

## The Hydrogen Age

a report by

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She is responsible for the ecological/economical evaluations of alternative energies and drivetrains as well as the necessary infrastructure and evaluation of strategies to introduce alternative energies and drivetrains to the market. From 1987 to 1997 Dr

Wolf was responsible for the approval of chemical matters and materials in department spanning functions, where her main focus was the assessment of materials and aspects of health and environmental protection. She was also in charge of the concept and groupwide introduction of the ZEUS information system for the administration of relevant data of chemicals and materials. Prior to this she was with the Max-Planck-Institut Solid Matters Research in Stuttgart, Germany from 1986 to 1987. Dr Wolf received her PhD in Chemistry in 1986 from the University of Tuebingen and Stuttgart.

Although it was proven long ago that hydrogen-powered cars are perfectly suitable for everyday use, the necessary infrastructure for the production, distribution and use of hydrogen in cars is not yet in place. This is why the BMW Group is involved in various national and international co-operations and organisations that aim, *inter alia*, to establish consensus on the introduction of hydrogen technology.

### BMW's Long-term Involvement in Hydrogen Technology

The BMW Group is creating the prerequisites today for the mobility of motorists in the future. It wants to ensure that it can continue to deliver vehicles with the dynamic performance and range that BMW customers expect and are already accustomed to.

In the knowledge that petrol and diesel will one day no longer be available and that carbon dioxide (CO<sub>2</sub>) emissions resulting from the use of fossil fuels are held responsible for enhancing the greenhouse effect, BMW is backing the fuel of the future – hydrogen. A hydrogen combustion engine that runs on hydrogen produced with regenerative energies does not pollute the atmosphere with CO<sub>2</sub> emissions or deplete fossil fuel resources. By pursuing this sustainable energy strategy, the BMW Group is assuming responsibility for economic, ecological and social balance.

### Current Political Events

Current political events demonstrate the dependence of industrial nations on oil. This is another reason why views have to be changed. The increasing economic dependence of many nations on the geological and political availability of oil has made the public at large more aware of this disadvantage.

### Compliance with International Agreements

In the past, priority was given to air-quality-related problems resulting from exhaust emissions. However, since the first UN Conference on Environment and Development (UNCED) in Rio

de Janeiro in 1992, priority has now shifted to climatic change.

At the Kyoto Summit in 1997, the EU Member States agreed to reduce emissions of greenhouse gases such as CO<sub>2</sub> by 8% by 2008/2012 (taking 1990 as the base year). Emissions will be reduced by more than 8% in some EU countries while they may increase in others. The German government, for example, gave its assurance of a 21% reduction.

In contrast, the US was only willing to agree to a 7% reduction target and Japan to only 6%. In 1998, the European Automobile Manufacturers Association (ACEA) made a commitment to a new car fleet-average CO<sub>2</sub> target of 140g/km by 2008. This means reducing the average fuel consumption in all models to less than six litres per 100km, which represents a 25% reduction compared with 1995.

### What Needs to be Done?

BMW demonstrated that their hydrogen-powered cars are suitable for everyday use during the CleanEnergy World Tours in 2001 and 2002. In the World Tour 2001 alone, the hydrogen fleet covered a distance of 170,000km across all continents. This success spurred BMW on to take the next important step to series development so that they can deliver the first hydrogen-powered car to its new owner before the current BMW 7-series is phased out.

There is no doubt that the BMW Group will put a hydrogen-powered car on the road in the foreseeable future. They are already making the necessary preparations to ensure that generations to come can profit from their commitment. However, the switch-over to hydrogen fuel will involve changes on a massive scale and major challenges for the automobile industry. This is why one of BMW's development aims is to ensure that a hydrogen-powered car is not much more expensive to buy than a comparable petrol or diesel-powered vehicle. It is also important to ensure that the costs of running a hydrogen-powered car – and thus the price of fuel – are at an acceptable level, an aim that can only be realised in conjunction with its partners.

Since hydrogen technology is already extremely advanced, it is now particularly important to establish a nationwide network of filling stations. However, representatives of the automobile, oil and energy industries cannot make such an important investment decision unless a reliable political framework exists for the creation of incentives to invest in this infrastructure.

Another important issue is the production of hydrogen. It is believed that the aims of reducing CO<sub>2</sub> emissions in the long term and coming full circle can only be realised if hydrogen is produced using renewable energies, such as solar or wind power.

### Level of Acceptance for Hydrogen Among the General Public

It is necessary to provide the general public with information about the hydrogen economy and convince them of its benefits so that the important process of conversion to a hydrogen economy can begin today. Information should be provided as early as possible – ideally at schools – so that young people are aware of existing problems and possible solutions. Special weighting should be accorded in this respect to sustainable production. Comprehensive information about hydrogen as the fuel of the future will provide tomorrow's decision-makers and consumers with the knowledge they lack today.

### Establishment of the Prerequisites for the Hydrogen Age

The BMW Group can only meet the challenge of where and how the prerequisites for the hydrogen age are to be established with the assistance of a global network of partners from the worlds of business and politics. On the one hand, a partner is needed in the field of vehicle development – bearing in mind, for example, fuel cell technology – and, on the other hand, partners who can establish the hydrogen infrastructure.

### The Verkehrswirtschaftliche Energiestrategie Initiative and the Clean Energy Partnership Berlin Project

The BMW Group is involved in many committees and

projects, among which are the Verkehrswirtschaftliche Energiestrategie Initiative (VES) and the Clean Energy Partnership Berlin Project (CEP).

#### VES

The VES is involved in preparing the hydrogen infrastructure and was founded at the initiative of the BMW Group and DaimlerChrysler. Its members include companies that operate in the automobile, oil and energy industries and representatives of politics, all of whom sit at the same table. The German government supports and co-ordinates the activities of this group, whose aim is to establish a nationwide hydrogen technology supply network. Cost-effective production of hydrogen on the basis of regenerative energies; the CO<sub>2</sub> values that are associated with the various methods of production and how they should be organised are all issues that are addressed by the VES as the basis for developing an appropriate strategy.

#### CEP

The CEP is an offshoot of the VES. While the VES takes a more theoretical approach, the CEP puts the knowledge gained into practice.

The opening of a public hydrogen filling station in Berlin will be a milestone for the CEP. The BMW Group and its partners set the ball rolling when the world's first hydrogen filling station was opened at Munich Airport. These filling stations will enable us to gain experience in the day-to-day use and handling of hydrogen, though there is a long way to go before the necessary network of hydrogen filling stations can be established. Two hydrogen filling stations will exist in Germany in the near future compared with around 14,000 petrol and diesel filling stations. The oil industry does not talk about nationwide coverage until the network comprises around 2,000 filling stations.

This is why we are all the more delighted that the CEP is anchored in the federal government's sustainability strategy and has been described as an important project for sustainable mobility. As far as we are concerned, these are very important signs that things are moving in the right direction. ■