BMW i
Corporate Communications

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Electric mobility in tomorrow's world – a question of give and take.

Green light for the Bidirectional Charging Management – BCM consortium research project led by the BMW Group: electric vehicles enable more efficient use of green energy while also boosting power supply reliability.

Munich. The newly launched Bidirectional Charging Management – BCM research project brings together companies and institutions from the automotive, energy and scientific sectors. They have teamed up to develop technological solutions for making electric mobility even easier and cheaper for users, with even lower emissions. By adopting a holistic approach, the project's interdisciplinary partners are aiming to interlink vehicles, charging infrastructure and power grids for the first time in a way that facilitates the widest possible use of renewable energy – and at the same time increase power supply reliability. The research project will run for three years under the aegis of the German Aerospace Centre and with funding from the German Federal Ministry for Economic Affairs and Energy. Testing of the first 50 BMW i3 cars equipped with bidirectional charging technology (i.e. that are capable of backfeeding) is expected to start under real-world everyday conditions in early 2021.

Not only will electric vehicles with bidirectional charging capability be able to draw electrical power for their high-voltage battery when plugged into a compatible charging station or wallbox, they will also have the ability to reverse the process and feed energy back into the power grid. This will effectively turn the electric vehicles' batteries into mobile energy storage devices that can also supply electricity when required. Integrating as many electric vehicles as possible into the power grid in this way calls for myriad innovations in terms of vehicle technology, charging hardware, charging management, communication interfaces with energy sector stakeholders and legal parameters. Bringing about these advances is the task of the research project, in which the BMW Group is acting as consortium leader. It is joined by KOSTAL Industrie Elektrik GmbH (development of charging hardware), transmission network operator TenneT and distribution network operator Bayernwerk Netz GmbH (both energy system services), the Research Institute for Energy (FfE) and Research Association for Energy (both energy system analysis), the Karlsruhe Institute of Technology (KIT; research into

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electricity market and grid repercussions) and the University of Passau (user research).

Expanding electric mobility enhances power supply reliability.
Although the fleet of electric vehicles on our roads keeps growing, this only results in a slight increase in the amount of electric power required. However, there is a growing need to control energy flows intelligently in order to make optimum use of electricity from renewable sources. The BMW Group has already succeeded in implementing methods of intelligent charging control in pilot projects. For several years, intelligent charging management to meet the needs of both the customer and the power grid has been undergoing practical trials in everyday conditions in California with a fleet of 300+ electric vehicles. This has paved the way for the BMW Group to team up with power grid operator TenneT to develop an innovative solution in Germany that allows the charging strategy for electric vehicles to factor in the customer's mobility schedule, the availability of green electricity and the current load on the power grid. It means plugged-in vehicles can suspend and later resume charging when prompted by signals from the grid operator.

The bidirectional charging technology (for backfeeding power) now being explored could lead to even greater benefits. Indeed, it allows parked electric vehicles hooked up to a charging station or wallbox to be used as flexible energy storage devices. During periods of particularly high demand for electricity, these vehicles are able to feed additional power into the grid, while their high-voltage batteries are mainly charged at times when overall demand is lower. In this way, electricity from renewable sources can be tapped and stored as it becomes available. And the stored energy can, in turn, be deployed exactly when needed, whether for electric driving or boosting power grid capacity. Electric mobility can therefore help to stabilise power grids and limit the need to expand them, keeping electricity prices stable.

Bidirectional charging assists the energy revolution.
As well as improving power supply reliability, intelligently controlled integration of electric vehicles into the power grid can also further increase the proportion of renewable energy in Germany's overall electricity consumption. By utilising the

storage capacities made available in the high-voltage batteries of electrified vehicles, supply and demand for green power can be reconciled more effectively. Using these electric vehicles as a means of buffer storage allows the potential of wind farms and solar plants for carbon-neutral energy generation to be exploited to an even greater degree.

For example, a surplus of solar power can be stored in the vehicles' high-voltage batteries and later used for driving, fed back into the customer's domestic network ("vehicle to home") or sent to the power grid ("vehicle to grid"), so that any sudden supply bottlenecks can be alleviated without resorting to fossil energy back-ups from power stations. This adds further depth to the role of electric mobility as an intrinsic element of the energy revolution. Its continued spread serves to lower CO_2 emissions both when driving and when generating electricity.

Fleet test involving 50 BMW i3 models with backfeeding capability.
In addition to devising systems for vehicles and wallboxes that are able to backfeed power, the Bidirectional Charging Management – BCM research project is also focusing on the development of technologies for energy management systems, plus hardware and software for controlling charging. The legal and regulatory parameters are being evaluated, too. Nowhere else has such an all-encompassing approach been actively adopted. All the relevant elements and variables for normal operation further down the line are being considered from a holistic perspective and aligned. The project will enter its practical phase at the start of 2021. A one-year pilot stage will see 50 private and fleet customers supplied with a BMW i3 with backfeeding capability, as well as the appropriate charging hardware and accompanying digital services, so they can test out the customer benefits of the solutions developed so far and their usability under real-world conditions. This will create a platform for subsequently implementing the technology across the board and so integrate electric mobility into Germany's power grid.

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The BMW Group

With its four brands BMW, MINI, Rolls-Royce and BMW Motorrad, the BMW Group is the world's leading premium manufacturer of automobiles and motorcycles and also provides premium financial and mobility services. The BMW Group production network comprises 31 production and assembly facilities in 15 countries; the company has a global sales network in more than 140 countries.

In 2018, the BMW Group sold over 2,490,000 passenger vehicles and more than 165,000 motorcycles worldwide. The profit before tax in the financial year 2018 was € 9.815 billion on revenues amounting to € 97.480 billion. As of 31 December 2018, the BMW Group had a workforce of 134,682 employees.

The success of the BMW Group has always been based on long-term thinking and responsible action. The company has therefore established ecological and social sustainability throughout the value chain, comprehensive product responsibility and a clear commitment to conserving resources as an integral part of its strategy.

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About the Bidirectional Charging Management – BCM research project

The Bidirectional Charging Management – BCM innovation project seeks to develop and test an all-encompassing, user-centric concept for integrating electric vehicles into Germany's system of energy supply.

Electric vehicles with backfeeding capabilities can be deployed to the benefit of the public power grid by optimising the grid's uptake of energy from renewable sources while maintaining grid stability. This requires both appropriate user-friendly technological solutions and intelligent interaction between vehicles, charging infrastructure and power grids. The interdisciplinary project partners from the automotive, energy and scientific sectors are working on holistic solutions to achieve this.

Participating in the project alongside the BMW Group – in its capacity as consortium leader – are KOSTAL Industrie Elektrik GmbH, TenneT, Bayernwerk Netz GmbH, the Research

Institute for Energy (FfE), the Research Association for Energy, the Karlsruhe Institute of Technology (KIT) and the University of Passau.

The innovation project receives funding from the German Federal Ministry for Economic Affairs and Energy. The pilot project will run for three years under the aegis of the German Aerospace Centre.

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