

# **Technologies for the city of tomorrow --Morgenstadt**

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A city that obtains its power from renewable resources, where electric cars move quietly along the streets and which emits almost no carbon dioxide - German federal minister Mrs. Schavan and the president of Fraunhofer, Hans-Jorg Bullinger, shone a spotlight on the scenario of a sustainable city of the future in the vision of "Morgenstadt".

At the UrbanTec Trade Fair in Cologne from Oct. 24 -26, 2011 in Hall 7, Booth A029. Fraunhofer researchers are demonstrating which of the technologies shown can already be implemented today.

It has become quieter on the streets of Morgenstadt: <u>electric cars</u> are now the masters of the road. And quite a bit has changed where housing is concerned: ecological rent guidelines provide landlords with an incentive to restore their houses with <u>energy efficiency</u> in mind. Local heating supply with combined heating and power, as well as solar energy, are systematically expanding into large areas of the city, and Morgenstadt managed to occupy first place in the category of major cities in the federal solar league. Old houses have been completely renovated where energy is concerned – even in the deepest winter they only need little heating to be comfortably warm. Last, but not least, new safety and security concepts ensure a resilient infrastructure such as railway stations. Plazas and city centers afford a high quality of life and comfort. And washing machines and dish washers run predominantly when electricity is most affordable. In their publication "Morgenstadt – An answer to climate change", German federal minister Annette Schavan and the president of Fraunhofer, Hans-Jörg Bullinger,



supported by nineteen researchers from business, science and politics, describe this vision for the high-tech strategy of the German federal government.

"Morgenstadt" is one of the lighthouse projects adopted by Fraunhofer in the course of the high-tech strategy of the German federal government: "The sustainable restructuring of our cities creates new challenges in the areas of power supply, water supply, infrastructure, waste removal and mobility", says Bullinger. "Despite the varying speeds of innovation in terms of information and communication technologies and supply networks, new solutions must be found and the existing substance must be taken into consideration for the long term". Prof. Dr.-Ing. Dieter Spath, Director of the Fraunhofer Institute for Industrial Engineering IAO in Stuttgart is also convinced by the project: "The opportunities afforded these days in the areas of renewable energies, electro mobility, urban production or mobile information and communication technologies are of immense importance for the cities of the future in their function as central living areas for our society. We must research all city-relevant technological fields in an integrated and systematic manner in order to identify the synergies and interrelationships of both today and tomorrow and to make them available for the vision of a sustainable and positive urbanity.

Just how long is the path to this vision of the future? What about the technologies that have been described? Fraunhofer researchers show some of the research results at the UrbanTec Trade Fair in Cologne from Oct. 24 - 26, 2011. In Hall 7, Booth A029 they are presenting new demonstrators and developments that could be part of Morgenstadt.

### Morgenstadt is a quiet city

Currently, extremely loud pneumatic hammers and screeching circular saws at construction sites rob people living in their vicinity of their last



nerve. So far, there are no noise reduction solutions for mobile noise makers that disturb the peace – concrete walls are too expensive and require a solid foundation. Researchers at the Fraunhofer Institute for Building Physics IBP in Stuttgart have developed a solution: an inflatable noise protection system. It can easily be reused and protects the ears of the people living nearby just as reliably as a massive concrete wall. The mobile protection system is also utilized along raceways and for open air events. But, when does it make sense to erect an expensive noise protection wall or install a sound-proof window? How does it sound when the noise from a train or an airplane is reduced by three, five or ten decibels? This is where software developed by IBP helps. It simulates noise with and without the protection system – and it helps the people living nearby and city planners to select the suitable noise protection system.

#### Low-energy living

There are many ways to save on energy: one is to utilize an intelligent electricity meter, the Smart Meterdeveloped by Fraunhofer researchers. In the Thuringian research project RESIDENS, the scientists from the Fraunhofer Institute for Optronics, System Technologies and Image Exploitation IOSB and the Application Center System Technology AST installed this meter in 200 test households. For the project, the local electrical utility offers three different rates, depending on the time of day. The test customers are able to check every day via a web interface, such as an iPad, for example, how much electricity they are using. They can select from among more than 300 visualization formats. Are they interested in seeing electricity usage as it occurs at quarter-hour intervals? Or is a resolution of every two hours sufficient? The customer may also select a monthly overview: How much electricity did he use when it was on cheap rate, how much when it was expensive? The electricity meter, then, offers the customer control over his consumption, for one, and for another an incentive to run the washing machine or the



dryer at those times where the electricity rates are low. Parallel to this, researchers at the Technical University Ilmenau are conducting expansive social research: does SmartMetering change consumer behavior? Visitors to the Trade Fair can get to know the customer portal via an iPad app.

Old buildings usually use up a lot of energy: The windows allow a lot of heat to escape to the outside, the walls are not insulated in an optimized manner and the warm, heated air escapes via heat bridges such as roller shutter casings. Now, researchers at the Fraunhofer Institute for Solar Energy Systems ISE have developed a concept how a concrete high-rise built in 1968 can be changed into a modern and environmentally friendly passive house – rather, into the first high-rise building in the passive standard. A new thermal insulation envelope, windows featuring triple pane glass and venting that utilizes heat recovery to keep the heat in the apartments. Since a lot of heat could escape via the balcony loggia around the building it was integrated into the building and is now part of the living quarters. The apartment dwellers can now enjoy sun and fresh air on newly constructed balconies. The floor plans are also new: since single households are increasing in numbers, the original six apartments per floor have now been turned into nine apartments. The first passive high-rise is only one of the restored buildings. The plan, as part of the "Weingarten 2020" (Wine Garden 2020) project, is to gradually modernize a complete section of Freiburg.

## Mobility and intelligent traffic infrastructures

Much will change in Morgenstadt also where traffic is concerned. It can be envisioned that the streets are no longer flanked with parked cars, but that the vehicles are parked in automatic parking garages. In the entry area of the parking garage, the driver drives onto a transport palette that has been embedded in the floor - he will be directed into a track, similar to that of a car wash. Once the driver has exited, the system transports



the car on the palette automatically into the parking garage and parks it in a kind of high-bay rack storage. This technology offers a number of advantages: there are no longer any cars parked on the street, the streets once again offer more space for the people living nearby. This also prevents the cars from being vandalized. Electric and hybrid vehicles can be charged in the parking garage: the palette contains a charging station whose charging cable can be connected with the charger by either the driver or, in the future, this can be done automatically. The automatic parking garage developed by researchers at the Fraunhofer Institute for Material Flow and Logistics IML is ready for use; a first building with an integrated charging infrastructure and decentralized power generation components is already in the planning stages.

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