BMW at the 2001 Frankfurt Motor Show.

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1. BMW at the 2001 Frankfurt Motor Show.

At the first Frankfurt Motor Show in the third millennium, BMW is setting a clear sign for the future: The absolute star of the show is the new 7 Series combining revolutionary solutions with evolutionary technology in a progressive body. Offering the iDrive control concept, the BMW 7 Series provides a unique range of functions and, at the same time, a drastic reduction and reorientation of control elements. New 8-cylinder power units with an unprecedented range of control and management functions plus the world's first six-speed automatic transmission improve both fuel economy and performance by 14 per cent.

745h: new 7 Series powered by hydrogen

The prototype of a hydrogen-powered 7 Series clearly underlines the cutting-edge technology of BMW's new top-of-the-range saloon. BMW's first zero-emission 8-cylinder offers unrestricted driving pleasure on the basis of an inexhaustible source of energy, standing out as the youngest product in BMW's CleanEnergy initiative. The objective of the hydrogen-drive 7 Series is to consistently introduce hydrogen into the market in a strategy given additional momentum by the 2001 CleanEnergy WorldTour. The new 7 Series is also the first product to become reality with another concept for the future developed by BMW: ConnectedDrive is the name of a fully integrated solution for the future interaction of the driver, the car and the environment on the road. To be specific, ConnectedDrive serves to relieve the driver of routine chores through the intelligent interaction and cooperation of assistance systems, allowing the driver to concentrate on his – or her – responsibility and the thrill of enjoying sheer driving pleasure.

M3 CSL:
lightweight sports car representing an entirely new concept.

The BMW M3 CSL Concept Car and the revised, updated 3 Series bear clear testimony to the features and characters so typical of the brand – features you can already experience today. Capitalizing on lightweight potential, the CSL offers the power and performance of a thoroughbred sports car of the highest caliber: This high-potential version of the M3 comes with a power-to-weight ratio under 3.5 kg/bhp (7.7 lb/bhp) not only making the M3 a keen competitor in terms of its performance data, but also enabling the driver to enjoy the genuine experience of Formula 1 with the SMG gearbox and Drivelogic. Incorporating two paddles on the steering wheel for shifting gears by wire, this trend setting gearshift has paved the way for the more or less identical system now also available in the 325i and 330i in most markets.

BMW's best seller, the 3 Series, stands out in new glory for the new model year with its sports suspension and an even clearer, more distinctive look on the sedan and sport wagon. This progress is then further enhanced not only by the Sequential Manual Gearbox already mentioned, but also by new engines and an extended range of series equipment.

Yet another high-performance BMW to be admired in Frankfurt is the X5 4.6is. Driven by a BMW 8-cylinder developing almost 350 bhp and modified exclusively for this Sports Activity Vehicle (SAV), the X5 4.6is offers the performance of a genuine sports car without giving up the outstanding features of the X5 concept.

2. The New BMW 7 Series.

The new BMW 7 Series points into the future of luxury performance motoring. Featuring progressive design language both outside and inside, an innovative control concept, and a wide range of highlights in technology, this outstanding car sets a new benchmark in its balance of performance, dynamism, safety, luxurious comfort and all-round economy.

The new 7 Series will again be available in two versions with the “standard” and extended wheelbase, both of which are to be admired at the 2001 Frankfurt Motor Show. The extra length of 140 millimeters or 5.5″ in the Li version serves exclusively to give the rear-seat passengers even more legroom and space in the car. This extra seating comfort comes together with an even more comfortable, upgraded range of interior features comprising, as just one example, pneumatic suspension on the rear wheels coming as standard. An additional range of new extras serves to further enhance the quality of driving the new BMW 7 Series, one example being the rear-seat air conditioning complete with a cooling box featured exclusively on the Li models and enabling the passengers at the rear to create their very own, individual climate zone.

The benchmark driver orientation and supreme comfort form: the iDrive concept.

iDrive in the BMW 7 Series is a new, trendsetting concept of advanced driver orientation and motoring: On the one hand, the new BMW 7 Series offers a unique range of functions and control options; on the other hand, the number of controls and instruments is dramatically reduced to a minimum in a clear-cut process of reorientation. Taking this consistent step into the future, BMW determined, for example, that the conventional shift lever in the middle of the front console or the conventional ignition key are technologically obsolete. The elements and features really required for motoring are arranged on and around the steering wheel, some basic functions also needed are in the middle of the instrumental panel. Most other functions – including all telematics services such as navigation, ASSIST and the BMW Internet gateway fully integrated into the car and allowing individual configuration tailored to the driver – are installed for the first time in the center console and are

activated by the driver in an intuitive process using the revolutionary Controller interacting with the Control Display. iDrive gives the driver intuitive, safe control of his car and comfortable access to the world of ConnectedDrive networking the various communication, information and navigation technologies.

A genuine benchmark in fuel economy and performance:
BMW's revolutionary 8-cylinder with the world's first six-speed automatic transmission.

A new generation of 8-cylinder power units ranks right in the forefront of the technological highlights featured by the new 7 Series. Incorporating infinite variation of virtually all relevant parameters such as valve timing (bi-VANOS), valve lift (VALVETRONIC) and – as another world-first achievement – the length of the intake manifolds, these new engines are able to adjust to all requirements with a degree of perfection never seen before. In practice, this uncompromising engine management allows BMW's 8-cylinders to set new, unprecedented standards: Fuel consumption is down by approximately 14 per cent, while maximum output is up by the same magnitude of roughly 14 per cent. The customer has the choice of a 3.6-liter engine in the 735i with maximum output of 272 bhp (200 kW) and torque peaking at 360 Nm (265 lb-ft) and the 4.4-liter in the 745i with maximum output of 333 bhp (245 kW), torque peaking at 450 Nm (332 lb-ft). For the US, SAE net figures fort the 745i and 745Li are 325 hp and 325 lb-ft of torque.

Power is transmitted by the world's first series-production six-speed automatic transmission. Highly efficient and compact, this state-of-the-art transmission system with integrated shift-by-wire technology is controlled by a new selector lever on the steering wheel and, respectively, by STEPTRONIC buttons on the upper half of the steering wheel rim. STEPTRONIC will not be offered initially on 745i/Li models in the US.

Featuring this innovative drivetrain, the new BMW 7 Series offers truly outstanding performance. Acceleration from 0–100 km/h (0-62 mph), for example, takes only 7.5 or, respectively, 6.3 seconds, top speed is 250 km/h or 155 mph on both models. At 10.7 liters/100 km and, respectively, 10.9 liters/100 km (26.3 mpg Imp and, respectively, 25.9 mpg Imp), fuel consumption in the composite EU cycle is extremely low and economical for cars of this caliber. Official 0-60 mph times and US EPA mileage ratings will be available later.

Setting the benchmark in driving dynamics and safety.

The new quality of driving culture offered by the BMW 7 Series is based on a whole range of progressive technologies. The all-aluminum suspension with BMW's new active Dynamic Drive suspension technology (known in the US as Automatic Ride Stabilization or ARS) , as well as the first ever continuously adjustable, map-controlled Electronic Damper Control (EDC) and pneumatic suspension with automatic self-leveling on the rear axle sets a new standard in every respect.

Passive safety is enhanced by BMW's Head Protection System, developed to a new standard. The Advanced Head Protection System (AHPS II) provides protection for both front and rear seat passengers. The front seats feature new active headrests. The extremely fast ISIS safety network ensures instantaneous exchange and transfer of all crash-relevant safety data by means of a decentralized, intelligent sensor concept activating the individual components even faster and more precisely in a selective on-demand process.

New flagship with 12-cylinder power unit from 2002.

The top model in the new BMW 7 Series will once again be the 12-cylinder sedan, now featuring an all-new 12-cylinder power unit. This new flagship scheduled to make its debut next year comes with the highest level of innovative equipment and boasts a six-liter power unit with VALVETRONIC technology within the engine compartment. Maximum output is in excess of 300 kW or 408 bhp and maximum torque is approximately 600 Nm or 442 lb-ft, ensuring absolutely supreme performance on the road, the outstanding engineering and technological qualities of this new car being born out by a significant reduction in fuel consumption and exhaust emissions.

The market launch of the 8-cylinder saloons in Europe will be on 17th of November 2001, in the USA in January 2002 and in the other markets in spring 2002, together with the introduction of the long-wheelbase versions (Li).

3. Built for the Future: BMW 745h with Hydrogen Drive.

With the new BMW 7 Series making its world debut, the market launch of the first hydrogen car is taking an important step toward reality. Just how close the hydrogen car now is to its actual introduction into the market is demonstrated clearly by the 745h prototype. The “h”, as the chemical sign for hydrogen, stands for this alternative drive system. During the production life of the new BMW 7 Series, the BMW Group will offer customers a hydrogen car built as standard on the basis of this new top sedan.

The BMW 745h comes with the first 8-cylinder engine featuring hydrogen drive. Displacing 4.4 liters, this V8 is largely identical to the new series-production engine with VALVETRONIC, bi-VANOS and the fully-variable intake manifold, supplemented, of course, by hydrogen injection developed to an even higher level. Like the former 750hL, the 745h is able, through its dual-mode technology, to run on both petrol and hydrogen with a complete tank and supply system on board for each type of fuel.

Running on hydrogen, the engine of the 745h develops maximum output of 135 kW or 184 bhp. Top speed is 215 km/h or 133 mph. The cylindrical hydrogen tank integrated in the luggage compartment providing a cruising range of 300 kilometers or 190 miles. Adding 650 kilometers or about 400 miles cruising range on petrol to this figure, we see that the 745h is able to cover approximately 1,000 kilometers or 600 miles without even filling up the tank.

CleanEnergy 7 Series in new design.

A number of design features distinguish the prototype BMW 745h from its conventional “brothers”: One example is the electrically adjustable fuel tank filler flap featured for the first time and making the process of filling up the tank even more convenient in future. This transparent filler flap is indeed reminiscent of the wonderful purity of water, clearly alluding to the CleanEnergy theme.

The wide exhaust tailpipe unit bears testimony to the dynamic performance and power of the car also provided by hydrogen drive. And the striking

exterior design of the BMW 745h with its CleanEnergy symbols naturally underlines the progressive drive technology offered by this car with its dual-mode hydrogen power unit.

Hydrogen burns without CO_2 emissions.

Running on hydrogen, the BMW 745i is just as friendly to the environment as any other drive system based on this progressive fuel. Hydrogen burns without generating any CO_2 emissions, the emissions responsible for the greenhouse effect and global warming. Part of the BMW Group's CleanEnergy strategy is the regenerative recovery of hydrogen using solar, wind and water power. This creates an ongoing, sustainable cycle. Breaking down water into oxygen and hydrogen in the process of electrolysis, ensures a smooth and refined combustion process in the engine itself and emits nothing but water.

The BMW 745h, in addition, comes with an APU Auxiliary Power Unit generating electricity for the car's various power-consuming items. While conventional batteries have to be charged by an alternator, this system based on a PEM (Polymer Electrolyte Membrane) fuel cell operates independently of the engine and is fed with hydrogen straight from the tank. This means that you can use power-consuming items such as the air conditioning or heating even if the engine is not running. The fuel cell not only generates three times as much power as an alternator, but is also far more efficient in providing electric power only when required by specific power-consuming items currently switched on, while an alternator has to work permanently even though it is not always required. Applying this more economical mode of operation to a conventional engine running on petrol, this alone means a saving of one liter of fuel for every 100 kilometers (approximately 1 US gallon in ever 235 miles) in city traffic.

4. Built for the Customer: New BMW 7 Series by BMW Individual.

Marking the introduction of the new BMW 7 Series, BMW Individual is presenting a show car in “diamond style”. This exclusive trim and body finish excels in particular through the special choice of materials and colors in supreme quality, with a perfect match of the exterior and interior. Finished in Carbon Black metallic, the sedan receives the final touch of perfection through BMW Individual’s high-gloss Satin Chrome in black.

The interior comes in a discreet and elegant interplay of Platinum and Black, creating a color world dominating the door and instrument panel linings with leather remaining largely natural and extending back along the center console and the trim on the A-, B- and C-pillars. The comfort seats are also finished in this top-quality leather, providing a new dimension in seat comfort and style, and are particularly impressive. The final touch is then provided by the individually styled steering wheel adding perfect harmony to the interior.

Refined details give this very special car a truly unique touch in every respect. Roof grab handles and deco trim in high-gloss piano paint, for example, create a particularly valuable, sophisticated impression. A truly outstanding point in this context is the ornamental trim in the instrument panel with three-artificial-diamonds. This outstanding luxury car will be offered in the marketplace by BMW Individual beginning March 2002.

BMW Individual: customer orientation at its best.

BMW Individual was established by BMW M as a separate business division in 1991, offering BMW customers an even higher level of individual style with cars tailored to their personal taste. The wide range of products and services provided by BMW Individual extends from products with a particularly exclusive and avant-garde character all the way through technology spearheads to high-quality special paintwork, interior fittings and special conversions. Perfect craftsmanship is given the same significance in this process as outstanding know-how in technology. Over and above the “regular” range of products and services offered through the BMW Individual Collection, specialists advise customers in the individual conversion of their cars and professional communication electronics.

5. Built for Top Performance: BMW M3 CSL Lightweight Concept Car.

This will really make the hearts of all sports car enthusiasts skip a beat. Presenting the M3 CSL, BMW M is proudly highlighting the concept of a lightweight sports car at the 2001 Frankfurt Motor Show – a truly unique driving machine resting on wide wheels and impressively proving the potential of intelligent weight reduction. This is clearly borne out by three figures describing the fortes of this prototype not only to the connoisseur: Weight reduction of about 200 kilograms, power-to-weight ratio under 3.5 kilos per horsepower, lap time on the northern circuit of Nürburgring less than eight minutes.

Formula 1 technology in lightweight and drivetrain engineering.

This phenomenal lap time is the result of a consistent concept based on “intelligent” lightweight engineering: The optimum combination of materials and components using the most suitable material for each component and its specific requirements. This strategy is directly connected to BMW’s Formula 1 technology carried over to the road by the M3 CSL on a number of fundamental points. Just one example is the consistent use on the car of carbon-fiber reinforced plastic, the material in Formula 1 racing.

Looking at the engine, the high-speed concept of BMW M’s well-known M3 straight-six again underlines the role of lightweight engineering in engine construction. Thoroughly modified, the upgraded engine comes with a streamlined cylinder charge process and friction reduced to a minimum, boosting output in the process with more than 350 bhp. And to shift gears within fractions of a second, ensuring a direct flow of power at all times, the car naturally features BMW’s Sequential M Gearbox with Drivelogic (SMG), again based directly on Formula 1 technology. Featuring electrohydraulic, microprocessor-controlled clutch operation, this highly advanced transmission is masterminded by two paddles directly on the steering wheel. Through its overall concept and harmony of features, this lightweight sports car is designed and built for dynamic motoring of the highest standard.

Lightweight engineering is nevertheless not a purpose in itself by the making of the M3 CSL of BMW M. Rather, the absolute weight and the mass inertia of a car around its vertical axis are crucial to the car's lateral, vertical and longitudinal dynamics – that is how the driver experiences the dynamic behavior of his car. Just for comparison, the series-production BMW M3 weighs 1,495 kg or 3,296 lb unladen, while the M3 CSL Concept Car is about 200 kilos (440 lb) lighter. Precisely this is the crucial factor, the power-to-weight ratio being essential for optimum longitudinal dynamics, that is fast acceleration. And here the improvement is even more significant, the series-production M3 coming with a power-to-weight ratio of 4.36 kg/bhp (9.6 lb/bhp) versus less than 3.5 kg/bhp (7.7 lb/bhp) of the M3 CSL Concept Car.

Dynamic driving test of the toughest caliber on the northern circuit of Nürburgring.

There is no better place in the world to test all these dynamic performance criteria as thoroughly and quickly as the northern circuit of Nürburgring, the most demanding racetrack in the world. This is where the great stand out from the good and the good beat the bad in terms of their driving dynamics, with the total lap time obviously depending on the interplay of all components within the car. Covering the northern circuit in well under eight minutes, the M3 CSL Concept Car beats its production counterpart by almost 30 seconds. The lightweight concept comes out clearly in the M3 CSL Concept Car in many respects and on many features: The flaps in the front air dam, exterior mirror housing and the roof are visibly made of carbon-fiber. The front air dam itself as well as the doors are made of carbon-fiber finished in body color, as are the rear lid optimized for perfect streamlining with its higher rear spoiler and the rear-end diffuser. A solid sandwich panel takes the place of the through-loading bulkhead between the passenger compartment and the luggage compartment, and the two racing-style bucket seats for the driver and front passenger as well as the door linings, the center console and instrument trim are also made of carbon-fiber reinforced plastic.

Further reduction in weight through specific use of alternative materials.

Carbon-fiber is however not the only alternative: The body-in-white is pressed out of high-strength steel panels, the rear window is made of extra-thin glass, the floorpan is in sandwich structure. The floor panel in the luggage compartment, in turn, is a honeycomb sandwich plate normally to be found only in aerospace applications, the substrate beneath the instrument panel is made of magnesium. Even the bottom layer beneath the carpet on the floor comes in weight-optimized foam. The M3 CSL Concept Car rests on 19-inch wheels incorporating 18-inch lightweight brakes for supreme stopping power. Lightweight engineering need not necessarily mean spartan motoring: With the exception of side airbags, the toolbox and the rear seats replaced by storage boxes, the driver and his passenger do not have to forego any of the usual amenities. At least in theory, because the M3 CSL Concept Car is a unique, one-off model not for sale.

6. The BMW 3 Series in the 2002 Model Year.

Featuring a wide range of innovations, the BMW 3 Series continues its impressive story of success into the 2002 model year: The far-reaching model upgrade now entering the market emphasizes the greater distinction in looks between the various body versions introduced by the BMW 3 Series compact. Now, therefore, both the sedan and sport wagon are receiving new, even more impressive style and presence through their re-designed front end, thus standing out even more clearly from the coupé and convertible.

A number of improvements for even greater driving pleasure, three new engines and two new models are boosting BMW's best seller into the 2002 model year. The cars are also enhanced by an even wider range of standard features which now includes air conditioning and DSC Dynamic Stability Control.

More power on less fuel: the new engines.

Highly advanced engine technology for even more power, extra comfort and far better fuel economy is now featured in the new four-cylinder diesel and petrol engine models. The diesel models fulfill the EU3 emission standard, the petrol models are certified to EU4 and give purchasers registering their car in Germany a tax credit of DM 600,00.

320d sedan and touring **320td** compact **(new engine)**	110 kW (150 bhp)/330 Nm (243 lb-ft), 4-cylinder direct-injection diesel, second-generation common rail technology, ltr/100 km* (51.3 mpg Imp*), 216 km/h* (134 mph*), 8.9 sec for 0–100 km/h*
318d sedan **(new model)**	85 kW (115 bhp)/265 Nm (195 lb-ft), 4-cylinder direct-injection diesel, ltr/100 km (50.4 mpg Imp), 204 km/h (126 mph), 10.7 sec for 0–100 km/h
318i sedan and touring (**new engine)**	105 kW (134 bhp)/200 Nm (147 lb-ft), 4-cylinder petrol engine with

318ci coupé/convertible	double-VANOS and VALVETRONIC
(new engine/new model)	7.2 ltr/100 km* (39.2 mpg Imp*),
318ti compact	218 km/h* (135mph*), 9.3 sec for 0–100 km/h*
(new model)	
	* Figures apply to the 3 Series sedan

320d: new 4-cylinder with second-generation common rail technology.

The 320d, one of the best sellers in the 3 Series model range, will continue to set the standard also in future: The objective in thoroughly updating the direct-injection diesel engine of this outstanding car was to further improve many features significant to the customer. And the result once again bears testimony to the innovative strength and attention to detail BMW engineers give to the drivetrain: This is the first large-volume two-liter passenger car engine in the world to feature second-generation fuel injection operating at a system pressure of 1,600 bar and with a volume-controlled injection pump, as well as a new system of digital engine management (DDE5), a new rapid-action pre-heater, and two balance shafts. The power and performance data provided in this way once again underlines the outstanding reputation of this car as the benchmark in its class – a standard it has proudly set ever since the BMW 320d made its first appearance in 1998.

Even more effective than before:
common rail fuel injection with volume control.

The big improvement versus the former common rail system is the increase in maximum injection pressure from 1,350 to 1,600 bar in conjunction with new volume control technology: Instead of constantly compressing the entire volume of fuel supplied to maximum pressure, the new system compresses only as much fuel as is currently required at any given point in time. The reduction in drive power required for the high-pressure pump thus makes a significant contribution to the far higher standard of fuel economy. Indeed, these improvements alone, together with the optimized combustion process, increase the output per liter to more than 55 kW or 75 bhp.

Either comfortable, or sporting and dynamic like in Formula 1: the new transmissions.

As an option, the new 4-cylinder petrol engine may be combined with a five-speed automatic transmission replacing the former four-speed version. While this automatic transmission is ideal for all motorists focusing on maximum gearshift comfort and only occasionally shifting gears by means of the integrated STEPTRONIC function, a further innovation now featured in the 3 Series reflects an entirely different philosophy: This is the Sequential Manual Gearbox (SMG) now available as an option on the 325i and 330i sedan and coupé models as a further sign of the 3 Series' pledge to performance. The name of the game in this case is to shift gears like in Formula 1 via paddles on the steering wheel, without even pressing a clutch. Clearly, this special feature focuses primarily on the passionate sports driver thrilled by the short gearshift times offered by automatic operation of the clutch and an automatic gearshift. (SMG will not be offered on 325 and 330 models in the US).

Sheer driving pleasure ensured also by extra agility.

To give the customer an even greater and more convincing experience of the 3 Series' sporting and dynamic driving characteristics, all models now entering the 2002 model year are receiving a number of detailed modifications to the suspension and steering, with the objective to enhance the supreme handling of the car to an even higher level of agility on the road. These are the same improvements already to be found on the 3 Series compact ever since its market launch in June 2001 and on the 330i as of April 2001. The spring and damper set-up on the front and rear axle, for example, has been realigned for even more sporting and dynamic performance, with the suspension intentionally being made less flexible through stiffer rubber mounts for all the chassis components. The result is much firmer roadholding even on bumpy roads, without any significant loss of driving comfort. Virtually looking forward to every bend on the road when driving in the country and offering outstanding directional stability on straight-ahead motorways, the updated BMW 3 Series literally sticks to the road in every respect.

The driver will feel these modifications most through the more direct steering now requiring only three turns from lock to lock. Together with the reduced elasticity of the steering, this provides a standard of steering precision and agility unparalleled in the market, together with first-class feedback on the current road conditions. And thanks to the longitudinal precision of the

engine, the turning circle of just 10.5 meters (35 feet) is smaller than that of many a compact car.

DSC Dynamic Stability Control now even more versatile.

Becoming a standard feature on all 3 Series as of the 2002 model year, Dynamic Stability Control (DSC) now offers an even wider range of functions making the system even more versatile for the sporting, ambitious driver. Particularly on slippery roads, DSC prevents the car from swerving out of control even in abrupt maneuvers and in bends falsely assessed and thus taken too fast by the driver. The system does this by applying the brake(s) as required on specific wheels in order to maintain an appropriate level of stability. DSC comprises the sub-functions All Season Traction and, since September 2000, the Electronic Differential Lock (ADB) as well as Dynamic Brake Control (DBC). The 2002 models retain the option offered to the driver to briefly press the DSC button in order to switch over to a purely drive-oriented mode with the differential locks remaining active through the intervention of the brakes but without any reduction in engine power should one of the wheels start to slip. A new feature, however, is that the risk of the car possibly swerving is now also avoided in this mode by stabilizing the car through on-demand intervention of the brakes on a specific wheel, depending on road speed. Engine power, on the other hand, is only reduced at high speeds. Featuring this enhancement of the DSC drive-oriented running mode, the BMW 3 Series offers the same agility and control ease as a conventional limited-slip differential, without however foregoing the extra safety provided by DSC with its stabilizing effect.

And together with realignment of both the springs/dampers and of the steering, as already described, this gives particularly the sporting and ambitious driver an unprecedented standard of dynamic performance combined with appropriate driving pleasure.

Individual design on the saloon and touring: a face full of power and presence.

The greater distinction between the individual body variants starting with the 3 Series compact is now continuing: Even at very first sight, the sedan and sport wagon now stand out clearly from the other models in the 3 Series. The headlights together with the direction indicators clearly form one self-contained unit and have evolved from a more technical, geometric design

towards a far more dynamic, curved line accentuating the car's particular character. The high-beams "cut" diagonally at the side and the transparent direction indicators now positioned further up convey a feeling of presence both likeable and powerful. This new look is further enhanced by the even wider, more dynamic kidney grille and the powerdome now extending along different lines from the grille to the A-pillars. The front bumper, with its horizontal lines being much less conspicuous and, indeed, reduced to the essential, exudes an air of tension and harmony, the round foglamps adding a new characteristic feature. With the contour line above the wheel arches being dropped, the front fenders come in new proportions further accentuated by the wedge-shaped side direction indicators now higher up than before. The rear air dam also has fewer horizontal lines, enhancing the graphic look of the rear light clusters now finished in brilliant glass. And while the rear light clusters have the same shape as before, they have been rearranged in a new concept with the brake light at the top and the direction indicator in the middle. This leaves the entire lower section for the taillights now emitting a much wider and, as a result, more conspicuous light signal.

All-wheel drive with Hill Descent Control: your autopilot for driving downhill.

Available only in the BMW X5 until now, Hill Descent Control now also comes as an optional feature on the all-wheel-drive sedans and sport wagons. An intelligent incline control system for steep gradients, HDC allows the driver to proceed down slopes smoothly, safely and consistently even on slippery surfaces. Without the driver having to press down the brake pedal, the car proceeds at a constant, low speed as if it were equipped with a reduction gearbox.

New: headlights with bi-xenon light technology.

Bi-xenon light technology available for the first time as an option on the 3 Series compact is now also being introduced on the other models in the 3 Series. This new generation of headlights uses the excellent light qualities of xenon technology not just for the low beams, but also for high-beam illumination of the road ahead. Clearly, this gives the driver of the 3 Series the best headlight technology currently available. To provide the appropriate low-beam/beam adjustment, a cover is swiveled in front of the xenon lights electromagnetically whenever required, thus shifting from one headlight level to the other. And to avoid any dazzling of oncoming traffic, the system comes with dynamic headlight range control.

7. The Sequential Manual Gearbox (SMG) in the BMW 3 Series.

Coming from Formula 1, it was featured for the first time on the road in the BMW M3 sports car in 1996 and is now also available in slightly modified form in the 325i and 330i sedan and coupé: BMW's Sequential Manual Gearbox SMG. Models equipped with SMG offer the same performance and the same fuel economy as their counterparts with a manual gearbox.

SMG appeals primarily to the passionate sports driver so far obliged to choose a conventional manual gearbox in his search for maximum performance on the road. Now customers of this caliber have the choice of SMG offering them a new dimension in modern motoring: Gears are shifted in 150 milliseconds – the time you need to blink an eyelid. And SMG does not require a clutch pedal, the entire gearshift process as well as the process of disengaging and engaging the clutch taking place faster than most drivers can move their hand, with the help of powerful, high-precision hydraulic control. At the same time the SMG Sequential Manual Gearbox makes it impossible to shift to the wrong gear in any situation, thus giving the sports driver maximum performance also in this respect at all times.

The less ambitious and dynamic driver also benefits from the pleasant feeling that he cannot make a mistake when shifting gears, since this feeling of certainty offers an enhancement of driving safety not to be underestimated. The SMG Sequential Manual Gearbox also incorporating a cruise mode with gears shifting automatically should nevertheless not be seen as a low-cost alternative to the automatic transmission. On the contrary, SMG does not seek to offer the same superior shift comfort as an automatic transmission with a converter lock-up clutch. Rather, it will thrill the driver who really enjoys the process of shifting gears manually – and it is precisely this kind of driver BMW has in mind with the Sequential Manual Gearbox.

Operating as a shift-by-wire system without a mechanical connection between the shift lever and the gearbox and without even a clutch pedal, SMG enables the driver to shift gears in the P-R-N-+/– mode via two paddles in the steering wheel or conventionally via a shift lever in the center console. The driver is thus able to concentrate in full on the road around him, SMG automatically operating the clutch and engaging the gear selected.

The SMG Sequential Manual Gearbox is based on BMW's proven five-speed manual gearbox and, in terms of its design and structure, is a kind of add-on solution: The entire electrohydraulic control unit is fitted over the gearbox like a sort of "bell". The SMG control unit thus communicates with its counterpart for engine management, monitoring engine torque during the gearshift process. As a result, the driver is able to keep the gas pedal pressed down even while shifting gears.

Electrohydraulic system takes over the process of operating the clutch and shifting gears.

The SMG experience starts for the driver right from the beginning when unlocking his car by remote control: A quiet humming sound from the gearbox area tells the driver that the electric pump in the hydraulic clutch and gearshift unit is starting to do its job, building up 55 bars of system pressure in order to provide ultra-fast clutch and gearshift operation. To start the engine, the driver must first move the gear lever to N. Since SMG, like a conventional manual gearbox, can also be used to hold the car in position by shifting to one of the gears, the driver first has to press down the brake pedal and then move the shift lever to its idle position before starting the engine. The current position of the gearbox is presented both by rest points in the gearshift gate and optically in the display beneath the rev counter.

In order to shift to reverse the driver must move the gearshift lever to the front left into position R, in order to drive forwards he must move the lever to the central position marked +/– for a manual gearshift or to the right to position C for the automatic mode. Also referred to as the cruise mode, this latter program offers enhanced motoring comfort, for example when driving in town, enabling the driver to delegate all gearshift functions to the system.

Shift-by-wire through the gearshift lever and paddles in the steering wheel.

The core function of SMG is nevertheless its manual gearshift in a process handled at unprecedented speed and with unknown precision. The driver is able to shift gears in two ways – either, as in the past, through the gearshift lever or through two paddles on the steering wheel. As the name SMG indicates, the order of gears is always sequential, that is like on a motorcycle with one gear after the other, and not random by direct selection of a specific gear, as with a conventional H-pattern.

The big advantage is that you cannot falsely shift to the wrong gear no matter how quickly you move from one gear to the next, while at the same time you can shift gears in an on going process involving more than two gears alone. To shift up, the driver either pulls the gearshift lever back or pulls one of the two paddles in his direction. To shift down he performs the same operation in the opposite direction, pushing either the shift lever or the paddles forwards.
A further advantage offered by the paddles is that they allow the driver to shift gears without taking his hands off the steering wheel. Indeed, he does not even have to take his foot off the gas pedal.

Sports program and assistance for perfect acceleration.

This does not mean, however, that the sporting functions of SMG are limited in any way on the 325i/330i. On the contrary: First, a sports button at the bottom of the shift lever allows the driver to change over in the sequential mode from a more comfortable gearshift to a dynamic shift process seeking to minimize the time required for shifting gears. Second, the driver is able to use the car's full acceleration power from a standstill when driving in the sports program and with the DSC stability program deactivated. All the driver has to do in this case is press down the gas pedal fully and completely, thus increasing engine speed when setting off to approximately 4,000 rpm before the system engages the clutch. In practice this means that even the less experienced driver will have no problem accelerating, say, the 330i from 0–100 km/h (0-62 mph) in 6.5 seconds, that is in a time only a professional will achieve with a conventional manual gearbox.

Cruise mode for the comfort and creep functions when maneuvering.

Despite its sporting character, SMG certainly has its comfortable aspects. In the comfort-oriented cruise mode, for example, activated by moving the gearshift lever against the stop point on the right, the system shifts gears automatically as a function of road speed, the position of the gas pedal, acceleration or, respectively, deceleration, without the driver having to provide an appropriate signal through the gearshift lever or one of the paddles. As soon as the driver operates the shift lever, the paddles or the sports button, however, the sequential mode is activated immediately. Maneuvering, finally, is facilitated by a creep function initiated as soon as you take your foot off the brake without giving gas after having shifted to a forward or reverse gear

8. BMW X5: New 4.6is Top Model, New Functions.

As of autumn 2001, BMW will be offering the aficionado of high performance the opportunity to experience sports motoring in a brand-new dimension – in the BMW X5 4.6is. Enjoying his unique, commanding position in the cockpit of the X5, the driver will then be in control of 347 horses, the new V8 power unit displacing 4.6 liters and exclusive to the X5 4.6is then developing up to 480 Nm or 354 lb-ft maximum torque. This boosts BMW's Sports Activity Vehicle to 100 km/h (0-62 mph) in 6.5 seconds, providing a top speed of 240 km/h or 149 mph. (The US SAE net figures for power are 340 hp and 350 lb-ft of torque).

In technical terms this new high-performance power unit is derived from the 4.4-liter V8 already giving the X5 4.4i its superior performance on the road. Its even greater output and torque result – apart from the increase in engine size – from the modification of the engine's charge cycle components and the engine management.

Shifting gears the sporting way – either manually or automatically.

To ensure that this new world of power also means appropriate driving pleasure, BMW's engineers have modified the five-speed automatic transmission with STEPTRONIC. They have given the transmission an entirely new program accentuating the sporting character of the vehicle even in the conventional D mode. The S mode, in turn, offers a new, uncompromising sports shift program for the enthusiast wishing to enjoy an even more direct experience of the vehicle's power and performance. And to shift gears by hand, you also have the choice of STEPTRONIC in the X5 4.6is, now with an even more sporting and dynamic character than before.

Outstanding suspension qualities.

Just how good the X5 is on the road was proven once again by professional racing driver Hans-Joachim Stuck in the X5 LeMans, when in June he lapped the 20.8-km-long northern circuit of Nürburgring in an incredible 7:49.92 minutes, achieving a top speed on the straights of 311 km/h or 193 mph.

The X5 LeMans experimental model is based largely on the series X5 in its suspension technology and was built especially to test the enormous technical reserves of BMW's Sports Activity Vehicle.

This means that the X5 4.6is is also able, in its power and performance, to rely on the outstanding suspension qualities of the X5 concept. In practice this ensures safe motoring even at high speeds in a bend, electronic control systems intervening either not at all or only at a very late point in time. And to cope with borderline cases in driving physics, the sports suspension featured as standard on this model comes with BMW's DSC III stability program.

Low center of gravity for extra safety.

The excellent on-road driving characteristics of the X5 4.6is result from the center of gravity exceptionally low for a vehicle of this kind. On the engine of the X5 4.6is, for example, the driveshaft for the front wheels goes through the oil sump in order to lower the position of the engine. The low center of gravity of the entire vehicle achieved in this way reducing the risk of the X5 toppling over in abrupt steering maneuvers.

Power under control – on-road and off-road.

Despite the greater emphasis on sports-car performance, the X5 4.6is retains all of its off-road qualities. The increase in maximum torque by 40 Nm over the 4.4i to a new peak of 480 Nm or 354 lb-ft gives this all-wheel-drive athlete generous power reserves also off the beaten track, on extreme gradients or when serving to tow a trailer. Like the 3.0i and 4.4i versions , the X5 4.6is also comes with BMW's electronic Automatic Differential Braking integrated into the DSC-X. The same applies to ABS with Cornering Brake Control and Dynamic Brake Control supporting the driver when applying the brakes all-out. For use on rough and hilly terrain, the X5 4.6is now also features BMW's enhanced Hill Descent Control keeping a constant speed when driving downhill off-road between 6 and 25 km/h (approximately 4 –16 mph), yet another outstanding and indeed absolutely unique feature worldwide being BMW trailer stability control available in conjunction with a trailer towbar.

Design: superiority and understatement in one.

In its design and looks, the X5 4.6is also makes it quite clear that this is the high performer in the Sports Activity Vehicle range. But it shows its muscles

discreetly, without trying to brag. To achieve this goal, BMW's designers have very carefully revised the already impressive look of the X5, emphasizing the high performance of the vehicle through a combination of understatement and specific features brought out in all their character.

Inside the X5 4.6is the driver will also realize that he is not sitting in an average car. New colors and materials give the interior its own, exclusive touch. This superiority is then underlined to the outside by the 20-inch wheels fitted as standard and specially designed for the X5 4.6is. Running on 275/40 tires up front and 315/35 tires at the rear, these extra-large wheels find sufficient space in the flared wheel arches.

Seen from the front, the high-performance X5 4.6is is equally impressive: The front air dam finished in body color powerfully accentuates the lower air intake scoops while at the side it comes with striking "wind splitters" carried over from motorsport in the interest of optimum streamlining. Xenon headlights are naturally standard.

The rear air dam also finished in body color gives the rear section of the X5 4.6is a very powerful look, too. Surrounding the two oval chrome tailpipes and also featuring wind-splitters at the side, this air dam is equally progressive. Exclusive paintwork colors from the BMW Individual Collection, finally, underline the special position of this vehicle.

New on all X5s: enhanced HDC function for even better downhill control.

Two new software functions again enhance the versatility of the BMW X5 Sports Activity Vehicle: Improved, "intelligent" Hill Descent Control and the new trailer stability control. HDC enables the driver to proceed safely downhill on steep slopes or slippery inclines. Without the driver having to intervene, HDC, once activated, keeps the X5 moving at a consistent speed either forwards or backwards, acting in the same way as a reduction gearbox.
So far the driver was only able to change speed with the HDC control system by giving gas or pressing down the brake pedal. Now, pressing the + button on the cruise control featured on the multifunction steering wheel, he can increase HDC speed to a maximum of 25 km/h (16 mph), while pressing the – button or applying the brakes he can reduce speed to approximately 6 km/h (4 mph). This gives the driver the possibility to choose his speed according to the incline and his personal preferences, without having to constantly operate the pedals. And by controlling speed via the steering wheel, he is able to dose

his rate of progress much more precisely even on very rough terrain with the vehicle moving heavily from side to side, thus achieving far greater precision than with a pedal. Should the X5 oversteer or understeer while HDC is active, DSC control takes priority and helps to stabilize the vehicle. ABS remaining active in the process ensures an optimum brake effect. The HDC function is switched on and off by a separate button next to the DSC button, which the driver can activate at speeds below 35 km/h (approximately 20 mph) even though the system only cuts in on offroad terrain. Then, once the driver accelerates beyond 35 km/h the next time, HDC returns to the stand-by mode, automatically deactivating at speeds above 60 km/h (35 mph).

A unique feature worldwide in the BMW X5: trailer stability control.

BMW's new, absolutely unique trailer stability control makes the X5 an even better vehicle than before for towing a trailer with supreme comfort, safety and traction. The new system offers additional safety against dangerous instability leading to an uncontrollable swerve effect on the road and, as a result, to an accident should the worst come to the worst. A vehicle with a trailer is a vibration-prone system moving more and more like a pendulum at increasing speed on the road. A heavy trailer may remain unstable after swerving even at relatively low speeds if the driver is unable to intervene. So now BMW's trailer stability control recognizes any such pendulum action and, rapidly braking the vehicle in front (as well as the trailer itself through the auxiliary brake system), is able to return the vehicle itself and the trailer to a safe driving condition. The trailer stability control recognizes that the vehicle is towing a trailer thanks to the connection at the rear through the trailer hook-up socket. This activates the control system able to intervene from speeds of 65 km/h (40 mph). Only an extension of the existing software was required for implementing this new suspension control system, without the need for any additional hardware.

The trailer stability control function is based on the yaw rate signal informing the DSC-X control unit of the vehicle's speed of rotation. This signal is permanently monitored, any pendulum or sway motion of the vehicle and trailer generating a signal typical of the forces involved then being detected by the control unit. Once a certain threshold has been exceeded, brake pressure is built up on all four wheels, without requiring any intervention by the driver, thus ensuring stopping power of 3-5 m/sec^2. Engine torque is reduced at the same time to a minimum, ensuring that the vehicle and trailer will regain their stability very quickly thanks to the rapid decrease in road speed.

Activation of trailer stability control is shown by the traction telltale flashing on and off. Part of the DSC system, trailer stability control remains active even when DSC is not working.

Apart from trailer stability control, the BMW X5 is available as of the 2002 model year with yet another feature significantly improving its qualities when towing a trailer: This is the option to increase trailer loads at the customer's request to a maximum of 3.5 tonnes (7,700 LBs).

More options:
new two-axle pneumatic suspension with self-leveling.

Starting in summer of this year, the X5 also offers yet another feature to customers in the interest of even greater comfort, safety and versatility in this outstanding sports utility vehicle: two-axle pneumatic suspension with self-leveling. This new system combines the advantages of pneumatic suspension and automatic load compensation with various adjustments to different levels. For loading and unloading, as well as for easier access and exit, the X5 can now be lowered by 35 millimeters (1.4 inches) in the access mode. Then, when driving off road, you can raise the height of the vehicle by 25 millimeters (1 inch) for extra ground clearance. The system works with a compressor and a compressed air tank. This provides a more rapid transition from one level to another than the simple use of a standard pressure pump. The control unit receives information on the current level of the vehicle from four height sensors on the individual wheels. The moment there is a change in load, the system automatically compensates any difference in height for the level chosen, even with a load on only one side of the car. As soon as the vehicle exceeds a speed of 35 km/h (20 mph) in the access mode, the X5 automatically moves back to the standard mode. The driver can then select the access mode again while driving, the system returning to this mode automatically as soon as road speed drops below 25 km/h (15 mph). In the offroad mode the X5 can be driven at speeds of up to 50 km/h (30 mph), automatically returning to its original level once that speed limit is exceeded.

9. CleanEnergy: BMW's Hydrogen Strategy.

BMW remains the pacesetter in developing cars with alternative drive ready for the market. Following the 750hL, the first hydrogen car in the world to be built in a small series, the BMW Group is presenting the new 745h at the 2001 Frankfurt Motor Show with its petrol/hydrogen 8-cylinder power unit, as well as a MINI concept car developed exclusively for hydrogen drive. On the CleanEnergy WorldTour 2001, the BMW Group demonstrated its clear commitment to the ideal source of energy for the future. This WorldTour provides important input for the introduction of hydrogen into the market as a fuel for road vehicles and has already attracted great interest and attention from experts and politicians alike.

The BMW Group is therefore consistently continuing a clear-cut energy strategy seeking to introduce hydrogen as a drive fuel. The reason, quite simply, is that only hydrogen meets the requirements made of the fuel of the future. Recovered with the help of solar energy, hydrogen is the cleanest fuel imaginable, burning in the combustion process to generate only one remaining material: water. CO_2 emissions could therefore be reduced by approximately 17 million tonnes (nearly 19 million tons) a year in Germany alone if only one out of every 10 cars were to run on hydrogen.

Longer range, better performance and superior comfort – many benefits speak in favor of the combustion engine.

The BMW Group has worked hard for its international leadership in hydrogen technology throughout more than 20 years of research and development. Accordingly, BMW has been able to provide know-how and decisive input not only in engine technology, but also in the recovery, filling and storage of hydrogen in the tank. The first hydrogen-drive BMW 750hL's have already covered more than 140,000 kilometers (85,000 miles) worldwide on normal roads and motorways, without any problems worth mentioning. They therefore confirm the high level of development BMW's hydrogen technology has achieved to date. "We are focusing on the combustion engine because we are convinced that our customers will continue to attach great importance to an adequate range, dynamic performance and superior comfort

also in future", says Dr Burkhard Göschel, Board Member for Development and Purchasing of the BMW Group.

International political support for the 2001 CleanEnergy WorldTour.

The objective of the 2001 CleanEnergy WorldTour was to place the international focus on hydrogen technology already very advanced and mature, together with the benefits this technology has to offer and the tasks still remaining. It is precisely for this purpose that the BMW Group sent a fleet of hydrogen-drive 750hL models on tour in six cities throughout four continents. Meeting local experts on the occasion, representatives of the BMW Group are discussing a number of highlights and issues involved in hydrogen technology.

The Tour started in Dubai, where the main point was the regenerative recovery of hydrogen. The event was held under the patronage of Governing Sheikh Mohammed Bin Rashin Al Maktoum, who is very interested in the BMW Group's concepts. As part of a US $ 46 billion environmental programmed, solar-thermal energy and hydrogen will play a decisive role in the United Arab Emirates.

The second destination on the Tour was Brussels, the capital of the European Union, where Prof. Dr.-Ing. Joachim Milberg, Chairman of the Board of Management of BMW AG, addressed a clear appeal in the area of European politics: "If it is the declared target of politicians to support mobility beneficial to the environment, we need their support until hydrogen holds a well-established position in the market." BMW's involvement in Brussels was supported by Klaus Töpfer, the Director of the United Nations Environment Programme (UNEP), and Loyola de Palacio, EU Commissioner for Transport and Energy.

Traveling round the world in support of hydrogen.

The third stop on the Tour was Milan, the city which, planning to build a hydrogen filling station on the premises of a 1.3 MW fuel cell power station, already plays a leading role in the introduction and use of this environmentally friendly source of energy. In Tokyo, the fourth stop on the CleanEnergy WorldTour, the BMW 750hL became the first hydrogen car built in a small production run ever to drive on Japanese soil. This symbolic maiden trip clearly represented the common objectives of Japan and the BMW Group in the

development and use of hydrogen. And on the occasion of this visit to Tokyo, the BMW Group reiterated its clear pledge to the objectives of the Kyoto Protocol benefiting the world's climate.

The CleanEnergy WorldTour then continued in mid-July to Los Angeles, California, one of the world's leading cities in its quest to ensure clean air. It is indeed particularly in such an environment that hydrogen cars already developed to a high standard and using proven technology on their combustion engines would be able to make a quick and effective contribution to the improvement of air and the quality of life. Some 750hLs have therefore remained at BMW's new Exhaust Emission Test Center in Oxnard near Los Angeles for comprehensive tests and demonstrations.

BMW's CleanEnergy strategy receives the Energy Globe.

The CleanEnergy WorldTour has not only aroused great interest worldwide, but has also won a number of international awards. One example is the Energy Globe with Euro 10,000 in prize money awarded to the BMW Group. This award goes to projects making a significant contribution to the preservation of energy and the use of renewable energy sources. This Austrian prize, for which this time there were 1,230 entrants from 83 countries, is given away in five categories by a jury made up of international experts. The BMW Group was the first and only car maker to receive such a special prize for the CleanEnergy hydrogen project. Earlier, BMW's CleanEnergy project had already received the Energy 2001 Innovation Prize for the most innovative idea in the field of energy. This prize is awarded each year by the Institute for International Research Germany, one of the world's leading providers of economic information, in cooperation with Energiewirtschaftliche Tagesfragen, a special journal on energy matters published in the German city of Essen. Winning this award, the BMW Group's concept proved successful against a number of other competitors.

CleanEnergy needs strong partners.

The commitment of the BMW Group to hydrogen energy proves that the use of this source of energy for mobile purposes is no longer a vision, but rather reality within very close reach. The technical concept developed by BMW – to use hydrogen in the combustion engine – has already made substantial progress. But hydrogen calls for more than just cars "ready to go". Indeed, the regenerative recovery of hydrogen, the infrastructure of filling stations, and

political support are significant building blocks in establishing a hydrogen society. So it is precisely in these areas that the BMW Group is cooperating with powerful, strong partners. Linde Gas AG, for example, just like BP, the global player from Britain, is a partner in the 2001 CleanEnergy WorldTour. The German Economic Transport Energy Strategy under the leadership of the German Federal Government, in turn, comprises other car makers and energy suppliers such as Shell and Aral also highly interested in hydrogen. Together, these strong partnerships will pave the way for hydrogen as the energy carrier of the future.

10. ConnectedDrive: BMW Places the Driver in the Middle of Things.

The introduction of the new 7 Series marks the world debut of BMW's first production car conceived, designed and built according to the connectedDrive concept. Applying this term combining the words "connect" and "drive" in a perfect symbiosis, this future-oriented BMW concept brings together the driver, the car and the environment in a genuine process of interaction.

While previously the interaction of these three factors used to be left to the driver and his personal flexibility, ConnectedDrive marks a new beginning: The objective is to process as much information as desired and necessary as individually and ergonomically as possible for the driver in his car. Supported in this way by the assistance principle – instead of having to shoulder an additional burden – the driver is backed up in his responsibility and benefits himself from greater safety and comfort on the road.

Numerous technical innovations have already been tested in this context for their use in future. Indeed, these new ideas go all the way to specific details, for example by the system exerting gentle counterpressure on the gas pedal in front of a tight curve the driver is approaching too quickly, "telling" him to slow down.

ConnectedDrive uses and links innovative technologies in the three areas of telematics, online services, and driver assistance systems. This is made possible by networked electronics and the new man/machine interface featured for the first time in the new 7 Series, since it is only such an integrated system that gives the driver all the possible benefits.

iDrive initiates progress in the man/machine interface.

The new BMW 7 Series already takes one of the most important steps in the man/machine interface: The new, innovative iDrive control concept enables the driver to intuitively control a whole range of functions by means of the controller housed in the center console without having to take his eyes off the traffic around him. This is why all operating functions are to be found in the

Control Display exactly in the driver's and front passenger's line of vision. Right there in the upper middle section of the instrument panel. The development of the man/machine interface in the ConnectedDrive project nevertheless goes even further, providing new options and possibilities for driver assistance systems: Active steering wheels and gas pedals are currently being tested with the objective to "tell" the driver, by exerting light counterforces, that he should correct the steering or reduce his speed on the road.

ACC – the starting point for assistance systems of the future.

Available as an option, ACC Active Cruise Control in the new 7 Series already represents a progressive assistance system supporting the driver in speed and distance control mainly on motorways and fast roads. In an on going development process, this assistance function in the ConnectedDrive research car is already being tested today for speed control at low speeds: This is the Stop & Go Assistant supporting the driver in traffic jams and congested city traffic. To make sure that such assistance systems operate reliably, you must know exactly what is happening around you. Precisely this is why new sensor concepts based on radar, laser or image processing technology will further optimize the process of monitoring conditions around the car in future, providing the foundation for even more sophisticated assistance systems such as the Speed Information Assistant, Curve Speed Assistant for more dynamic driving safety, or Heading Control assisting the driver in keeping on exactly the right line.

New telematics and online services already available today.

The BMW ASSIST telematics service – in Germany complete with data feedback – is an important element of ConnectedDrive essential to the interplay of the driver, the car and the environment. Automatic emergency calls in the event of a severe accident, a breakdown service, real-time traffic information, and mobility-related inquiry services with numerous points of interest in Germany alone are clearly combined within one overall system. With the next stage of development networking in the new BMW 7 Series the driver is in his surroundings now available to access Internet-based services directly from the car. Typical examples are online banking, real-time monitoring of the stock exchange, the reception of e-mails, and the transmission or reception of the latest news – now a BMW gateway paves the way the first time for integrated Internet access in the car. Integrating this

system directly into the car's electronics, the new BMW 7 Series provides a direct connection between the Internet and the navigation system as well as the car telephone, making operation of the individual functions very simple and convenient.

Networked electronics serving as the foundation.

To use the components and modules in the car as often as possible (multiple use), BMW is pursuing an ambitious objective: This is to connect information provided by components today with the data offered by systems in the future, introducing and implementing new functions in this way.

This reflects an approach already taken in the past: Today, for example, the signals provided by the ABS wheel speed sensors are used not only to control the brakes, but also for navigation purposes, when, for example, it is impossible to contact a satellite in a tunnel or at a similar location. The signals provided by the airbag electronics, in turn, are used for the automatic emergency call function provided by BMW ASSIST.

Practical testing with the BMW X5
as a ConnectedDrive technology spearhead.

Serving as the first practical example of these new applications and as a spearhead in technology for implementing the ConnectedDrive concept, a specially equipped BMW X5 as an example, has proven to be very helpful in BMW research. Incorporating various, partly new sensor and communication systems, this very special X5 is permanently informed of the route ahead, traffic conditions and the general traffic situation. Details and information required for the trip are processed by the Driving Assistant either independently with an autonomous reaction by the car or as clear information for the driver. This enables the driver, for example in stop-and-go traffic, to delegate the task of applying the brakes entirely to the Drive Assistant. When approaching tight bends, moreover, the system advises the driver, by increasing pressure on the gas pedal, to slow down. This system is the starting point in making traffic safer, more comfortable, more efficient and, not least, more beneficial to the environment in future. Indeed, it is only through this network of assistance and information systems that, according to the results of BMW research, we will be able to further optimize road safety and comfort in future.

The future systems with ConnectedDrive:

- **Active Light:** Adaptive Light Control (ALC) receives its information from the navigation system and directs two variable headlights towards the road ahead exactly as required, giving the driver a better and therefore safer view of bends and road conditions coming up ahead. When approaching a junction, in turn, the system broadens the light beam for better illumination of the crossroads and pedestrian paths. The brake lights have been further developed into a genuine brake force display (BFD) informing vehicles approaching from behind through the number of segments coming on in the brake lights how hard the driver is applying the brakes.

- **Active Steering Wheel:** An electric motor in the steering wheel builds up steering forces in the direction required by the driver, providing convenient assistance in keeping exactly on track. This support is however intentionally not strong enough to control the steering automatically, nor will it exert any significant resistance to the driver's movements. This means that the driver can easily override the active steering effect when maneuvering or overtaking, thus remaining in control at all times. A further point is that the system is only active when the driver has his hands on the steering wheel, helping, for example, to assist the driver should he lose attention or fall asleep for fractions of a second.

- **Active Gas Pedal:** This touch-effect gas pedal applies the same principle as the active steering wheel, exerting a certain force against the driver's foot. Such a request to reduce speed may come, for example, from the navigation system when approaching a bend or a built-up area. Critical road surfaces and conditions such as rain or snow, as well as vehicles ahead detected by the ACC system, may also activate this assistance function. Like the active steering wheel, the forces exerted by the active gas pedal can easily be overcome, for example when overtaking.

- **Extended Floating Car Data:** Precise traffic information provided in good time helps to enhance both road safety and motoring comfort. To provide such information, however, we need a comprehensive system of traffic data acquisition. This is why BMW is working on future-oriented methods of data acquisition using the car as a mobile sensor. The latest data supply system referred to as Extended Floating Car Data allows an entirely new quality of traffic information for vehicles on the road, warning motorists, for example, of local traffic jams, black ice or fog.

- **Displays with the latest technology:** Further innovations in technology simplify control functions and enhance motoring comfort in the ConnectedDrive X5. A monitor, for example, communicates through a wireless, wideband frequency with the video system in the car, and may be removed and used in any other desired position when necessary. Incorporating its own controls, the monitor can therefore be used outside the car as well. A further point is that it is linked to all services available on board, such as the navigation system and Internet, TV and video.

- **Data up- and down-link via Bluetooth:** Bluetooth technology is a quantum leap in communication between individual terminals in the car, thus offering a significant improvement in motoring comfort. In the ConnectedDrive X5 the driver is able, for example, to transmit addresses from a PDA via Bluetooth to the navigation system. Similarly, the audio system or the car telephone is able to communicate easily and efficiently with other terminals such as a laptop, mobile phone or organizer.

  All ConnectedDrive features mean practical benefits for the driver – he can use them, but he does not have to. And depending on his personal wishes, he can put together his own system individually at any time, traveling conveniently in his car today and using all sources of information all the way to e-mails, driving more dynamically tomorrow with his eyes only on the speedometer and rev counter. So, to put it in simple terms, ConnectedDrive makes your sheer driving pleasure even more enjoyable.

11. Two New BMW Motorcycles at the Frankfurt Motor Show: F 650 CS and R 1150 RS.

Never before in their 78-year-old history have BMW motorcycles been so successful: Delivering 74,614 units to customers, BMW Motorrad made the year 2000 its 8th record year in a row. Never before has BMW Motorrad launched so many new models within a period of twelve months: The R 1150 R, R 1150 RT and K 1200 RS were introduced in March 2001. Now, opening up the 2002 model year, BMW is presenting the new and truly outstanding F 650 CS single-cylinder and the new R 1150 RS sports tourer.

It is also fair to say that BMW's model range has never been as comprehensive and young as it is now: Following the introduction of the new R 1150 RS taking over from the R 1100 RS, the R 1200 C launched in autumn 1997 is now BMW's "senior" model at an age of just four years...

The new BMW F 650 CS: A truly exceptional motorcycle.

In spring 2000 BMW introduced the first successor model in the F Series, the F 650 GS. This all-new funduro combines a high standard of comfort, all the qualities required for riding with a passenger also on long tours, and excellent handling on the road with the qualities required for light offroad riding conditions. It is the first single-cylinder in the world equipped with Digital Motor Electronics and a fully controlled catalytic converter, and as an option – like all BMW motorcycles – it comes with ABS. So it is no surprise that the F 650 GS is extremely successful in the market. The production of the F 650 GS and F 650 GS Dakar at BMW's motor-cycle plant in Berlin exceeds the figure of 30,000 units by summer 2001. In September 2001 BMW will present the second successor model in its single-cylinder series at the Frankfurt Motor Show and the Milan Show: the new F 650 CS. Contrary to its predecessor, the F 650 ST, which differed from the F 650 funduro virtually only by the running gear modified more consistently for road use, the F 650 CS is an all-new motorcycle standing out as an exceptional new entry in this segment in terms of both design and product substance. The intention, therefore, is to appeal also to new customers and target groups with the F 650 CS which, through its looks alone – fresh, nimble and free – bears out its unique character and powerful personality.

A city bike and nimble rider for lots of fun.

The home of the F 650 CS is the road. Serving as an ideal city bike, the F 650 CS is simply ideal for riding in the middle of town, going to work, riding to university, or for a spree down the boulevards. The new storage space concept within the central fairing offers lots of opportunities for accommodating all the odds and ends the rider needs in everyday life. Low seat height of just 780 mm/30.7″ – or an even lower 750 mm/29.5″ as an option – makes the F 650 CS ideal also for the somewhat smaller rider. And through its superior handling combined with the fast-revving, high-torque but economical power unit, the F 650 CS offers sporting talents on country roads – it is a genuine performer even in tight bends, offering superior riding pleasure wherever you go. Not only the new storage space concept, but also a sophisticated softbag luggage system available as special equipment clearly proves that the F 650 CS is taking a new approach, deliberately doing without the touring cases otherwise so typical of BMW motorcycles.

High-revving engine with fully controlled catalytic converter.

The single-cylinder power unit and the five-speed gearbox have both been carried over from the F 650 GS. Like all BMW motorcycles, the F 650 CS also comes with Digital Motor Electronics and a fully-controlled catalytic converter. The liquid cooled four-valve power unit stands out in particular through its fast-revving response and behavior, well-balanced development of power, running smoothness and sophisticated refinement. Due to modifications of the airbox and the new exhaust system, the cylinder charge cycle had to be reconfigured, providing a slight change in performance data: Maximum output of 37 kW (50 bhp) now comes at 6,800 rpm (F 650 GS at 6,500 rpm), maximum torque up from 60 Nm to 62 Nm (46 lb-ft) is developed at 5,500 rpm (6,000 rpm). Torque of more than 50 Nm or 37 lb-ft is consistently available between 3,500 and 7,000 rpm. In ECE trim, the F 650 CS also comes in a 25 kW (34 bhp) version geared to multi-level motorcycle license requirements.

Engine oil reservoir in the frame.

To provide an integrated storage compartment in front of the rider, the engineers and designers building the new machine obviously had to make the necessary space available. To do this they developed a principle already introduced on the first generation of the F 650, using the frame of the motorcycle as the engine oil reservoir instead of a separate oil tank.

Accordingly, the two upper arms of the bridge-type frame are connected to one another at their lower end, taking up 2.5 liters of engine oil.

New exhaust system as a genuine eye-catcher.

The exhaust system is entirely new in its structure and design, and is also a genuine eye-catcher. The fully controlled three-way catalytic converter and the oxygen sensor are integrated conveniently into the silencer made of high-quality polished steel. This avoids the need for a pre-silencer and allows the designers to smoothly continue the lines and contours of the exhaust manifold all the way back to the final muffler. The two-piece exhaust pipe covers are matt-blasted and stand out attractively from the glossy surface of the silencer itself.

A world-first achievement in motorcycle construction:
single swinging arm with toothed drive belt.

The two most outstanding innovations of the F 650 CS will catch your eye immediately when looking at the rear wheel from the right: the single swinging arm and toothed drive belt, a combination never seen before in motorcycle construction. Launching toothed belt drive, BMW is opening up a new chapter in the Company's 78-year history of rear-wheel motorcycle drive technology: For 70 years, from 1923–1993, all BMW motorcycles came exclusively with BMW's characteristic shaft drive – still the most service-friendly and longest-lasting drive technology featured to this day on all of BMW's two- and four-cylinder models. Introducing the new F 650 single-cylinder in autumn 1993, BMW used a chain for the first time, which was then also featured on the F 650 GS, the successor model launched in spring 2000.

Toothed belt drive: quiet, clean, easy to service, long-lasting.

Toothed belt drive is an excellent alternative for motorcycles such as the F 650 CS intended for road use only. The drive system is quiet, it requires no lubrication, it is clean and easy to service, and it lasts at least twice as long as a drive chain. The toothed drive belt on the F 650 CS is 26 mm or 1.02″ wide, features a special partition (11 mm/0.43″) and has a special surface profile. The belt drive gear on the rear wheel is a cold-molded precision metal plate unit made of stainless steel, the gear leading out of the transmission is made of extra-strong sintered metal.

Single-swinging arm continues BMW's tradition of innovative wheel guidance systems.

Introducing the single-swinging arm on the F 650 CS, BMW is continuing the Company's tradition in the area of innovative wheel guidance systems. The single swinging arm on the rear wheel (BMW Monolever) was introduced in 1980 on the R 80 G/S. The R 100 GS following in 1987 featured the double swinging arm, the BMW Paralever then carried over step-by-step to all models in the K and R Series (with the exception of the R 1200 C featuring the Monolever). Introducing the R 1100 RS in 1993, BMW then launched the BMW Telelever, a unique front-wheel guidance system now featured on all K and R models. The beautifully designed single swinging arm on the F 650 CS made of aluminum and quite unique in this part of the market, contributes to the stability of the running gear through its high level of torsional stiffness and thus serves to enhance the motorcycle's agile and precise riding behavior. Like the F 650 GS, the F 650 CS comes with a central spring strut with a kinematic pivot ensuring effective spring progression. The actual progression curve and the set-up of the spring strut with 120 mm/4.72″ spring travel does away with the need to adjust or re-set the spring strut.

Again like the F 650 GS, the F 650 CS comes with a bridge frame backbone made of rectangular steel profiles. Serving additionally as a reservoir for the engine oil, these steel profiles have a larger cross-section than usual, which also ensures a higher standard of stiffness. The panels on the side profiles are not just in the interest of good looks, but also protect the rider's legs from heat coming from the engine oil.

Front-wheel guidance is provided by a telescopic fork like on the F 650 GS, the only difference being the shorter spring travel of 125 mm/4.92″ and the special set-up for riding on the road.

Elegant cast aluminum wheels.

The elegant, silver-painted 17-inch three-spoke cast aluminum wheels are also brand-new. A special feature of the rear wheel is its "curved" design from the hub to the rim resulting from the accommodation of the brake and toothed belt sprocket on the right-hand side. Like the F 650 GS, the F 650 CS also comes with a single-disc brake (diameter 300 mm/11.81″) at the front, featuring a two-piston floating caliper and sintered metal brake linings. The

rear-wheel brake is also a single-disc (diameter 240 mm/9.45″) with a single-piston floating caliper.

ABS optional like on all BMW motorcycles.

It almost goes without saying that the F 650 CS is also available as an option with ABS anti-lock brakes developed especially for BMW's single-cylinder model series and very popular with customers: More than 55 per cent of all F 650 GS purchasers so far have chosen this safety technology offered by BMW as the only motorcycle manufacturer with ABS available throughout the entire range of models.

Customization through a wide range of colors for the paintwork, seats and side cover.

To begin with, the F 650 CS will be available in three attractive colors: in azur blue metallic, golden orange metallic, and beluga blue. The seat is available in either dark blue or sepia, and the exchangeable side covers on the central fairing come in white aluminum or golden orange, this large range offering the customer superior freedom of choice.

New dual headlights with ellipsoid technology.

With its grayish-blue tinted, clear-view windshield, the translucent windshield support and the low-fitted, almost ducked-looking dual headlights, the F 650 CS has an entirely new face at very first sight from the front. Featuring ellipsoid technology, the low-beam headlights ensure a bright, bundled light beam. The high-beam in free-form technology guarantees broad illumination of the road ahead. A small parking light, finally, comes right in the middle beneath the two headlights. The instrument cluster carried over in its basic design and features from the F 650 GS is housed in the cockpit. The speedometer and rev counter come in a new graphic look reminiscent of a modern watch and accentuate the progressive style of this outstanding machine.

Finished in silver, the handlebar measures 745 mm or 29.33″ across and the rear-view mirrors and handlebar controls come straight from the F 650 GS. Like on the F 650 GS, the fuel tank of the F 650 CS with a capacity of 15 liters or 3.3 Imp gals is housed in the frame triangle beneath the seats in the interest of a low center of gravity and optimum handling. The tank filler pipe, in

turn, is located conveniently on the right-hand side of the seat. The F 650 CS comes with two different seat heights: either 780 mm/30.7″ (standard) or 750 mm/29.5″ (optional). The translucent luggage rack carrying a maximum load of 5 kg is held by two stable grab handles for the passenger made of aluminum.

Central fairing with an innovative storage space concept.

Visually, the most striking feature of the F 650 CS is the central fairing replacing the tank or tank fairing, since the fuel tank, like on the F 650 GS, is housed beneath the seat and the engine oil now circulates within the frame of the motorcycle, and not in an oil tank. The space provided in this way is used for a new, innovative storage compartment within the central fairing above the airbox, featuring a translucent fastening rail on both sides and the capacity to take up all kinds of odds and ends.

From the softbag through the helmet fastening spider all the way to the audio system.

The softbag made of a special water-repellent fabric, features easily removable tightening straps simply fastened to the railing fits conveniently into the storage box, providing safe accommodation for everyday items such as the rider's purse, his mobile phone, keys or sunglasses. Using one of the straps, the rider can also take along the softbag conveniently, carrying it over his shoulder. And instead of the standard softbag with a volume of approximately 12 liters there is also an upgraded frontbag available as special equipment. A plastic hardcase (volume approximately 10 liters) fits conveniently into the storage compartment and on the railing, and is easy to carry after being removed by means of a carrier handle. The helmet and baggage spider is made up of three flexible plastic arms with metal inserts and a locking mechanism for fastening and securing the helmet or other baggage within the storage compartment. Based on the design of the hardcase, there is also an audio system with two integrated, weather-proof active loudspeakers and a stereo amplifier with both manual and speed-related volume control. The sound source for the audio system is a portable CD, MC or MD player.

Softbags also for the luggage rack and passenger seat.

A softbag made of robust, watertight nylon with a capacity of up to 27 liters fits quickly and conveniently on the luggage rack without slipping around, and may also be used as a backpack. Another softbag with a capacity of approximately 35 liters fits on to the passenger seat and may be connected if required with the softbag for the passenger rack, in the process forming an extra-large backpack with additional capacity.

Special equipment and optional extras for further customization.

Customization is an important feature of the F 650 CS. Apart from the choice of colors, the wide range of optional extras and special equipment available from the BMW dealer offers further freedom of choice. Among other items, the F 650 CS is available as an option with ABS, heated grab handles, a reduction in engine output to 25 kW (34 bhp), a lower seat measuring 750 mm or 29.5″ in height, and hazard warning flashers. Apart from the storage space and luggage system already mentioned, the special equipment available for the F 650 CS includes a GRP engine spoiler, a chrome trim package, an on-board computer, a power socket, an anti-theft warning system, a special stand for assembly and disassembly operations, and a motorcycle cover.

A perfect match for the F 650 CS: the innovative range of CS rider equipment.

Applying the successful principle of an all-round systems manufacturer providing everything from one source, BMW Motorrad has developed a collection of rider wear and equipment especially for the F 650 CS. Geared in their design and use to the new machine, these items will be available right from the start when the F 650 CS enters the market. Innovative, highly individual seats with unique functions and design are simply perfect for the urban-lifestyle, brand-conscious female rider as well as the trend-oriented male motorcyclist, giving them exactly what they need not only for riding their machine, but also for shopping conveniently and comfortably in town. These are also the first motorcycle suits to come in a special techno material reinforced by Kevlar. Sneakers, gloves and accessories such as a T-shirt, kerchief, cap or sunglasses, finally, provide a perfect match.

The new R 1150 RS: Sports tourer even more dynamic and agile, more comfortable and safer.

Spring 1993 marked a new era in the then 70-year-old motorcycle history of BMW: The R 1100 RS became the first model in the all-new Boxer generation featuring a two-cylinder four-valve power unit and BMW Telelever front-wheel guidance technology. Now, starting the 2002 model year, the sports tourer, the “senior” model in BMW’s current range of motorcycles, is being replaced by the new R 1150 RS. Like the R 1150 GS, R 1150 R and R 1150 RT, the R 1150 RS also comes with a larger and more powerful engine featuring a fully controlled catalytic converter and six-speed transmission. Matching the increase in power and performance, the brakes have also been upgraded, the new R 1150 RS coming with BMW’s new EVO brake on the front wheel and as an option with BMW’s new Integral ABS – in this case the partly integrated version reflecting the sporting character of the machine. New features also include the wheels and a larger windshield. In all, the new R 1150 RS is even more dynamic and agile, more comfortable and safer than ever before – simply the ideal sports tourer.

Bigger engine displacement, more power and torque.

The engine and the silencer right below have been carried over unchanged from the R 1150 RT, with the same performance data in every respect. Maximum output is up from 66 kW (90 bhp) on the former model to 70 kW (95 bhp) at 7,250 rpm and maximum torque has increased from 95 Nm to 100 Nm (74 lb-ft) at 5,500 rpm, making the torque curve even “beefier” throughout the entire speed range. In practice, this means more than 90 Nm or 66 lb-ft consistently between 3,000 and 6,500 rpm, providing better acceleration and even more muscle on the road.

New wheels for better handling.

The new wheels are the most significant modification of the running gear and suspension not only in their looks, but also in their technical features: Like the R 1150 RT, R 1150 R and R 1100 S, the R 1150 RS now comes on lighter, almost delicate but nevertheless very strong cast aluminum wheels with five double spokes. The reduction of unsprung masses ensured in this way serves to enhance both handling and riding comfort. While the front wheel remains unchanged in size at 3.50 x 17, the new machine now features a smaller and wider rear wheel measuring 5.00 x 17 (previously 4.50 x 18). This allows use

of the latest generation of tires and helps to provide even greater riding stability, enhanced handling and, as a result, even more riding pleasure.

New EVO brake on the front wheel and BMW Integral ABS as an option.

The R 1150 RS comes with BMW's newly developed EVO brake on the front wheel, enhancing brake power by 20 per cent. The rear-wheel brake, in turn, is from the R 1150 RT. As an option, the R 1150 RS is also available with BMW's new Integral ABS anti-lock brake system – in this case the partly integrated version, meaning that the handbrake lever acts on both wheels, the footbrake lever only on the rear wheel.

Larger windshield for better protection from wind and weather.

In terms of its looks the R 1150 RS is not very different from the R 1100 RS. The most important innovation visible at first sight is the windshield eight cm higher and six cm wider. This increases the total area of the windshield by approximately 30 per cent, ensuring a superior standard of protection from wind and weather in the process. As in the past, the windshield is infinitely adjustable for angle in just one simple operation.