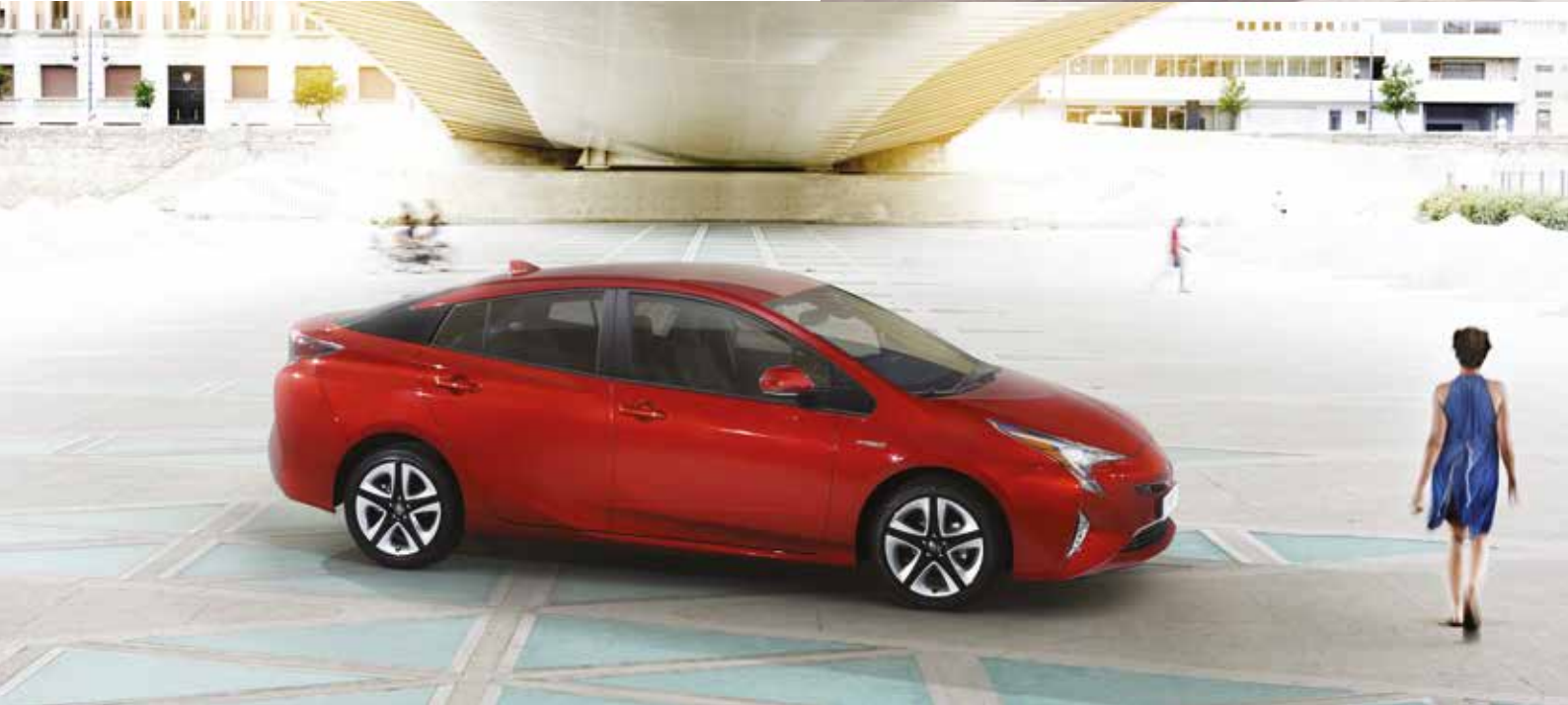
Toyota believes hybrid's market potential will increase further, with more people taking up the technology as the emissions performance of all vehicles comes under closer scrutiny and legislative control. At the same time, more manufacturers are following Toyota by introducing their own hybrid models, increasing competition and giving customers a wider choice.

Toyota will continue to enjoy the advantage of offering a full hybrid system, in which the electric motor can operate independently of the petrol engine. This allows the car to be driven in all-electric EV mode when possible, with zero fuel consumption and zero tailpipe emissions. These benefits are not available in "mild" hybrid systems, in which the electric motor can be used only to support the performance of a petrol or diesel engine.





Toyota believes that continuous improvement of its full hybrid technology will enable it to strengthen its market position, ahead of the wider uptake of alternatives such as plug-in hybrids, electric vehicles and fuel cell vehicles. Key challenges in securing this growth are to strengthen environmental performance while increasing the attractiveness of hybrids as desirable cars that are fun to drive. These qualities are fundamental to the new Prius, which sets new benchmarks for environmental performance while making a stronger emotional connection with customers through improved styling, quality and driveability.



## INTERVIEW: KOUJI TOYOSHIMA, CHIEF ENGINEER

***What did you want to achieve with the new Prius and how did you go about making it different from previous generations of the model?***

Prius has always been an ecological car, right from the start. That meant we knew it was important for the new model to maintain its role as an eco-leader, even though it faces more competition, from other hybrids and alternatives like electric vehicles. At the same time, we knew it had to create an emotional response, with an exterior design that is inspiring, passionate, perhaps even sexy. From the customer's point of view it had to be fun to see, touch and drive.

We wanted to achieve a metamorphosis, a beautiful transformation. The new model has the same eco-DNA as its predecessors, but it is an even better car. And certainly we wanted it to be fun to drive, making sure it provided the waku-doki (exciting) sensation that's an important aspect of modern Toyotas.

***This really is an "all-new" car, what kind of challenges did that present?***

The project has taken us several years to complete with an all new platform, exterior styling and "Iconic Human-tech" cabin, and a re-engineered, optimised powertrain. We invested a huge amount of care and consideration into what we did, all the time keeping in mind the smiles we wanted to see on customers' faces.

The first challenge was to keep the new car's weight in check, so I gave the team the go-ahead to think about how and where we could reduce vehicle weight from scratch. We also had the pressure of this being our first model to use a TNGA platform and the need to live up to the Prius' reputation for always delivering better fuel economy and emissions with each new generation.



***The improvements in efficiency are greater than ever. How was that made possible?***

Like world record-holder Usain Bolt, it's hard to find another one-tenth of a second or, in our case, one tenth of a litre. Success comes by challenging everything you do and by striving continuously to make even the smallest improvements, because they all add up.

Take the gasoline engine for example. Outwardly it seems it hasn't changed, with the same capacity and basic design, but in fact we have taken its performance to a much a higher level, with much better combustion and multiple, detailed measures that reduce its internal friction and give better heat management. With this level of scrutiny we have in fact made it the most thermally efficient in the world. Simply put, you get more power from every drop of fuel.

We paid the same close attention to all the other major elements in the hybrid system – the transmission, the electric motors and the hybrid battery. We reduced weight everywhere, it is as though they have all been put on a diet. We have managed to make things smaller as well, which let us improve the packaging, so we could relocate some items, such as the hybrid battery, saving space and helping lower the car's centre of gravity.

The hybrid battery is an interesting example of how we have been able to improve performance. Like before, it uses nickel-metal hydride technology, which we know suits the Prius' global market needs, but we've made it more compact, yet at the same time more powerful, faster charging and longer lasting.

***What factors determined the radical new look of Prius?***

We focused just as much on the exterior design as we did on the powertrain when it came to improving the new Prius' efficiency. We needed to come up with a design that delivers excellent aerodynamics, as well as great looks.

Our guiding concept for this was to “fold in the wind,” calculating how we could control air flow by effectively wrapping the car in a single veil of air. Our work was made easier thanks to a new wind tunnel which let us measure the airflow while the vehicle was actually moving. We produced model after model with millimetre-adjustments until we came up with the perfect body. We also had the benefit of the TNGA platform, which meant we could bring down the height of the roof, body and hood, achieving better aerodynamic performance without sacrificing headroom inside the car.

We had a young group of designers working on the car's exterior and they were committed to producing something really new. The new Prius is futuristic, but still retains some elements of being influenced by living things, so it manages to combine being a machine with having an emotional dimension.

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# THE THREE PILLARS OF THE NEW PRIUS

The new Prius is founded on the latest evolution of hybrid technology, delivering unprecedented efficiency and environmental performance. But beyond these credentials it embraces stronger emotional and performance qualities that give it wider and greater appeal to customers who appreciate eye-catching, original styling, high levels of sensory quality, practicality and a driving experience that is genuinely fun and rewarding.



## THE THREE PILLARS OF THE NEW PRIUS

**THE REALISATION OF THESE QUALITIES** in the new Prius is based on three pillars: the Toyota New Global Architecture (TNGA)-based platform, design and styling, and a new generation full hybrid system.

### TOYOTA'S FIRST TNGA PLATFORM

The new Prius is the first model to use a chassis based on Toyota New Global Architecture (TNGA). Known as the GA-C platform, this will also underpin other future models and will be joined by further platforms suitable for different vehicle applications, from compact sports cars to SUVs.

Prius' TNGA-based platform plays a defining role in the car's essential fun-to-drive quality, giving the car a lower centre of gravity compared to the current model, and securing a more engaging driving position and more precise and responsive handling, with less body roll. This means better handling can be achieved directly from the quality of the chassis and body without having to use firmer suspension settings, or compromising ride and comfort.

It makes a big contribution to the improved driving dynamics – beyond what might be expected of an eco-car. This quality is further supported by a body that is 60 per cent more rigid than before thanks to extensive use of high-strength steels and additional reinforcement to the centre pillars' lower structure and the panel connection. The result is superior, direct and responsive handling.

These qualities are also enhanced by the Prius' new double wishbone rear suspension, which produces one-third the level of shock when

driving on uneven roads compared to the current model. To achieve better handling with more direct response, the front MacPherson strut suspension has been revised with an increase in the incline angle of the shock absorbers and the use of slant bearings.

The chassis is fully able to harness the more responsive character of the new full hybrid system. Greater stability is maintained, body roll is much reduced in high-speed lane changes and performance is smoother on rough surfaces. On winding roads, new Prius holds easily to the driver's intended line and there is outstanding straight-line stability when driving at speed.

### ERGONOMIC EXCELLENCE IN VEHICLE PACKAGING

The benefits of the TNGA extend to new, defined lay-out rules for the position of different state-of-the-art components which simplifies

**PRIUS' TNGA-BASED PLATFORM PLAYS A DEFINING ROLE IN THE CAR'S ESSENTIAL FUN-TO-DRIVE QUALITY, GIVING THE CAR A LOWER CENTRE OF GRAVITY COMPARED TO THE CURRENT MODEL.**



vehicle design in key areas without detracting from the styling qualities that give each vehicle its individual character and appeal.

For example, the driving components – items such as the pedals, steering column and driver's seat – will conform to one of five different lay-outs according to vehicle type and platform. Previously much time was spent on millimetre-adjustment to define the most suitable design and arrangement of these components to achieve the optimum driving position in every new model. The TNGA solution provides an ergonomically ideal combination to suit the vehicle, in line with the floor height provided by the platform. Each lay-out can be further refined with detailed adjustment to the pedal and pedal operation angles and the position and angle of the steering column.

TNGA also brings a new approach to the design of the engine compartment, with a focus on placing components lower down in a more rationally organised “clean and tidy” space. In the new Prius this allows for better packaging, a lower vehicle centre of gravity and a more attractive, lower hood, which in turn improves safety by giving the driver a clearer forward view.

### **IMPROVED SAFETY PERFORMANCE**

Improved safety is another aspect of TNGA's contribution to the new Prius, and to future Toyota models. The new TNGA platforms and designs prioritise the highest active and passive safety standards. They are designed to meet the exacting standards of independent crash testing programmes worldwide and provide impressive levels of active and preventive safety through the functions and systems of Toyota Safety Sense.

## **STYLING AND DESIGN**

New Prius is not simply “another green car,” its design and high quality throughout give it greater emotional appeal and a powerful,

desirable presence, underpinned by the fundamental strengths of the new TNGA-based platform. As Toyota's most advanced car, it is appropriate that it is an image leader and the intention has been to produce a design that makes an immediate impact.

The car's new low-slung stance – made possible by the TNGA platform – suggests an excellent driving performance, supported by a distinctive new body silhouette that is both athletic and aerodynamically efficient. The result is a “human-tech” design with strong emotional quality, fully exploiting the opportunity presented by the car's lower centre of gravity.

Prius Chief Designer Shunsaku Kodama, who at 43 was Toyota's youngest chief designer when appointed in 2011, led a team whose youthfulness generated a natural enthusiasm to challenge the status quo, even for a vehicle as revered as Prius. He says their focus was to “inject ego” into the car by crafting a more powerful, engaging and sporty image that would increase pride of ownership beyond Prius' traditional ethical profile.

### **EXTERIOR**

The design theme for the new Prius has been to capture in the contrast created between the rich curves and hard surfaces of the bodywork. The result is a new form that stands out with its smooth yet sharp use of lines.

The frontal design is true to Prius's heritage in making the Toyota emblem a strong focal point, but it also makes an impactful visual statement about its more advanced design and performance with a much lower hood height. Notably the front emblem sits at the same height above the road as it does on the GT86 coupe. New headlights have permitted slimmer, more striking headlamp units to be designed and these combine with an intricate but unfussy treatment of the fog lights and air intakes to give the car a distinctive and intelligent appearance.

The lower part of the front bumper and the shape of the lower grille

## THE THREE PILLARS OF THE NEW PRIUS

and wheel arches have been designed to direct airflow around and under the vehicle. A novel feature in the car's airflow management is an electric shutter behind the large lower grille. Derived from motor sport technology, it opens and closes in line with the airflow cooling requirements of the engine; by remaining shut during cold starts, it helps save fuel by helping the engine reach its operating temperature quicker.

In profile, the Prius displays a silhouette that is lower and more athletic. The TNGA-based platform has allowed for significant reduction in height in key areas to create a lower, more dynamic appearance. The overall height has been reduced by 20 mm compared to the current Prius, to 1,470 mm. The peak of the roof has been moved forward by 170 mm, and the belt line has been dropped and angled forward and lower, emphasising the car's stronger dynamic qualities. The rocker panel displays a light-catching surface that starts from the lowest part of the front bumper, runs beneath the front door,

then races upwards, accentuating the car's low-slung stance.

The new model retains the 2,700 mm wheelbase of the current Prius, but is 60 mm longer overall at 4,540 mm. It is also 15 mm wider at 1,760 mm.

The new Prius has a unique aerodynamic treatment to the rear section of the roof, which supports the clean flow of air over and away from the vehicle. The length and angle of the rear spoiler have been precisely calculated and the bodywork tapers towards the rear corners, helping smooth airflow and reduce drag. The low roof and rear pillars are distinctively integrated using blacked-out panels that are shaped to draw air around the side windows to the rear of the car. Other aerodynamic aids include graduated vertical channels each side of the windscreen that direct airflow and rain water up and over the roof without generating wind noise. Aero stabilising fins are featured



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on the front quarterlight trim and rear combination lamp housings, which control air turbulence along the side of the car. The new TNGA platform is also designed for the smoothest possible airflow beneath the car.

In combination, the car's low wind resistance features secure a world-class 0.24 coefficient of drag.

The rear end design flows strongly from the rear spoiler down through the bumper, with the wheel placement further emphasising the car's firmly planted stance. The slim, striking combination lamps have been moved to the outer edge of the car, following a sharp angle that is accentuated by the distinctive, unbroken line of the red LED tail lights.

Toyota has produced a vibrant colour palette for the new Prius with seven exterior finishes available, including a new shade that is unique to the model, Emotional Red. This finish is created using a three-stage process that adds lustre, allowing light to pass through a translucent red layer and reflect off flakes of aluminium in the base layer.

### **"PEACE OF MIND" INTERIOR**

"Peace of mind" is the theme for the cabin, which is designed to be a welcoming, quiet and comfortable space, embracing the car's "human tech" design concept by being futuristic and stylish, yet rational and ingenious.

The design has been developed to make an emotional connection with the occupants through an improved quality feel and the use of simple, multi-functional displays that present information at a glance. The peace of mind factor is supported by better visibility front and rear, contributing to both safer driving and a lighter, more pleasant cabin atmosphere.

### **ENHANCED INTERIOR QUALITY FEEL**

The cabin has a strong design that is advanced, functional and makes a big visual impact. It inherits the intuitive concept of previous Prius

generations by consolidating operational functions closest to the driver and placing the information functions further away. The functionality of this approach can be seen in the layered construction of the dashboard with distinct control and display zones.

The dashboard wraps gently around the driver and flows almost seamlessly into the door panels. The number of different parts that make up the instrument panel has been reduced, for example the piano black section is now a single unit. This creates a strong visual contrast with the areas of the dashboard and door panels, finished in a high-quality white material that is scratch-resistant.

The dominant centre cluster has a silver-finish frame and a "floating" design, created using a sculpted and near-invisible rear mounting. The seven-inch touchscreen panel is designed like a tablet and allows intuitive operation of the audio and navigation functions, including "flick" actions to scroll through the displays. Two sound systems are available: a standard six-speaker audio package that gives



## THE THREE PILLARS OF THE NEW PRIUS

rich and clear sound quality, and a 10-speaker JBL audio unit that uses GreenEdge™ technology to deliver powerful output and excellent sound quality from smaller, lighter and more energy efficient speakers. The instrument cluster features dual 4.2-inch full colour TFT (thin film transistor) LCD screens with easy to read displays. The screen nearest the driver presents vehicle speed and ancillary information such as fuel level, odometer, trip meter, driving range, average fuel consumption, outside temperature and drive mode. The background colour changes according to the drive mode selected: blue for ECO, grey for Normal and red for Power. The second screen provides information about the hybrid system and eco-driving tips and performance, together with multimedia and climate control system details and driver assistance alerts.

The fine attention to detail can be seen in elements such as the Prius-logo's that decorate the air vents, while the high ergonomic quality extends to intuitive positioning and range of adjustment of the seats. The high sensory quality of the interior is further emphasised by a pleasingly tactile leather steering wheel trim. Two interior colour choices have been created for the new Prius – cool grey and black. Overall the cabin environment is light and spacious.

Quietness has always been a distinguishing characteristic of Toyota's hybrid vehicles and the new Prius provides a cabin environment that exudes a genuine sense of luxury in exceptionally low levels of noise, vibration and harshness.

### IMPROVED DRIVING POSITION

A reduction in the steering column angle from 24 to 20 degrees, a

lowering of the driver's hip point by 59 mm and a new seat design all help create a more natural and engaging driving position. The range of tilt adjustment has been increased, to accommodate a wider range of driver heights.

The front seats have been completely redesigned to offer more comfort while at the same time saving weight and space. They offer a snuggler fit, with better body holding that helps reduce fatigue on long journeys. The seat heating area has been increased, adding to the improved comfort level. The rear seats have also been revised for greater comfort and benefit from an improved armrest and cupholder.



## CONVENIENT STORAGE PROVISION

The efficient use of space inside the new Prius ensures ample provision of storage space. Thanks to the more compact hybrid system and HV battery and the new double wishbone rear suspension, there is no intrusion in the trunk space. The cargo floor is set 110 mm lower, expanding capacity to 457 litres when a temporary spare wheel is carried, 412 litres with a full-size spare and 502 litres with a tyre repair kit.

In the cabin the storage points have been made larger or have been reprofiled to improve their usability. They include front and rear door pockets, an overhead console, glove box and a console box with a removable inner tray. The console box's soft-close lid doubles as an armrest and it opens side way so it is easy for the driver to access. Two cupholders are provided in front of the console box.

## NEW HYBRID SYSTEM

The New Prius introduces the next generation of Toyota's signature hybrid powertrain, the first in a new family of powertrains that builds on the two pillars that have made Toyota hybrids popular with drivers across the globe: on the one hand their fuel efficiency, and on the other the relaxed and carefree drive that they provide.

Toyota has focused its efforts on making this next generation of hybrids even easier and more intuitive to drive. The system has been set up so that it gives a natural, immediate, but smooth response to any accelerator pedal input. Refined and confident, it delivers the right level of performance.

But of course, fuel economy has been improved as well, as demonstrated in new Prius' combined cycle economy starting from just 3.0 l/100 km. The new hybrid system comes in a more compact package that is lighter in weight and lower in cost. It reflects significant advances in battery, electric motor and petrol engine technologies.



The new hybrid battery offers higher energy density. Whilst its total power was maintained, its size could be reduced by 10%. And what's more, it can now absorb 28% more energy in the same amount of time, which means that it charges faster than before. The electric motors are smaller in size, yet also provide a better power-to-weight ratio. And the thermal efficiency of the petrol engine – at 38.5 per cent already very high on the current Prius – is increased to more than 40 per cent – a world's best for a petrol unit.

## IMPROVED PETROL ENGINE

As in the current model, Prius' hybrid system features a 1.8-litre VVT-i Atkinson cycle petrol engine. However, the unit has been completely re-engineered to deliver significantly better fuel economy. The gas

## THE THREE PILLARS OF THE NEW PRIUS



flow, combustion, cooling and knock control have all been improved and much more effective use is made of exhaust gas recirculation.

Toyota has developed a heat recovery system that uses spent exhaust gas to speed the warming up of engine coolant. This means fuel can be saved because the hybrid system is able to stop the engine earlier and more often when it isn't needed to power the vehicle. The engine is also helped to reach its optimum operating temperature more quickly thanks to a new dual-passage cooling system that can reduce the volume of coolant flowing into the engine, when required. This helps improving efficiency during cold weather.

Further work has been done to reduce energy losses, particularly through eliminating friction. Measures include the use of thin-section, resin-coated connecting rod bearings and a low-friction camshaft chain. Friction created by the piston skirts, rotating parts and oil pump has been reduced and a new electric water pump has helped cut the level of losses.

Conical "beehive"-type springs have been adopted to reduce the valvetrain load. And, to ensure comprehensive improvement, the entire engine underwent CAE analysis to achieve the best rigidity and to reduce noise and vibration.

The intake and exhaust systems came under particular scrutiny, resulting in an engine that enjoys better breathing, air filtration, packaging efficiency, reliability and quietness. The air filter has been made smaller and reduced in height, which helped the designers bring down the line of the hood. The new intake system has a resonator that creates less noise at noticeable frequencies and the intake duct is made of a porous material that suppresses resonance.

A fresh air inlet duct has been added to make sure ample air volume



is obtained at motorway speeds and a clever air/fluid separating structure has been added to keep water and snow from mixing with the intake air. Should the fresh air duct fill with water or snow, a secondary inlet serves as the air intake.

A thinner silencer secures optimum performance and noise reduction, while also improving the underbody aerodynamics and avoiding any intrusion on the space available in the trunk.

The engine block has V-shaped drilled paths that reduce losses in water jacket pressure. There is also a new water jacket spacer which helps control cylinder wall temperatures in the combustion chamber, reducing friction and preventing engine knock, which in turn supports optimum ignition timing.

Engine cooling has been improved with a new cooling module structure and attachment, and a redesign that accommodates a lower hood line and helps reduce the car's centre of gravity. There is a new grille shutter behind the radiator which automatically closes when full airflow isn't required, improving aerodynamic performance and saving fuel.

While engine cooling helps improve anti-knock performance, it can lead to an increase in cooling heat loss. To help counter this, Toyota engineers have developed a new water jacket spacer to control temperature on the surface of the cylinder. This keeps engine oil warmer with lower viscosity and reduces the temperature fluctuation. This helps reduce friction and allows more engine torque to be generated. At the top end of the temperature scale it reduces temperatures in the combustion chamber.

The engine's maximum output of 98 DIN hp/72 kW is delivered at 5,200 rpm, with peak torque of 142 Nm at 3,600 rpm.

### **WORLD-BEST THERMAL EFFICIENCY**

Thermal efficiency is a measurement of how well an engine converts the energy available in its fuel into usable energy to power the vehicle. As a result of the large-volume exhaust gas recirculation



system, improvements in combustion efficiency and innovative ways of managing heat and reducing friction, the new Prius' engine has a maximum 40 per cent thermal efficiency, the highest level in the world for a mass-produced petrol engine. This surpasses the 37 per cent of the first Prius' 1.5-litre unit and the 38.5 per cent level of the 1.8-litre engine in the third generation model.

### **IMPROVED EXHAUST GAS RECIRCULATION**

The exhaust gas recirculation system in the new Prius has an EGR cooler which lowers the temperature of the gas being circulated, thereby reducing the temperature of the intake mixture and suppressing engine knock. This allows ignition timing to be advanced, which contributes to better thermal efficiency. Cooling loss has been reduced by eight per cent as a consequence.

## THE THREE PILLARS OF THE NEW PRIUS

### **MULTI-SHAFT TRANSAXLE – A HYBRID FIRST**

The new Prius has a redesigned transaxle that offers more efficient performance and packaging and reduced weight. Its smaller dimensions, notably a 59 mm decrease in length, have allowed the auxiliary battery to be relocated to the engine compartment.

The transaxle houses four components: two electric motor-generators (MG1 and MG2); a single planetary gear; and a reduction gear to the final drive. MG1 serves primarily as a generator, converting any surplus power from the petrol engine into electricity, which can be stored in the HV battery. It also serves as the engine's starter motor. MG2 is the electric drive motor, which also acts as a generator when the car is in regenerative braking mode. It drives the car from start-up, at low speed and in EV (electric vehicle) mode and is the sole propulsion method when the vehicle is in reverse.

### **IMPROVED HYBRID SOFTWARE**

Updates to the hybrid system software allow the new Prius to draw more on its electric drivetrain, allowing it to accelerate in a low engine rev range. It also has permitted the speed range of the electric motor (the range in which the electric motor can be used exclusively) to be increased by 60 per cent, compared to the current model. This means there is less dependency on the petrol engine at higher speeds, improving fuel economy.

### **SMALLER, BETTER ELECTRIC MOTORS**

The two motor-generators are all-new and are smaller and lighter than before to suit the new multi-shaft transaxle design, with no negative



affect on fuel economy.

Higher motor speed and new forced water-convection cooling in place of air cooling improve the efficiency of the electric-drive motor (MG2), which delivers 53 kW of power and 163 Nm of torque.

### **FULLY REDESIGNED POWER CONTROL UNIT**

The power control unit (PCU) has been totally redesigned, resulting in



a 33 per cent reduction in size, a six per cent weight saving and a 20 per cent reduction in electrical losses. The PCU is the multi-purpose electrical heart of the vehicle, housing the inverter/voltage booster, a DC/DC converter for auxiliary power and the electronic control for the motor-generators.

In place of a belt-driven alternator the new Prius uses a DC/DC converter to recharge the 12-volt auxiliary battery by using the HV battery energy.

#### **NICKEL-METAL HYDRIDE HV BATTERY**

The nickel-metal hydride (NiMH) battery is more compact, so can be



located entirely beneath the rear seats, avoiding any intrusion in the load space. It has increased cooling efficiency and the regeneration range. The new cooling system features an air filter in the intake bezel, which is located in the trim beneath the right rear seat.

#### **FUEL EFFICIENCY**

The fuel economy achieved by the new Prius marks the largest improvement between generations of the hybrid model, achieved thanks to improvements in the hybrid system and efficiency improvements throughout the car. This accomplishment reflects Toyota's philosophy of refining existing technology – the concept of having something good, then making it better.

Every aspect of the hybrid system has been made more efficient and these improvements deliver about half the gain that's been realised in fuel efficiency. The petrol engine uses less fuel; the electric motor-generators are smaller, lighter and more efficient; mechanical losses in the transaxle have been cut by 20 per cent; the power control unit is more efficient; and the nickel-metal hydride HV battery is lighter and more efficient. Further gains have been made by reducing the energy load of the air conditioning system, improving the rolling resistance performance of the tyres and creating a more aerodynamically efficient vehicle design.

## INTERVIEW: VINCENT DEWAERSEGGER, SENIOR PRODUCT MANAGER



**THE INTRODUCTION OF THE NEW PRIUS** is not just about a new generation vehicle, it also begins a new era of product development and manufacturing, the first application of the Toyota New Global Architecture. This has brought about a whole new way of thinking about how we design, produce and deliver our vehicles, starting with Prius and benefiting the cars we will build in the future, too.

The fundamental challenge we faced in developing the new Prius was what more we could do with an iconic car that effectively created the market for hybrids, maintaining its leadership in terms of technology and environmental performance. Of course today there are more competitors for Prius, not just hybrids but other alternative powertrains such as EVs and plug-in hybrids, both from other manufacturers and from within our own, growing hybrid model range as well.

We also knew we had to introduce an element of fun to the mix, delivering a stronger emotional aspect. This is what Akio Toyoda talked about when he said we would build ever-better cars and put smiles on the faces of our customers.

In terms of the hybrid driving experience, we have achieved the biggest improvement yet between generations of Prius with improvements of more than 20 per cent in fuel economy and CO<sub>2</sub> emissions. We have also given the car highway cruising fuel consumption that can be compared to a diesel, and with growing public concerns about air quality, Prius continues to offer exceptionally low NO<sub>x</sub>, as well.

We knew it was crucial, too, to improve the car's driveability and in

fact the driving experience has been transformed. Using the TNGA platform has lowered the centre of gravity and we have introduced a new double wishbone rear suspension and made the body 60 per cent more rigid, all important elements in securing better driveability.

We listened to customers and the press, and challenged the engineers to reduce the powertrain noise under acceleration. The result is a tremendous improvement in linear acceleration feel and noise, both from low to high and mid to high engine speeds.

New Prius makes a big visual impact, with a design that reflects its advanced qualities. In the course of recent generations, the Prius' styling had become diluted and the car lost some of its distinctiveness, becoming more mainstream in appearance. Although the new generation still features the signature triangular silhouette and a forward roofline, its look is far from traditional. The design has genuinely strong character that contrasts with its more conservatively designed competitors. Because Prius has an important image-making quality, we could afford to be bold and explore new styling opportunities.

**THE FUNDAMENTAL CHALLENGE WE FACED IN DEVELOPING THE NEW PRIUS WAS WHAT MORE WE COULD DO WITH AN ICONIC CAR THAT EFFECTIVELY CREATED THE MARKET FOR HYBRIDS, MAINTAINING ITS LEADERSHIP IN TERMS OF TECHNOLOGY AND ENVIRONMENTAL PERFORMANCE.**

The result is quite radical and in fact the looks are perfectly aligned with what the car wants to achieve. It gets away from Prius looking like any other car and projects a much stronger emotional quality.

You can see this in the cabin as well, where the guiding principles were to create a peace-of-mind environment with a "human-tech" approach. The wrap-around interior, with a natural flow from the door panels to the dashboard, centre console and instrument panel, makes you feel comfortably cocooned inside the car. The white inserts in the console were a strong element in the interior concept from an early stage in the design development. Of course, special attention has been paid to practicality – they are highly scratch-resistant so will continue to look good.

Prius has always been a high-tech model and it was vital to retain and advance that quality. We have accomplished a great deal in this area, not least with what we provide with the Toyota Safety System and other features such as the Blind Spot Monitor and Rear Cross Traffic Alert that warn the driver of hazards they can't see from wheel. The way information is communicated to the driver has also been improved, with the larger head-up display and the use of two TFT displays in the instrument panel. Together with convenience and comfort features, such as the wireless phone charger and the intelligent, energy-saving air conditioning system, we have further extended the benefits of what we can achieve with new technologies.

The result is to make the new Prius a genuine breakthrough car. Everything is new and advanced, but at the same time, the car remains competitively priced. It's affordable high-tech.

# HIGH-TECH THEN, NOW AND ALWAYS

Since the launch of its first generation in Japan in 1997, Prius has maintained its status as Toyota's technology ambassador, an eco-car that regularly brings valuable next-generation technologies and innovations to the marketplace.

The achievements made by the first three generations provide an impressive platform on which the all-new fourth generation Prius is able to make even greater advances.





## HIGH-TECH THEN, NOW AND ALWAYS

**THE APPLICATION OF A WIDE RANGE** of new technologies in Prius takes safety and driver assistance to a higher level, improves comfort and gives clear and instant delivery of vital vehicle and performance data and information. The intention has been to create a truly integrated vehicle, with technology improvements that focus on a better experience for the driver and occupants.

### TOYOTA SAFETY SENSE

New Prius will make a significant advance in active and preventive safety measures with the adoption of Toyota Safety Sense. This package of integrated safety features is further extended in the new Prius with the addition of radar-governed Adaptive Cruise Control with Full Speed Range Following Function and a pedestrian recognition capability in the Pre-Collision Safety System.

These technologies help to reduce the risk of a collision and deliver additional benefits by making life easier for the driver and reducing fatigue.

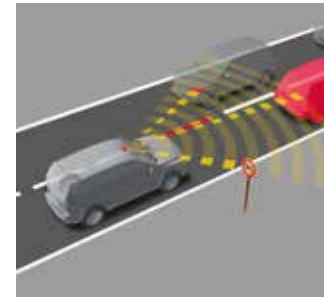
### PRE-COLLISION SAFETY SYSTEM

At speed ranges of between 10 km/h and the vehicle's top speed this system uses a front-mounted monocular camera sensor and millimetre-wave radar sensor to detect vehicles and pedestrians on the road ahead. If it calculates a risk of a collision, it automatically warns the driver with a buzzer and alert in the multi-information display. At the same time the Pre-Collision Brake Assist engages to provide extra braking force the moment the brake pedal is pressed. If the system determines that the possibility of a frontal collision with a

vehicle or pedestrian is extremely high, the brakes are automatically applied to help avoid the collision or help reduce the impact of the collision. Toyota's improvement of the technology has enabled it to recognise and react to the presence of pedestrians as well as vehicles and to function across a wider range of speeds.

### ADAPTIVE CRUISE CONTROL WITH FULL SPEED RANGE FOLLOWING FUNCTION

The new Prius' Adaptive Cruise Control with Full Speed Range Following Function makes use of the same millimetre-wave radar as the Pre-Collision Safety system to maintain a safe distance from the vehicle ahead, slowing the car to a standstill if necessary and accelerating smoothly back to the pre-selected cruising speed once the way is clear.



### **LANE DEPARTURE ALERT**

Lane Departure Alert uses the camera on the windscreen to track the vehicle's course between lane markings painted on the road surface. If it judges that the new Prius is about to move out of its lane without the turn indicator being used, the system sounds a buzzer and lights up a warning on the multi-information display. If the vehicle is still moving outside the lane, it will apply steering force to assist the driver to bring the vehicle back on course.

### **AUTOMATIC HIGH BEAM**

Automatic High Beam uses the same windscreen-mounted camera as the Lane Departure Alert. This recognises the lights of oncoming vehicles or traffic ahead, automatically switching the headlights to low beam to avoid dazzling other road users and returning them to high beam as soon as the road is clear, maximising night-time illumination and the driver's field of vision.

### **ROAD SIGN ASSIST**

Road Sign Assist uses the front camera to recognise principal highway/motorway warning and command signs. These are then repeated on the multi-information display, reducing the risk of the driver not being aware of speed limits, lane closures and other important information.

### **ADVANCED SAFETY AND DRIVER ASSISTANCE SYSTEMS**

The new Prius is available with additional systems that support safer driving by giving the driver better real-time information about the area immediately around the car, including a Blind Spot Monitor and Rear Cross Traffic Alert.

The Blind Spot Monitor uses radar sensors mounted on the rear corners of the vehicle to detect nearby vehicles in adjacent lanes as they move into the driver's blind spot. The driver is alerted to their presence by LED warning indicators in the door mirror on the appropriate side of the car. The LED indicators will remain illuminated

as long as the vehicle remains in the blind spot. If the driver operates the turn indicators, intending to move into path of the vehicle, the LEDs will flash rapidly to draw further attention to the hazard.

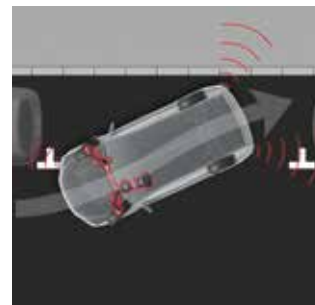
The same radars are used to provide the Rear Cross Traffic Alert, monitoring approaching traffic from either side as the vehicle is reversed out of a parking space and warning the driver if any vehicles are detected.

A new, intelligent parking sensor system helps avoid the kind of low-speed bumps that can happen during parking manoeuvres, regardless of accelerator and brake operation. It will also mitigate damage if contact does occur.

### **SIMPLE INTELLIGENT PARKING ASSIST SYSTEM**

The new Prius showcases Toyota's new Simple Intelligent Parking Assist system, which uses an array of sensors to identify viable parking spaces and surrounding objects. Improvements to the technology allow it to work in parking spaces up to 22 per cent smaller than previously.

The driver stops the car next to the parking space and pushes a single button to engage S-IPA, which guides the car to the correct position for reverse manoeuvring into the space. This system was developed to utilize the corner sensors for the parking assist.



## HIGH-TECH THEN, NOW AND ALWAYS

### **MULTI-INFORMATION DISPLAY**

Toyota has improved the look and performance of the multi-information display in the driver's instrument binnacle. Data and images are now presented in full colour with high resolution graphics on a dual, 4.2-inch display. The right-hand section presents speed, fuel level and other basic data and left section is a multi-display where the driver can select preferred content using a switch on the steering wheel.

The efficiency of the driver's driving style and the car's progressive fuel economy can be monitored, broken down into periods of five minutes, last kilometre, last five kilometres and one month.

### **COLOUR HEAD-UP DISPLAY**

For the first time in a Toyota vehicle, Prius is available with a colour head-up display. This projects essential vehicle data and alerts on to the lower section of the windscreen, making information instantly and easily readable without the driver having to taking their eyes off the road ahead. Content includes vehicle speed, the state of battery charge, hybrid system status, Adaptive Cruise Control with Full Speed Range Following Function setting and Lane Departure Alert.

### **INTELLIGENT S-FLOW AUTOMATIC AIR CONDITIONING**

The automatic air conditioning system is smaller, lighter and uses less power, benefiting from a new S-FLOW function to improve efficiency. It detects whether the front and rear passenger seats are occupied, using a sensor in the front seat and detecting when either of the

rear doors is opened and closed, and adjusts ventilation and heating performance accordingly, minimising air flow around any empty seats. It also monitors the air conditioning temperature settings, external temperature and the amount of sunlight to calculate the most efficient operating parameters.

Other advances in the system include a new evaporator that uses less energy and a new electric compressor that is quieter and delivers better cooling performance.

As well as making the cabin environment more comfortable, the system's multiple new features also improve fuel efficiency. The driver can monitor how efficiently the air conditioning is being used with a new Eco-judge function that calculates a performance score (out of 100) every second. Performance can be called up on the multi-information display; after the engine is turned off, an average score is displayed, with tips on how the air conditioning can be better operated.

### **WIRELESS PHONE CHARGER**

The new Prius is available with a wireless phone charger, located below the centre stack. Using Qi technology, this allows compatible smartphones to be recharged without having to connect a cable.



## INTERVIEW: WASSIM KANOUN, MARKETING MANAGER

**EVERY PRIUS LAUNCH** is an event in itself, with each generation creating a new milestone in making hybrid an even truer alternative to traditional petrol and diesel powertrains. The current third generation marked a breakthrough for hybrid technology, which had matured to the point where it appealed to a much greater number of customers. This prompted Toyota to introduce hybrid power in its core European models. That has helped us reach an impressive one million hybrid sales in Europe since 2000, with half a million of these achieved in just the past three years.

There is no doubting the important impact Prius continues to make for the Toyota brand. It remains our hybrid technology flagship and is the precursor of the next hybrid drive experience. Prius owners are great ambassadors for the car and its technologies; they proudly share their experiences and the day-to-day benefits that come with driving a Toyota hybrid.

The fourth generation Prius features the latest iteration of our hybrid powertrain and showcases the benefits that customers can expect from future hybrid models we will be bringing to the market. We believe people who have been sceptical up to now about the performance of hybrid cars will be pleasantly surprised. The fully revised powertrain and the first use of a Toyota New Global Architecture platform take the hybrid driving experience to an unexpected level, making it relaxing and enjoyable not just around town, but out on the open road as well.

It takes the three pillars of the Toyota hybrid driving experience – silent, responsive, intuitive – to a higher level, improvements customers will immediately notice when they get behind the wheel.

There's been a drastic reduction in noise from the transmission which helps make the cabin amazingly silent, and acceleration has been made more responsive thanks to extra support being provided by the electric motor. The intuitive quality has been increased by making the drive even smoother; there are no gear changes to make and the stop and start function has been fully integrated, with no perceptible delay in operation. Customers will also be pleased to learn that improved battery recharging means they can enjoy EV driving for longer on urban journeys.

These are the emotional benefits, but the new Prius provides greater rational benefits as well. These are key decision factors for fleet and business customers. The new model achieves the best improvement in fuel efficiency we have seen since the first generation model, with particular gains in highway fuel consumption. Thanks to a more sophisticated cabin design and higher standard equipment specifications, we expect the Prius's class-leading residual value to be strengthened further. The hybrid system will continue to deliver low running costs compared to traditional engines, an advantage supported by the findings of an independent German study<sup>1</sup> that compared costs over 36 months of ownership.

The new Prius is a pioneer of high-tech features. The Intelligent Park Assist can help you park the car in even smaller space – up to 1.5 metres shorter than before – and can now automatically steer you out of the space when you drive away. We have introduced a wireless smartphone charger, so you don't have to worry about forgetting your cable. The Adaptive Cruise Control can slow the vehicle right down to

<sup>1</sup> Fleet magazine "bfp Fuhrpark + Management"



standstill if need be, then give you smooth acceleration back to your chosen speed when the way ahead is clear. In all there are 22 sensors available around the vehicle, which we like to compare to giving you a sixth sense when you're driving, adding to the feel-good experience with much less stress, particularly in urban traffic.

The new Prius will make an important contribution to our target for hybrid to account for half of all our new car sales in western Europe by 2020, not just through sales of the model itself, but through its role as a generator of positive perception of Toyota hybrid technology, attracting more and more customers to our growing range of hybrids.

**PRIUS REMAINS OUR HYBRID  
TECHNOLOGY FLAGSHIP  
AND IS THE PRECURSOR  
OF THE NEXT HYBRID DRIVE  
EXPERIENCE.**



# GREATER DRIVING APPEAL

The new Prius' lower centre of gravity and increased body rigidity assists to deliver a safe and secure drive. Passengers enjoy a smooth, comfortable ride, with minimal roll.



## GREATER DRIVING APPEAL

**THE TNGA CONCEPT DELIVERS** an increase of more than 60 per cent in body rigidity, compared to the previous model, by using a ring-shaped, cyclical frame, laser screw welding (with a greater number of weld points) and structural adhesives. Together these contribute to achieving a more stable ride.

New Prius also uses a higher proportion of high-tensile strength steel in its construction, making good use of high-strength, lightweight hot-stamp materials to achieve rigidity of 980 Mpa and higher. The content of this quality of steel in the vehicle has increased from three to 19 per cent. Furthermore, our advanced 'Global Outstanding Assessment' (GOA) methodology for designing safer cars brings the benefits of light weight, stability and excellent collision safety performance.

The driving experience has been improved with better acceleration feel, achieved through an upgrade of the hybrid system control unit. Optimal use of the battery and electric motor have minimised the "rubber band" feeling when accelerating – the sense of a delay in acceleration when you press the throttle.

### IMPROVED REAL-WORLD PERFORMANCE

The new Prius accelerates from nought to 100 km/h in 10.6 seconds. Highway overtaking acceleration from 80 to 120 km/h can be accomplished in just 8.3 seconds and the top speed is 180 km/h.

The new hybrid system's output – petrol engine and electric motor combined – is 122 DIN hp/90 kW, and the drivetrain now delivers its power in a more user-friendly manner. The new Hybrid System allows the system to draw more on its electric power, which means



that acceleration feels more natural with the engine-revs building up gradually as the car picks up speed.

Day to day usability also improves significantly and the fourth generation Prius is the first that is able to pull a trailer, thanks to its 725 kg towing capacity (unbraked).

### SELECTABLE DRIVE MODES

The new Prius maintains the smooth, quiet and refined drive that has characterised previous generations of the model, its shift-by-wire transmission making it as easy to drive as an automatic. The driver can choose from three selectable driving modes – Normal, ECO and Power – to suit driving conditions and personal preference.

Furthermore, the driver can also select the EV mode, for short distances in pure EV driving, such as entering a parking or garage.

Normal mode provides a suitable balance between fuel economy and accelerator responsiveness. Switching to ECO mode optimises the powertrain and vehicle systems to prioritise fuel saving, adjusting throttle response and air conditioning performance. Power mode gives emphasis to acceleration feel.

The new Prius benefits from a drive assist system to provide a more responsive driving experience. The adaptive system continuously monitors the vehicle's G-forces to understand driver behaviour and habits, a function activated when the driver selects Power mode. The hybrid system responds to the driver's desire for more sporty performance, adjusting engine braking performance and throttle response.

### **IMPROVED FRONT SUSPENSION**

New Prius' high-rigidity body provides the ideal platform for a sophisticated development of its MacPherson strut front suspension, which has been revised with a focus on improved steering, handling response, stability and ride comfort. With a new rear suspension and improvements to the brakes and steering, Prius benefits from new underpinnings throughout.

The front suspension hardware, geometry and calibration have all been revised and the system has been equipped with new shock absorbers with a 37 per cent reduction in strut friction and a new piston valve that can generate damping force at very low damper speeds. This delivers better body control and optimum damping characteristics at high damper speeds, reducing impact harshness when travelling on rough and uneven surfaces.

Impact harshness has also been addressed by recalibration of the coil spring rates and spring pre-loading. The front anti-roll bar is mounted on a ball joint to help keep uncontrolled body roll to a minimum and the sliding parts in its bushings have been given a fluorine-resin coating to minimise friction.

### **NEW DOUBLE-WISHBONE REAR SUSPENSION**

The double wishbone rear suspension is all-new, designed to give the Prius higher levels of handling stability and ride comfort, including a more than 50 per cent improvement in impact shock damping. The layout offers numerous advantages compared to the current torsion beam system, including greater flexibility when it comes to fine-tuning its calibration.

The design builds on the foundation of the car's increased body rigidity and strengthened suspension mounting points. Key design features in its hardware and geometry include wide-mounted, forward-angled shock absorbers and compact coil springs. These give reduced friction for improved ride quality and their size and positioning frees up more space, allowing for a lower floor in the boot. Special aero under covers have been designed to smooth air flow around the new suspension system, part of a comprehensive underfloor aerodynamic package.



## GREATER DRIVING APPEAL

The forward angle of the new shock absorbers and careful tuning of the tyre movement curve combine to reduce longitudinal, low-frequency vibrations and suppress road shock. The rigidity and geometry of the suspension arms have been optimised to control toe change during suspension travel to give supple yet responsive handling and confidence-building stability.

Special attention was paid to reducing impact harshness through geometry and individual tuning of the bushings, with rubber bushings replacing ball joints in some key areas to allow for further fine tuning and reduction of high-frequency vibrations. The new double wishbone system features several bushings per side, compared with just one on the current torsion beam design; each can be tuned for different stiffness characteristics in two planes.

For example, the new trailing arm bushing is larger and calibrated to reduce lateral-force steer while controlling longitudinal force compliance. Soft trailing arm bushings and a low static friction property in all the bushings reduce road shock.

The trailing arm mount is positioned relatively high to optimise suspension travel, with the shock absorber strut and trailing bush mounting angles set to reduce harshness, road shock and stuttering. The anti-roll bar mounting system and calibration have been defined to secure high levels of roll rigidity for a comfortable, 'flat' ride. The superseded torsion beam suspension did not feature a separate anti-roll bar.

### NEW ELECTRIC POWER STEERING

The Prius was at the heart of Toyota's breakthroughs in development

of its Electric Power Steering (EPS) and many other models have since adopted the technology to benefit from its practicality and fuel-saving qualities.

The new Prius' steering has been redesigned and recalibrated, enhancing each phase of its operation. Feel, effectiveness and feedback have all been improved and a new, quicker steering gear ratio gives the steering a sportier quality.

The changes to the steering hardware and control software combine with the benefits of the car's new platform, lower centre of gravity and revised front suspension to improve controllability and the turning radius (from 5.2 to 5.1 m). Engineers have produced new steering rack ratios: 13.4:1 for models using 15-inch wheels (previously 17.6:1) and 13.6:1 for those on 17-inch wheels (previously 14.6:1). The system has gained a new, high-rigidity intermediate shaft that contributes to better steering effectiveness and greater feedback from the road surface, and it features a new, brushless electric motor that provides extra assistance when needed.

**FEEL, EFFECTIVENESS AND  
FEEDBACK HAVE ALL BEEN  
IMPROVED AND A NEW,  
QUICKER STEERING GEAR  
RATIO GIVES THE STEERING A  
SPORTIER QUALITY.**



The steering's centring feel has been improved by using an elastic support structure for the worm gear mechanism and a new control EPS control logic. The EPS logic has reduced the "no assistance" area when the steering is at or near centre, to give extra controllability in straight-line driving. A further new feature is EPS damping control, which gives the system the same feel in both the steering and return phases. The new Prius provides a more progressive build-up of assistance as steering is applied and great controllability on steering return. The new control logic also generates a lighter feel at low speeds and a precise feel and quick response at higher speeds.

Electric power assistance is always available, even when the petrol hybrid engine is shut down to save fuel.

### **NEW WHEELS AND TYRES**

Toyota has developed two new lightweight alloy wheels which complement the performance of the new Prius' suspension and improve handling stability by being more rigid. This higher rigidity also has an impact on the level of tyre resonance that's generated, thus reducing road noise.

The 15-inch wheel is 30 per cent more rigid and half an inch (+12.7 mm) wider at 6.5 inches (165.1 mm), enabling better grip to be gained from the new low rolling resistance tyres. The larger, 17-inch wheels feature new resin ornamentation and are 0.7 kg lighter than the equivalent wheels featured on the current Prius, reducing the car's overall unsprung weight and contributing to better handling and fuel economy. Keen to make savings wherever possible, Toyota has also shaved 1 kg off the weight of the temporary spare wheel.

All versions of the new Prius feature a Tyre Pressure Warning System. A sensor on each wheel triggers a warning light on the instrument panel if tyre pressure drops to a level that could compromise performance and safety. The system has an ID function that shows which wheel /tyre is affected.

### **ELECTRONIC BRAKE CONTROL WITH BETTER FEEL AND SECURITY**

The new Prius has a state-of-the-art Electronically Controlled Braking system (ECB) that precisely balances the requirements of both regenerative and friction braking. The system also cooperates with the vehicle's active safety technologies, including the ABS and Vehicle Stability Control (VSC).

The regenerative braking function uses the electric drive motor a generator, converting kinetic energy created when the vehicle slows down into electricity which can be stored in HV battery.

The friction-braking system uses lightweight, floating aluminium front callipers with lightweight resin pistons and ventilated 255 by 25 mm discs. The rear solid discs measure 259 by 9 mm and are also fitted with aluminium callipers.

A new active hydraulic brake booster and new pedal ratio help deliver quiet performance, controllability and improved braking feel. For ease of driving there has been a reduction in the degree of play in the pedal and an extension to the side of the brake pedal to make for smoother movement when switching from the accelerator.



## SPECIFICATIONS

| ENGINE                        | 1.8 VVT-I HYBRID                   |
|-------------------------------|------------------------------------|
| Engine code                   | 2ZR-FXE                            |
| Type                          | 4 in-line cylinders                |
| Fuel type                     | 95 unleaded petrol or higher       |
| Valve mechanism               | DOHC 16-valve with VVT-i           |
| Fuel system                   | Electronic Fuel Injection          |
| Displacement (cm³)            | 1,798                              |
| Compression ratio (:1)        | 13,04                              |
| Bore x stroke (mm)            | 80.5 x 88.3                        |
| Max output (kW)               | 72                                 |
| Max. Torque (Nm)              | 142 @3,600                         |
| <b>Hybrid system</b>          |                                    |
| Hybrid battery                | Nickel-metal hydride               |
| Nominal voltage (V)           | 201.6                              |
| Capacity (kWh)                | 1.31                               |
| Motor Generator               | 1NM                                |
| Type                          | Permanent Magnet synchronous motor |
| Max output (kW)               | 53                                 |
| Max. Torque (Nm)              | 163                                |
| <b>Total system</b>           |                                    |
| Max. power (DIN hp/ kW @ rpm) | 122/90 @ 5,200 rpm                 |
| Emissions level               | Euro 6                             |

| TRANSMISSION                           | 1.8 VVT-I HYBRID      |
|--|-----------------------|
| Type                                   | Planetary Gear System |
| Differential gear ratio (:1)           | 2,834                 |
| <b>PERFORMANCE</b>                     |                       |
| Max. speed (km/h)                      | 180                   |
| Acc. 0 - 100 km/h (seconds)            | 10,6                  |
| <b>FUEL CONSUMPTION (L/100)</b>        |                       |
| Urban 15"/17"                          | 2.9/3.3               |
| Extra-urban 15"/17"                    | 3.1/3.3               |
| Combined 15"/17"                       | 3.0/3.3               |
| Fuel tank capacity (l)                 | 43                    |
| <b>CO<sub>2</sub> EMISSIONS (G/KM)</b> |                       |
| Combined 15"/17"                       | 70/76                 |

| CHASSIS                              | 1.8 VVT-I HYBRID        |
|--------------------------------------|-------------------------|
| Front suspension                     | MacPherson strut        |
| Rear suspension                      | Double-wishbone         |
| <b>Steering</b>                      |                         |
| Overall ratio (:1) 15"/17"           | 13.4/13.6               |
| Lock to lock 15"/17"                 | 2.84/2.65               |
| Min. turning circle (m)<br>(15"/17") | 10.2/10.8 (tyre)        |
| <b>Brakes</b>                        |                         |
| Front (mm)                           | Ventilated discs (255)  |
| Rear (mm)                            | Solid discs (259)       |
| Tyres                                | 195/65 R15 - 215/45 R17 |
| <b>EXTERIOR DIMENSIONS (MM)</b>      |                         |
| Overall length                       | 4,540                   |
| Overall width                        | 1,760                   |
| Overall height                       | 1,470 (1,490*)          |
| Wheelbase                            | 2,700                   |
| Tread front (15"/17)                 | 1,530/1,510             |
| Tread rear (15"/17")                 | 1,520/1,540             |
| Front overhang                       | 950                     |
| Rear overhang                        | 890                     |
| Ground clearance                     | 123 (136*)              |
| Cd Drag coefficient                  | 0.24                    |
| <b>CARGO</b>                         |                         |
| Capacity (dm <sup>3</sup> VDA)       | 501                     |
| <b>Rear seats down</b>               |                         |
| up to the tonneau cover              | 1,054                   |
| up to the roof                       | 1,633                   |

| INTERIOR DIMENSIONS (MM)       | 1.8 VVT-I HYBRID |
|--------------------------------|------------------|
| Lenght                         | 2,110            |
| Width                          | 1,490            |
| Height                         | 1,195            |
| <b>WEIGHT (KG)</b>             |                  |
| Curb weight min/max            | 1,375/1,400      |
| Gross weight                   | 1,790            |
| Max towing capacity (unbraked) | 725              |

\* with rough road specification

# IMAGE BANK

## THE NEW TOYOTA PRIUS

### **Contents:**

- Word-, and PDF-files
  - Images Hires and Lores .jpg
- 

### **For editorial use only.**

The usage of this USB is strictly limited to editorial use. It shall not be used for any other purpose, not shall it be made available to any third party, without the prior written consent of Toyota Motor Europe NV/SA, Avenue du Bourget, B-1140 Brussels, Belgium.

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**More images available on [newsroom.toyota.eu](http://newsroom.toyota.eu)**





Prius\_EXT\_01.jpg



Prius\_EXT\_02.JPG



Prius\_EXT\_03.JPG



Prius\_EXT\_04.JPG



Prius\_EXT\_05.JPG



Prius\_EXT\_06.JPG



Prius\_EXT\_07.JPG



Prius\_EXT\_08.JPG



Prius\_EXT\_09.JPG



Prius\_EXT\_10.JPG



Prius\_EXT\_11.JPG



Prius\_EXT\_12.JPG



Prius\_EXT\_13.JPG



Prius\_EXT\_14.JPG



Prius\_EXT\_15.JPG



Prius\_EXT\_16.JPG



Prius\_EXT\_17.JPG



Prius\_EXT\_18.JPG



Prius\_EXT\_19.JPG



Prius\_EXT\_20.JPG



Prius\_EXT\_21.JPG



Prius\_EXT\_22.JPG



Prius\_EXT\_23.JPG



Prius\_EXT\_24.JPG



Prius\_EXT\_25.jpg



Prius\_EXT\_26.jpg



Prius\_EXT\_27.JPG



Prius\_EXT\_28.JPG



Prius\_INT\_01.JPG



Prius\_INT\_02.JPG



Prius\_INT\_03.jpg



Prius\_INT\_04.JPG





Prius\_INT\_05.JPG



Prius\_INT\_06.jpg



Prius\_INT\_07.JPG



Prius\_INT\_08.JPG



Prius\_INT\_09.JPG



Prius\_DET\_01.jpg



Prius\_DET\_02.jpg



Prius\_DET\_03.jpg



Prius\_DET\_04.jpg



Prius\_TEC\_01.JPG



Prius\_TEC\_02.JPG



Prius\_TEC\_03.JPG



Prius\_TEC\_04.JPG



Prius\_TEC\_05.JPG



Prius\_TEC\_06.JPG



Prius\_TEC\_07.JPG



Prius\_TEC\_08.JPG



Prius\_TEC\_09.JPG



Prius\_TEC\_10\_doublewishbonerearsuspension.JPG



Prius\_TEC\_11.JPG



Prius\_TEC\_12.JPG



Prius\_TEC\_13.JPG



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Prius\_TEC\_17.JPG



Prius\_TEC\_18.JPG



Prius\_TEC\_19.JPG



Prius\_TEC\_20.JPG



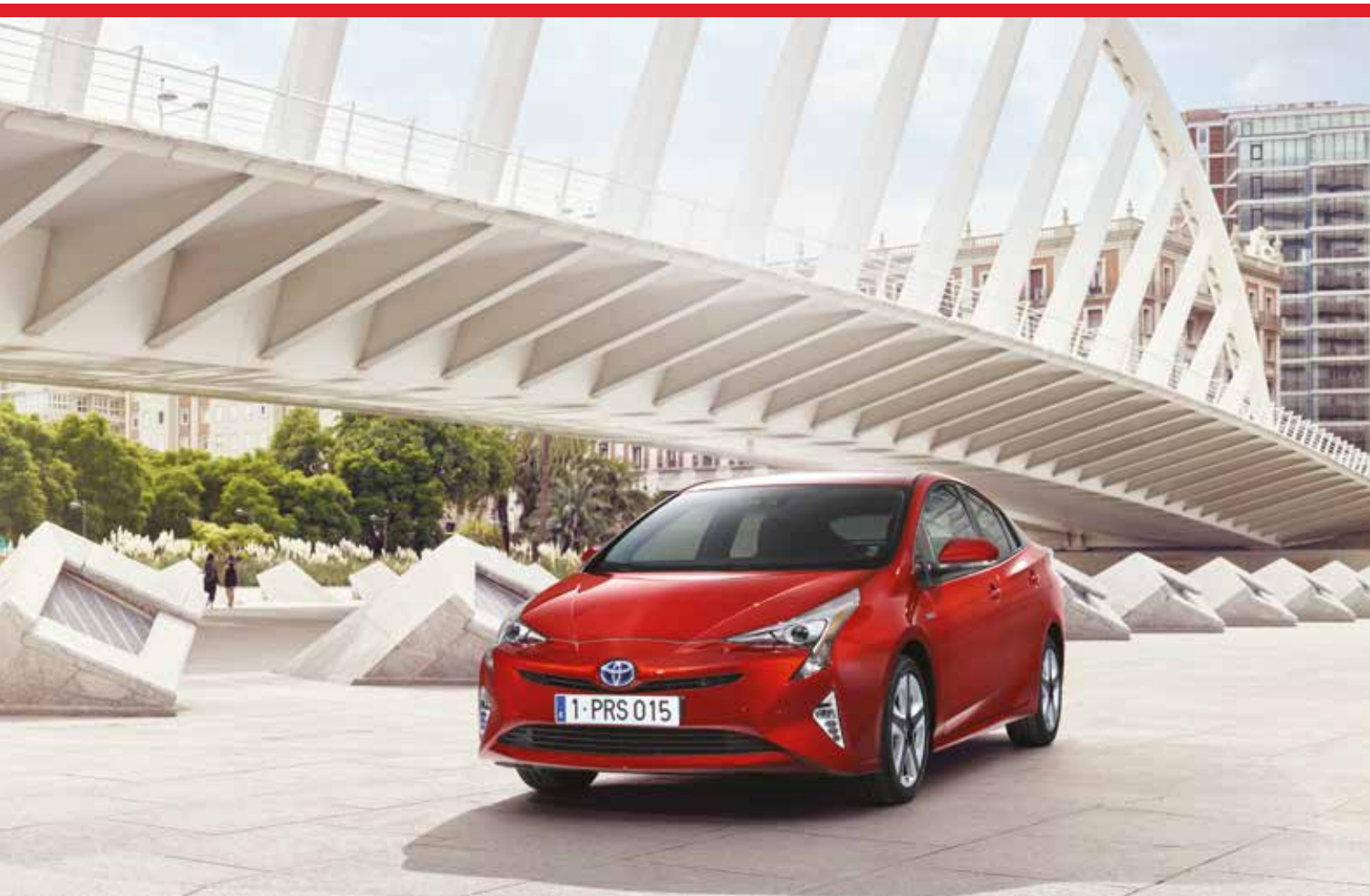
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Prius\_TEC\_22.JPG



Prius\_TEC\_23.JPG



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