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User motivation: “Human Factor” conference
In cooperation with the Technische Akademie Wuppertal, the EnergyAgency.NRW is holding a “Human Factor: Energy-efficiency Campaigns for User Motivation” conference on 27 November, 2008. The event, organized for both commercial companies and municipalities, and chaired by Thomas Heyer, of the WDR regional TV station, will focus on new discoveries, experience and recommendations for long-term internal motivation campaigns, the target of which is reduction of energy consumption. Scientists, users and PR and advertising sector professionals will have the opportunity of speaking. The participation fee is 250 euro. Contact www.energieagentur.nrw.de or mail anmeldung@taw.de to register and obtain an agenda.

Storage is crucial.
Conference in Berlin on 24/25 November
EUROSOLAR and the World Council for Renewable Energies (WCRE) invite speakers and participants to the third “International Renewable Energy Storage Conference”, to be held in Berlin from 24 to 25 November, 2008. Experts from both Germany and abroad will be discussing the technological potentials and current limitations of storage of energy from regenerable sources in the state of North Rhine-Westphalia’s state delegation building in Berlin. The event is being organized in cooperation between the federal environment ministry and the EnergyAgency.NRW. The focus this year in Berlin will be, among other things, on presentation of innovative concepts and technologies, integration of energy generation and storage, storage solutions for stationary applications, heat stores and lithium-ion batteries. Registration and further information: www.eurosolar.org or www.energieagentur.nrw.de

Magazine

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Dear Reader,

The world’s hunger for energy can scarcely be stilled. Globally expanding mobility must be set against admittedly enormous but nonetheless finite oil reserves - a fact illustrated more than clearly by our daily anxious study of filling station prices! Motorists’ desperate attempts to keep their operating costs within acceptable limits by means of fuel-saving driving styles are, quite simply, not enough. Everyone - and not only motorists, and most certainly not only German motorists - must confront this worldwide challenge if we want to avoid mobility becoming a luxury available only to the wealthy few, and to maintain our standard of living and secure our jobs.

As President of Europe’s largest motoring club, I am thinking, in particular, of the motor-vehicle manufacturers, whose products are what make mobility possible for millions of people. They must redouble their efforts to develop, more intensively than ever before, low-consumption propulsion concepts which, ultimately, must break free of dependence on oil. I am convinced that investments in this field will prove rewarding extremely quickly, since purchasing behaviour is set to change tangibly under the pressure of high fuel prices. The legendary VW Beetle may, through the rose-tinted spectacles of motoring nostalgia, be a cult object - but with its consumption of up to 15 litres per 100 km (15.68 miles per US gallon) and its only modest performance, it has no chance today of finding purchasers. Even this simple example shows that technology never stands still - what is revolutionary today may tomorrow be obsolete. Hybrid propulsion systems are an initial, successful concept, but development must continue - such is the nature of progress.

But technology alone will not be enough - government is equally important, and must create the right boundary conditions for a fair and just mobility policy.

Mobility and the concomitant need for energy must under no circumstances be viewed in isolation. There are many diverse applications for oil, and intelligent concepts to achieve greater energy efficiency are vital here, too. Not only here in Germany, society will be obliged to enter into a discussion not only on alternative energies, but also on regenerative raw materials and their effects on food prices in poorer countries. In all these deliberations, however, we must never lose sight of one important fact: mobility is vital in our modern age. Individual mobility too. Mobility signifies quality of life, better relaxation and, ultimately, freedom. We would be well advised not to jeopardize these values.
The future of energy-efficient mobility

There are no simple answers to one of the present-day's most pressing questions: "What is the future of mobility?". The demands of climate protection and the existing energy resources force us to undertake a wide-sweeping search for alternatives to diesel and gasoline. "The need is not only for new fuels, it is equally necessary to find and test new technologies for optimized use of fossil fuels, and develop them up to market maturity", explains Dr. Frank-Michael Baumann, the director of EnergyAgency.NRW. "As well as producing high-quality products at an acceptable price, these products must also be designed, manufactured and used in an environmentally and socially responsible manner", added Norbert Krüger, Manager Sustainable Mobility at Ford, recently at the Ruhr Symposium on "New ideas for future mobility", organized by the EnergyAgency.NRW at the Hansemann Training Center operated by the Chamber of Crafts (HWK), Dortmund.

Record prices for fossil-based fuels, combined with increasing ecological responsibility and awareness, are also rolling electric vehicles from the backyard inventor's shed into the fast lane. The mobility pundits appear to have found their candidate for the roads of the future in the Zero Emissions Car, and Germany's federal government is also working on a "National Electromobility Development Plan". With the EU thinking aloud about CO₂ emission penalties, California already planning the introduction of a zero-emissions car quota, and the German federal cabinet resolving to introduce a CO₂ limit of 120 grams per kilometre by 2012, there are now clear political signs for, ultimately, the accelerated introduction of low-pollution vehicles. This spring, electric cars were the "eye-catchers" at the Peking Motor Show and, in Germany, Volkswagen has now set itself the target of being the first manufacturer to launch – by 2010 at the latest – a zero-exhaust, safe, affordable "large-series solution" based on lithium-ion batteries.

"Electric", furthermore, no longer necessarily means "slow" - all-electric propulsion systems no longer exclude driving pleasure. Li-ion technology recently demonstrated its performance capabilities in the Tesla Roadster, a Silicon Valley product. With its 6,800 Li-ion batteries, this sporty little number, costing around 80,000 euro, accelerates to over 200 km/h and has a range of some 350 kilometres (around 217 miles). Drivers with aspirations to a sporty style can compete on equal terms with the Porsches of this world – the Tesla takes just four seconds to get from 0 to 100 km (65 mph), driven by a 185 kW (248 hp) electric motor. According to the manufacturer, energy consumption in city traffic is approx. 133 Wh/km, equating to some 1.74 l/100 km (around 135 mpg) in terms of the energy content of gasoline. And mini-cars (Smart, Think City, and Mitsubishi's iMiev) with performance data that stands up to comparison with any gasoline-engined car, are already undergoing field testing or approaching their market launch. Prices are predicted to be around 17,000 euro.

The precondition for this trend was the optimization of the performance of lithium-ion batteries. These cells, at 150 Wh/kg, are now capable of storing more than twice as much energy as the nickel-metal hybrid batteries generally installed in hybrid vehicles. A study performed by the Center of Automotive Research (CAR) of the University of Applied Sciences (Fachhochschule) of Gelsenkirchen forecasts dominance of the car market by electrical and hybrid propulsion systems by 2025, thanks to their technical refinement and development, and an increase in battery performance. According to calculations by the Wuppertal Institute, "switching" all the 41 million cars in Germany to electrical propulsion would raise demand for electricity by around 16 percent, an increase which could, above all, be met using regenerable energy sources, claims the Bundesverband der Energie- und Wasserwirtschaft (German Association of Energy and Water Industries, BDEW), which values in particular the properties of the electromobiles as energy stores that relieve the load on the grid.

"We are talking about electrification of the power train, but we remain dependent on the internal combustion engine, particularly in the field of transportation. This is why research is also focused on Clean Diesel concepts and on fuel-saving vehicle developments", comments Dr. Frank Köster, head of EnergyAgency.NRW's "Future propulsion systems and fuels" network. This network concentrates and focuses the activities of vehicle-industry and research institutions in North Rhine-Westphalia. As Köster adds, "This is why it is still rational for automotive-industry subsuppliers such as Pierburg, in Neuss, to work on an aluminium radiator module for diesel vehicles, since this can be used, among other things, to reduce oxides of nitrogen emissions".

Orange electric city sanitation vehicles, the fuel-cell powered buses operated by the Düsseldorfer Messe (trade fair company), and fuel-cell hybrid fork-lift trucks in Duisburg's harbour, are now proving their capabilities in practical use. "Here, hydrogen is used to generate electricity and drive an electric motor – and there is plenty of hydrogen available, as a byproduct of North Rhine-Westphalia's chemicals industry", continues Dr. Frank Koch, from the EnergyAgency.NRW's "Fuel cell and..."
The future of Car & Co.

Work is thus already proceeding on the step-by-step establishment of a network of hydrogen fuelling stations.

Opel intends to enter the market with its Flextreme technology as from 2010. In this system, a small diesel engine is used only for battery-charging, and not, directly, for propulsion. "The company’s long-term target is to reduce motorists’ dependence on oil, and make cars environmentally acceptable by using alternative energy sources", explains Karl Mauer, Director for Technical Communications at Adam Opel GmbH.

One of these alternative energy sources is bioethanol, the first generation technology for which is now available, and the synthetic production of which is also the subject of extensive research activity. Ford is the manufacturer of Flexi-Fuel vehicles, which can operate on up to 85 percent bioethanol. Conversion of gasoline engines to run on bioethanol is now possible.

Toyota, on its own admission, has already been on the market with hybrid propulsion systems for more than ten years. Hybrid technology has, however, now acquired a good reputation. A hybrid vehicle is, essentially, one in which two energy converters (an electric motor and a gasoline or diesel engine) and two energy-storage systems installed in the vehicle (the battery and fuel tank) provide the propulsion. The electric motor propels the vehicle during acceleration and during travel at low and at other, constant, speeds. The batteries are charged, among other things, via conversion of braking and coasting energy in so-called “stop-and-go” traffic. This is the reason that these cars are particularly suit-

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Since it is a rare individual who has the time and money to wait for the electric car – or a fall in gasoline prices – we provide below a few tips which can, at least, reduce the financial discomfort caused by rising costs of using private cars. Fuel savings of 15 to 25 percent are possible simply by driving efficiently.

1. Service your vehicle correctly, and check the oil-level regularly! This helps in running your car more efficiently, and can also assist in reducing CO₂ emissions.
2. Avoid short trips - fuel consumption, and therefore CO₂ emissions, are particularly high when the engine is cold. So either walk into town, or to the supermarket, or use your bike or public transport.
3. Shed weight! Lightly loaded cars consume less than heavily loaded ones. So: Empty the boot. Snow-chains should be stored in the basement, or in the garage, in summer, and not under the seats. And take the roof-rack off whenever it is not needed - left on, it increases air-resistance, and therefore fuel consumption.
4. Change up as early as possible, and don’t drive at high revs. Changing up at between 1500 and 2000 rpm can save up to 20 percent of fuel consumption. The rule of thumb: 40 km/h in fourth gear, then switch to fifth gear above 50 km/h.
5. Check tyre pressures - underinflated tyres can increase fuel consumption by up to 4 percent.
6. Switch the air-conditioning off if you don’t need it. The air-conditioning can increase fuel consumption by up to 5 percent.
7. Switch the engine off if you have to wait for more than a minute - at level crossings and traffic lights, for example.
8. Move off gently, and accelerate smoothly. Frequent acceleration and braking (“the gas and brake” habit) uses more fuel.
9. The natural gas boost. It may well be worthwhile to change over to natural gas for your next car. The purchase price of a natural-gas powered vehicle is only insignificantly higher than for a diesel. In addition, in many towns, gas suppliers and municipal technical services offer subsidies for purchasing of a new natural-gas fuelled vehicle.
10. Car-sharing - two, three or more people using only one vehicle to get to work, or for leisure purposes, helps to avoid jams and save fuel.

Together with the Commission of the EU, the European oil industry has organized a Europe-wide consumer campaign to attract consumers’ attention to potentials for fuel-saving driving. Forty oil companies, operating more than 45,000 service stations in twenty-nine countries in Europe, are participating in the “Save more than fuel” campaign. Information is available at: www.savemorethanfuel.eu, further information on “Market transparency in alternative fuels from Verbraucherzentrale NRW (NRW Consumer Center) (www.vz-nrw.de).
So-called “plug-in” hybrids are currently still at their development stage, but are, nonetheless, not far from their market launch. Plug-in hybrids can be connected to a power socket to charge their batteries, and are said to have a range of up to 50 kilometers under purely electric propulsion. To increase range, an internal combustion engine can either provide direct propulsion (as in the case of the Toyota, for example) or can generate power for the electric motor (as in the Opel Flexxreme).

In parallel to the development of new propulsion-system technologies, the NRW climate protection strategy also extends to the opening up of new fuel sources. The state of North Rhine-Westphalia is participating in the development, in particular, of clean fuels in the framework of the “Future Propulsion Systems and Fuels” network. This involves the concentration of capabilities, with the aim of making the state an attractive and leading location for the development, production, marketing and rational use of sustainable fuels. As Köster comments, “In addition to determination of potential quantities, there is also, for example, the question of availability: in other words how to get the right amounts to the right place at the right time. What is more, everyone who will need to handle and use the new fuel must also be taken on board - service stations, workshops, and subsuppliers, up to and including motorists.”

Against this background, the state is working for the introduction of so-called “GtL” (gas to liquid) fuels in the Ruhr region, and on the future introduction of other synthetic fuels (XTL). The stated target is that of diversifying the motor fuels market, achieving assured supplies, and reducing pollutants, all within cost-efficient boundaries. “Synthetic fuels have the great advantage of being able to use already existing and proven engine technology and the existing distribution infrastructure. This, combined with their constant high fuel quality, provides us with an instrument that enables us to react relatively quickly and effectively to the challenges of present-day fuel problems”, explains Dr. Frank Köster. The use of GtL fuels in unmodified mass-produced engines, for instance, promises to achieve a reduction of around 40 percent of fine-particles emissions, and of as much as 85 percent, in specially tuned engines. “If we can manage to demonstrate these benefits in practical application, GtL could potentially also be used not only as a fuel for road vehicles, but also for ships, for the railways, and even for heating purposes”, continues Köster. The “Future propulsion systems and fuels” competence network is hoping for the achievement of broader commercial use of GtL in North Rhine-Westphalia from as early as 2010 onward.

Biodiesel from microalgae – the hopes of many attach to this development, which promises a solution to the debate on whether production of bio-fuels should be allowed to compete with the supply of human foodstuffs and animal feeds.

The production of microalgae offers yields up to ten times higher per unit of area than intensive agricultural crop production. It is, moreover, possible to use sites that are not suitable for crop cultivation. Even the necessary water supply is not subject to the demands made on the quality and quantity of drinking water, since algae cultures can also be cultivated in saline and brackish water.

Ideal European growing areas are being sought in the Mediterranean region at locations which, due to potential climate changes, may no longer be suitable for the cultivation of crops. Here, algae producers will benefit from the abundant availability of light and heat, and can operate using the saline water available close to sea coasts.

In our latitudes, optimum conditions for the microclimate necessary for the production of algae can be found only in greenhouses. The high added value when the derivatives are used for nutrition supplements and as additives for cosmetic products justifies the high complexity and financial input, however, as the production plant operated by Bioprodukte Prof. Steinberg GmbH in Saxony-Anhalt has been successfully demonstrating for many years. The CO₂ required by the algae is supplied from a tank installation. It will be necessary to develop lower-cost cultivation methods, however, if the algae biomass is to be used as the feedstock for fuels or other chemical intermediates. A new project initiated by NRW’s innovation ministry has been started at the RWE power plant in Niederaussem with this aim. At this site, it is not only possible to use surplus heat for heating of greenhouses, the CO₂ contained in the plant’s flue gas can also be utilized to supply microalgae cultures. A quick start is assured by the greenhouses already existing close to the power plant. A range of differing production systems have been installed at this “Microalgae Innovation Park” to permit their comparison and their evaluation for efficiency and effectiveness. Further information: Sabine Michelatsch, Tel. 0211/896-4610, e-mail michelatsch@energieagentur.nrw.de

Modern microalgae production in a 12,000 m² greenhouse; here, CO₂ still comes from a tank, and requires an industrial supply.
Biogas fuel

Biogas has a future — and, increasingly, a future as propulsion-system fuel. Plans issued by the Commission of the EU prescribe a 10 percent bio-fuels component in overall vehicle-fuel consumption in the mid-term. Cost-efficient use of biogas, which is generated in fermentation processes, as a fuel is now imminent. “Biogas can be recovered, via fermentation processes, from waste, from sewage treatment, and from household refuse. The product is a gas with a high methane content which can also be utilized as a fuel for vehicles”, elaborates Dipl.-Ing. Michael Müller, of the Energy Agency NRW. Production costs are currently around 76 eurocent per cubic meter of gas.

A further argument in favour of biogas is the fact that — thanks to its high methane content — the existing natural gas supply infrastructure can also be used. “This means that biogas could, without great difficulty, be made available to motorists at every service station that has a natural-gas pump”, continues Müller. Car and bus fleets could, given the current trend in gasoline costs, benefit from converting to biogas. The continent’s largest biogas fleet is currently operating in Stockholm, Sweden, with more than one hundred buses. In addition, local public transport in many Swiss cities also runs on biogas. In France, biogas-fuelled bus fleets are now undergoing testing; the Lille region is at present analyzing the extent to which the cost-effectiveness of using biogas as a fuel for buses can be further improved by participation in emissions trading.

Fans travel on natural gas

Swiss gas and water utility Energie Wasser Bern (ewb) converted a portion of its bus fleet to natural gas fuel in good time for the soccer European Cup; the vehicles were operated in everyday scheduled traffic. In Cologne, from North Rhine-Westphalia, delivered three high-capacity compressor units capable of fuelling fifty to sixty articulated (“bendy”) or rigid buses with up to 210 kilograms of natural gas in a tight time window via high-speed filling pumps. These buses can, alternatively, also be operated on biogas. The benefits of natural gas (principal constituent: methane, with an octane rating of 130) can be found in its favourable costs compared to other fuels, and in the low CO₂ content in the exhaust gas.

At the ceremony celebrating the 25th anniversary of Energiewerk Stromsysteme, of Cologne, some 250 guests from the worlds of politics and industry took the opportunity of congratulating Michael Schäfer, who was one of the pioneers in recognizing the potentials of new energy sources. Twenty-five years ago, solar power generation, i.e. direct conversion of solar radiation to electrical energy, remained a niche market. At that time, practically nobody really believed in the potential for any productive use, except in aerospace, for the photovoltaic effect discovered by Alexander Bequerel in 1839. In Cologne, six enthusiastic engineers, including Michael Schäfer, were nonetheless bold enough, in 1983, to enter the field of regenerative energy sources. Their starting capital for the setting-up of the “Energiefabrik Köln” was just 6,000 DM. The company now has ninety employees in Cologne, and at its subsidiaries in Italy, the Netherlands, and the African countries of Mali and Ghana, and achieved a turnover of 130 million euro in 2007. Its current business activities cover solar-power system feeding into the grid and stand-alone installations for regions with no grid connection. The Cologne-based company also recently founded the “Energiefabrik Forum”, consisting of a combination of specialist courses, the interchange of experience, and discussion of solutions for typical scenarios and problems. With these new opportunities, the solar-power systems supplier concentrates attention, in particular, on the topic of build quality.

The starting signal for the Energiebau Forum was given by CEO Michael Schäfer at the Intersolar technical fair in Munich. “It is not our intention simply to add another program to the many already available in the further-training sector”, emphasized Schäfer at the unveiling of the initial schedule of seminars. “Our focus, instead, is on direct feedback with installation practice. We are not offering classical training courses, but wish, instead, to promote exchange of experience via discussion forums and with a direct link to practice, backed up by our twenty-five years of experience”.

Further information: www.energiebau.de
Hydrogen, as a “clean” source of energy, is capable, in future, of assuming an important role in fuel and energy supplies. Routes for the production of hydrogen have been the subject of intensified research for many years now. The German Aerospace Centre (DLR) in Cologne, has, in the context of the HYDROSOL I project, developed a thermo-chemical process for CO$_2$-free recovery of hydrogen using concentrated solar energy, and is currently testing it in the HYDROSOL II follow-up project.

HYDROSOL I involved the setting-up of a reactor in which water is split in two process stages into its chemical constituents, hydrogen and oxygen. In the first stage, regeneration, a metal oxide is reduced, resulting in the liberation of part of its chemically fixed oxygen. In the second stage, the actual water-cracking operation, the reduced metal oxide is reacted with water vapour. In this process stage, the oxygen is fixed in the metal oxide, i.e., the metal is reoxidized, and hydrogen is liberated. The cracking stage takes place at temperatures of 800 to 1,000 degrees Celsius, the regeneration stage at around 1,200 degrees Celsius.

This so-called Konti reactor was firstly successfully tested and operated on a 10 kW scale in the DLR’s solar furnace in Cologne. This made it possible to demonstrate process feasibility and achieve continuous hydrogen production. These Research & Development activities have received official recognition in the form, inter alia, of the EU’s Descartes Research Prize and the Technical Achievement Award of the International Partnership for the Hydrogen Economy.

The development of the process is now continuing with the testing of a pilot installation on a solar tower in Almeria, southern Spain, the HYDROSOL II project. The pilot reactor, designed for a thermal output of 100 kW, was commissioned in March, and has already successfully completed its initial program of thermal testing, during which the maximum working temperature of 1,200 degrees Celsius was achieved. The next step following these tests is production of the first hydrogen, in the autumn of this year. This reactor’s size and degree of automation make it an important prototype for potential industrial applications.

The project is being conducted by an international consortium consisting of participants from Germany, Spain, Greece, Denmark and the United Kingdom.

Further information: Prof. Dr. Robert Pitz-Paal, DLR, e-mail Robert.Pitz-Paal@dlr.de
Around 350 participants from science and industry attended the kick-off event for the Cluster EnergieForschung.NRW (Energy Research Cluster NRW) in Essen. The CEF.NRW's target is that of intensifying cooperation between science and industry. In this new cluster assembled by the NRW innovation ministry, this cooperation is to be pursued more intensively than up to now by the research side, with its own staff in the selected fields. The CEF.NRW provides energy research in North Rhine-Westphalia with a contact and a motor that will give it an even higher visible profile.

The technical emphases of the CEF.NRW are orientated around the strengths of North Rhine-Westphalia's energy-research landscape: power-generating plant technology, solar energy, energy storage systems, fuel cells and hydrogen, along with the sustainable use of biomass for energy purposes.

Energy research is one of the central sectors on which the state is concentrating its research funding. An additional 100 million euro has been made available for this research field up to 2015. "Yesterday’s formulas will not help us to solve the major questions of future energy supplies. We must, instead, pursue all the technological options currently perceivable - and without any ideological blinkers. In addition, we must resolve to invest in Research & Development, in order that new potentials for safe, cost-efficient and environmentally sustainable energy supplies can develop", emphasized innovation minister Prof. Andreas Pinkwart at the kick-off meeting.

North Rhine-Westphalia currently supplies 30 percent of Germany’s power, and employs 240,000 persons in the energy industry. Research and teaching in the field of energy technology is conducted to high international standards at practically every university and more than twenty research institutions in North Rhine-Westphalia, including such renowned establishments as the Jülich Research Centre, the German Aerospace Centre in Cologne, the Duisburg Centre for Fuel Cell Technology, the Max-Planck Institute for Coal Research, in Mülheim, and the Solar Institute in Jülich. "Energy has two strong facets in North Rhine-Westphalia: science and industry", affirms Pinkwart. "North Rhine-Westphalia must be not only Energy State No. 1, but also Energy Research State No. 1".

Management of the CEF.NRW is the responsibility of Dr. Frank-Michael Baumann, director of EnergyAgency.NRW. The EnergyAgency.NRW has, in the past, already brought together parties active in this field on a topic-orientated basis. In addition, North Rhine-Westphalia has thus also achieved a nationally and internationally acclaimed role on the energy scene. This is why, in the future, too, the EnergyAgency.NRW’s networks and partners will continue to lay the basis for the work of the cluster.

The unveiling of the cluster also marked the start of the "EnergyResearch.NRW – Innovative hydrogen storage systems” competition. Small and medium-sized enterprises, along with universities and research institutions, can participate in this competition, in cooperation with industry. Their task is to submit, by 18 September, the best possible concepts for innovative materials, processes and systems for the storage of hydrogen. An independent jury of specialists will choose the best ideas, with the winners being announced by the end of this year.

Outstanding importance attaches to hydrogen in future energy supplies, whether in the context of the dissemination of fuel cell technology, the storage of electricity from regenerable energy sources, or as an alternative fuel. Current methods of hydrogen storage can all be lumped together as: too big, too heavy and too expensive. The aim of the competition is to promote solutions which improve the storage of hydrogen in terms of the technical requirements and make it more cost-effective. Further information: www.cef.nrw.de and www.innovation.nrw.de/wettbewerbe
The term “micro gas-turbine” is used when the machines have a rated electrical output of up to 300 kW, unlike the definition in the field of heat+power and other cogeneration technologies, where facilities are generally only referred as micro-cogeneration plants at outputs of less than 50 kW or 10 kW.

This is a relatively new product, which has reached market maturity only in the past ten years. There are now around ten suppliers on the market, offering machines with rated electrical outputs of between 30 and 250 kW.

Three machines on one shaft
Micro gas-turbines are notable for their extremely compact design, in which the three essential components (compressor, turbine and generator) are installed on a single shaft, with no intervening couplings or gearing.

The intake combustion air is used in this configuration for cooling of the generator, with the result that it is heated with surplus heat from the generator in the very first step. The compressor stage then compresses the air to around 4 bar, after which it is heated by the hot exhaust gases in the recuperator. After mixing with the fuel gas and ignition in the combustion chamber, the exhaust gases reach the turbine stage at around 950°C. Here, they are expanded, simultaneously driving the compressor and the generator. After passing through the recuperator and the exhaust heat-exchanger, the exhaust gases leave the micro gas-turbine. Temperatures of around 300°C are still found downstream the recuperator; this heat can be utilized in the exhaust-gas heat-exchanger for space or domestic water heating, or as process heat.

The generator is activated by means of a permanent magnet, and runs at speeds of between 70,000 and 100,000 rpm, generating high-frequency AC power which is first rectified in the power electronics module, after which it is converted to grid-specification current with a frequency of 50 Hz and a voltage of 400 V. Grid-specification electricity can thus always be generated, even in case of fluctuating generator speeds. The result is that electrical efficiency is less heavily dependent on output, and that the installation’s part-load behaviour is on the whole better than that achieved using internal combustion engines.

Electrical efficiency at rated output, however, is only around 30 percent, while thermal efficiency is just on 60 percent. Typical fuel efficiencies are between 85 percent and 90 percent. This is not as good as the figures achievable on the basis of state-of-the-art technology using internal combustion engines in conventional unit-type cogeneration plants. These figures are, however, perfectly comparable to those achieved by unit-type cogeneration plants at the time of their market launch, with the result that it can be assumed that the efficiencies of micro gas-turbines will improve in the course of further technological development.

An essential advantage of micro gas-turbines, on the other hand, is their high exhaust-gas temperature level. This makes these machines suitable, for example, for production shops requiring process heat. Such integration is normally not possible using internal combustion engines and other combined heat + power cogeneration technologies are also, in the main, not suitable. It is also possible, depending on the recuperator design, to bypass the gas-turbine, permitting exhaust-gas temperatures of 600°C and above, and thus use of this gas for steam generation. Even without this provision, coupling with an absorption refrigeration system is possible, something not achievable using other cogeneration technologies.

Superior technology
According to information from manufacturers, micro gas-turbines also have the advantage of extremely long maintenance intervals of up to 8,000 operating hours, making them greatly superior to internal combustion engines, with their 2,500 operating hours. The specific investment costs for micro gas-turbines are a good ten percent higher, however.

Contact: Gaswärme-Institut e.V., Guido Dubielzig, Hafenstr. 101, 45356 Essen, Germany, e-mail dubielzig@gwi-essen.de
Pollutec 2008 in Lyon

From 2 to 5 December, 2008, companies from North Rhine-Westphalia and the Energy Agency.NRW will be showcasing their capabilities in the fields of water, the environment and energy at France’s largest trade fair for environmental technologies, the Pollutec 2008, held in Lyon. The Energy-Agency.NRW will be focusing on the topics of bio-energy, alternative fuels, hydrogen and the fuel cell, energy-efficient and solar construction, and climate protection certificates.

The new title, “Energie! Entdecke, was die Welt bewegt” (Energy! Discover what moves the world!) is intended to provide an entertaining route to familiarizing children and adolescents between ten and fourteen years of age with the topics of energy generation and utilization. The book is conceived as a blend of a comic and an instructional work and is published by RWE AG, Essen, and the Hoffmann & Campe Verlag publishing house in Hamburg. It is available from bookshops (ISBN 978-3-455-50080-6), but can also be obtained free-of-charge by schools and educational institutions.

Further information: www.hoca.de

Winners announced

A team of girls from the St. Ursula Grammar School, Aachen, took first prize in this year’s North Rhine-Westphalia “Fuel Cell Box” school-pupils’ competition in the field of hydrogen and fuel cell technology. The runners-up were the (boys’) groups from the Plettenberg Grammar School and the Inda Grammar School, Aachen. All three teams were awarded professional fuel-cell operated model vehicles by NRW economics minister Christa Thoben at the concluding ceremony held at the Düsseldorf exhibition centre. The other placed teams from the Brilon grammar school and the Wuppertal vocational college received event tickets donated by the host.

The competition, which was organized by the EnergyAgency. NRW and h-tec GmbH under the patronage of Minister Thoben, was intended to acquaint school pupils, both girls and boys, with the future-orientated technologies of hydrogen and fuel cells. The central topic was efficient use of energy for transport, using the example of fuel-cell-operated (model) buses. The use of real fuel cells at the Düsseldorf exhibition grounds served as the real-life example. The groups of pupils were set the specific task of building model buses from the “Fuel Cell Box” kit, and elaborating special concepts for the use of the buses at an exhibition. In the first phase, 150 teams from all over North Rhine-Westphalia entered for the competition in autumn 2007. The five best teams of the twenty who qualified for the final phase in February 2008 now received their awards.

A further highlight of the event was the race between the pupils’ self-constructed bus models on a specially prepared course, the winners being the team from Plettenberg. Also on the agenda were test rides on the exhibition centre’s real fuel-cell buses and a visit to the hydrogen filling station.

“The Fuel Cell Box competition is an important instrument for familiarizing young people with significant future tasks”, stated the minister. “This is why we are planning a repeat of it for the coming 2008/2009 school year.”

The schools competition is organized in close cooperation with industry; providing support for the now concluded competition were TÜV Nord Systems GmbH & Co. KG, Air Liquide Deutschland GmbH, HOPPECKE Batterien GmbH, Hydrogenics Corporation and the Messe Düsseldorf GmbH exhibition company, along with the German Hydrogen and Fuel Cell Association, DWV. Internet: www.fuelcellbox.nrw.de
Germany looks forward to World Hydrogen Conference 2010

The official invitation was issued upon the conclusion of the 17th WHEC in Brisbane: the 18th “World Hydrogen Energy Conference” (WHEC) is to be held in Essen from 16 to 21 May, 2010. By way of preparation for this international hydrogen event, Germany was both a guest and an exhibitor in Brisbane this year, with its own national pavilion. The Heliocentris company, the Jülich Research Center and the member companies and institutions of the organizing committee for the 2010 conference showed the flag in Australia.

“Germany’s selection as the venue for the 2010 WHEC demonstrates that German companies and research institutions in the field of fuel cell and hydrogen technology, which are concentrated and coordinated in the context of the National Innovation Program (NIP), have achieved highest international acclaim”, explains Dr. Klaus Bonhoff, CEO of Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie (NOW GmbH). “The decision in favour of the venue in Essen is both a great distinction and also a major challenge to Germany and North Rhine-Westphalia as fuel-cell and hydrogen locations”, adds Dr. Frank-Michael Baumann, director of the EnergyAgency.NRW, which will head the organization of the WHEC 2010. This global hydrogen conference takes place every two years, on various continents in alternation.

Further information: www.whec2010.com

Hermes Award to Zenergy from NRW

The 2008 Hermes Award went this year to Zenergy Power GmbH (formerly Trithor GmbH), located in Rheinbach. The company was selected jointly with Bültmann GmbH, from Neuenrade, by an independent jury, for the development of an innovative induction heater, for which resistance-free conductors have been developed to market maturity in the world’s first industrial application of this technology. The 100,000 euro Hermes Award is one of the most hotly contested international industrial-technology prizes and has gone to companies from North Rhine-Westphalia in three of the past four years. The award ceremony takes place every year in combination with the Hanover Trade Fair.

“High-temperature supraconduction technology is one of the keys to the solution of our energy problems, not only in the field of generation, but also in distribution and use. In the high-efficiency induction heater, the product is heated by rotating it in the magnetic DC field of a high-temperature supraconductor”, explains Dr. Carsten Bührer, CEO of the Rheinbach company. The energy to heat the product is transferred by the rotation drive system into the product, increasing efficiency to above 80 percent. Supraconductor technology is thus now being incorporated into an extremely widely used industrial process, permitting significant energy-saving potentials compared to conventional induction heaters, in which efficiency, due to high electrical losses, is only around 50 percent.

“Zenergy Power GmbH, one of Europe’s leading manufacturers of high-temperature supraconducting systems, components and wires, has successfully crossed over from being simply a wire producer to a system supplier”, continues Bührer. “Our products permit a higher power density and lower electrical losses, particularly in the energy and metallurgical industries, in magnet engineering, shipbuilding, and also in transport and medical technology”.

The term “high-temperature” is deceptive, however. It is not heat, but rather cold, which is necessary for the supraconductors to reach their typical operating temperature of around -180°C. The name distinguishes the ceramic materials discovered in the late 1980s from other supraconductors, which become supraconducting only at around 270°C and therefore require considerably more effort for their cooling. One of the outstanding properties of the supraconductors is the fact that they are resistance-free at operating temperature and can transport at least one hundred times more current at room temperature than copper.

Further information from: www.zenergypower.com
Award for solar estate

The GAG solar housing estate in Ossendorf, Cologne, recently won the federal environment ministry’s Energy Balance competition. More than fifty entrants from five EU countries had submitted innovative concepts on the topic of “Intermeshing planning”. The target was to reward groundbreaking products, systems and concepts that combined in exemplary fashion energy efficiency and regenerable energies. The competition was organized by the Institute for Energy and Environmental Research (IFEU) in Heidelberg and the Wuppertal Institute for Climate, Environment and Energy. The Graw Planning Consultancy, from Osnabrück, which planned the radical refurbishing of the solar residential estate on behalf of GAG Immobilien AG, was selected as prime prize-winner from the total of six winners.

As Aloys Graw states, “In 2006 and 2007, GAG’s residential estate in Ossendorf, a district of Cologne, constructed in 1963, was holistically energy-modernized in accordance with the requirements of the ‘50 solar housing estates North Rhine-Westphalia’ program. The integrated planning concept, covering building systems, architecture, landscape planning, construction-quality assurance, project control and resident support, made it possible to achieve rapid and rationally priced modernization without disturbing the residents. The building shells were consistently heat-insulated on the “first insulate, then install” principle, in order to achieve resource-conserving heat supplies using regenerable energy sources”.

“North Rhine-Westphalia, with forty-seven solar housing estates up to now, is unique in Europe, and the Cologne-Ossendorf renovation project is exemplary”, comments Andreas Gries, of the EnergyAgency.NRW. “The old heating systems in Ossendorf have, for example, been replaced by modern wood-pellet and solar-thermal installations. This modernization project will, in some cases, reduce tenants’ energy costs by over 90 percent”.

Within the framework of the “50 solar housing estates in NRW” pilot project, the state of NRW is promoting the construction or conversion of residential estates with the focus on energy-efficient buildings and the use of regenerable energies. Twenty-one estates, with over 1,800 residential units and 4,500 house-owners and tenants, have now been completed, and a further twenty-six are currently under construction or at the planning stage.

Further information: Andreas Gries, Tel.: 0211/86642-17, e-mail gries@energieagentur.nrw.de, www.50-solarsiedlungen.de and www.ifeu.de/energiebalance

Ruhr cities set up hydrogen network

The cities of Marl, Gladbeck, Herten and Bottrop, in cooperation with the Emschergenossenschaft water management board and WIN Emscher-Lippe Gesellschaft zur Strukturverbesserung mbH, have now set up the Ruhr Metropolis Hydrogen Network (Wasserstoff-Netzwerk Metropole Ruhr). The EnergyAgency.NRW is also a founding member.

The Ruhr Metropolis Hydrogen Network has set itself the task of promoting hydrogen and fuel-cell technology in the region. The network takes the form of a cooperative venture between the participating municipalities and other public bodies, enterprises, confederations and individuals, with the function of presenting at both national and international level all the entrepreneurial and public activities located in this region in the field of hydrogen and fuel-cell technology. In addition, the Network will be working to achieve broad support for these activities from industry and state institutions and will be publicizing this technology extensively, particularly at educational institutions.

The non-profit-making “Ruhr Metropolis Hydrogen Network” will pursue the aim of creating the necessary boundary conditions in the Ruhr conurbation, and in the north of the Ruhr, in particular, in order that the region can become established as a location of Europe-wide importance for the hydrogen and fuel-cell industry. The Network will be responsible for promoting these capabilities in the outside world. In addition, it also aims to assist in accelerating the market launch of hydrogen technologies and fuel cell applications, including the production of low-to-neutral-CO₂ “green” hydrogen. A further objective is that of actively assisting companies and institutions in the submission of applications for financial support. Any legal entity or individual can join the Network.

Further information: Volker Lindner, City of Herten, Tel.: 02366/303302, e-mail v.lindner@herten.de or Frank Nosczyk, City of Herten, Tel.: 02366/305284, e-mail f.nosczyk@herten.de

Further information: Andreas Gries, Tel.: 0211/86642-17, e-mail gries@energieagentur.nrw.de, www.50-solarsiedlungen.de and www.ifeu.de/energiebalance
The company Gerstel GmbH & Co. KG from Mülheim/Ruhr heats and cools its new headquarters with a combination of a heat pump and a natural gas condenser boiler. The company is a leading supplier of systems and laboratory equipment to the chemical industry. Ongoing expansion meant that it was necessary to build a new company headquarters. In co-operation with the company Orga-Serv GmbH and EnergyAgency.NRW, concepts for heating and cooling the building were compared and contrasted. The combination of a heat pump and a natural gas condensing boiler was the solution of choice.

Despite the relatively low heating capacity, the heat pump will supply more than 50 percent of the necessary heating, as it works at basic load. Taking into consideration the annual rate of efficiency, the heat pump can cover around 40 percent of the entire heating requirement in an environmentally friendly way using geothermal heating.

Cooling is carried out bypassing the heat pump. The heating water of the underfloor heating is cooled directly via a heat exchanger through the brine circulation system of the earth probes, so that the electric current is only needed for the circulation pumps. This means that only one kWh of electricity is needed in order to produce 20 kWh of cooling. This means that around two thirds of the entire cooling requirement is obtained regeneratively via the ground.

With regard to the heating, the lighting output was reduced by half from originally 30 W/m² to around 15 W/m² with the help of a light planner. In addition, presence sensors with integrated brightness sensors were used. This system reduces the artificial lighting when there is sufficient daylight. In total, annual electricity costs are reduced by around 15,000 euro with a one-off investment of around 65,000 euro.
Windows save energy

Ever more stringent requirements as regards energy efficiency have also affected the further development of glazing for windows and doors. The single glazing which was formerly used, exhibiting heat transfer coefficients (U values) of around 6 W/m²K, can still be found in buildings today. However, the windows found as standard in older buildings are twin-pane insulating glass or double glazing in double-sashed or casement windows. This means that heat transfer could be reduced to around 3 W/m²K.

With the introduction of the German thermal insulation ordinance (Wärmeschutzverordnung) in 1995, the requirements as regards thermal insulation of doors and windows became much stricter, which meant that only thermal insulation glazing was installed in new buildings. This twin-pane glazing, which is provided with an extremely thin coating on the side of the inner pane which faces outwards, and whose internal gap is also filled with an inert gas (argon or krypton) to reduce heat transfer, has remained the standard solution up to the present day. Heat transfer coefficients up to 1.0 W/m²K are achieved.

The development of the passive house standard and the associated desire consistently to avoid thermal weak points in the building shell has driven development yet further. This has included reduction of the heat flow between the panes through the use of thermally insulated glass separators and the development of heat insulated window frames. The frame is the weakness with regard to window insulation, and can account for around 30 percent of the entire window area.

Those who really want to build with a view to energy efficiency make use of triple glazing. This glazing, which also utilises coating and whose intermediate space is filled with inert gas achieves heat coefficients of up to 0.6 W/m²K. The combination of efficient glazing, thermally insulated glass spacers and highly-insulated window frames means that nowadays windows are available on the market which not only exhibit very high insulating values, but can also make a contribution to the heating of the building through the utilisation of passive solar energy. However, the area of energy-efficient glazing offers further scope for innovation. Vacuum glazing opens up a route which can be started on the site of the former Pattberg mine. Riedel Recycling GmbH is not making use of any public funding. The 11,500 modules are mounted on the south-facing side of the roof of a former coal store and mixing building, which is 240 metres long and 30 metres high. After the end of operations in the Pattberg mine, the factory will be used by Riedel Recycling GmbH for processing and storage of earth and residual waste materials.

Environmental friendliness was a decisive motivation for the company in the implementation of the project. “By generating electricity from the sun instead of by conventional means, we can save the environment around 400 tonnes of CO₂ emissions each year,” says Ludger Riedel. “Because of its location directly on the industrial culture route and on the western edge of the Ruhr region the project provides a signal which cannot be overlooked and which is symbolic of the structural change which is taking place in an entire region”, explains Prof. Dr. Norbert Hüttenhölscher, Director of Energy Agency.NRW, who supported the project in an advisory capacity.

Further information: Dipl.-Ing. Thomas Gentzow, e-mail gentzow@energieagentur.nrw.de

Innovation at the gateway to the Ruhr

The final days of the Bergwerk West coal mine in Kamp-Lintfort are being counted off, and already the future of energy is creating a clear light on the horizon in neighbouring Moers. This is where one of the largest solar power stations with thin-layer modules in Germany is being built on the site of the company Riedel Recycling GmbH. In total, the installation will cover an area of more than 8,000 m² on a factory roof and will provide a total nominal output of 860 kWp. Company owners Norbert and Ludger Riedel are expecting an annual yield of 730,000 kWh which can be fed into the public power supply network – sufficient in order to supply around 200 households with climate-friendly electricity.

Five years passed since the initial project draft on the path from idea to implementation until the 3.5 million euro project could be started on the site of the former Pattberg mine, Riedel Recycling GmbH is not making use of any public funding. The 11,500 modules are mounted on the south-facing side of the roof of a former coal store and mixing building, which is 240 metres long and 30 metres high. After the end of operations in the Pattberg mine, the factory will be used by Riedel Recycling GmbH for processing and storage of earth and residual waste materials.

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Further information: Dipl.-Ing. Thomas Gentzow, e-mail gentzow@energieagentur.nrw.de
Hagen – a shining example

Hagen is reducing its annual energy requirement by up to 700 Megawatt hours (MWh), corresponding to 420 tonnes of carbon dioxide, through the modernisation of its street lighting. And for this achievement, Hagen has been awarded the GreenLight partnership of the European GreenLight programme by NRW Economics Minister Christa Thoben. The award ceremony took place during the roadshow of the central federation of the electrical industry, Zentralverband der Elektrotechnik und Elektroindustrie (ZVEI) “Local authority lighting” in cooperation with the “Energy-saving lighting” campaign of the Berlin Energy Agency and EnergyAgency.NRW. More than one third of all German streets and roads are equipped with inefficient lighting systems, and 1.6 tonnes of CO₂ could be saved each year through the use of modern technology. In total, 520 street lamps will be converted to energy-saving technology over a period of twelve years. The GreenLight programme was initiated by the Directorate General Energy and Transport of the European Commission. It recognises organisations and institutions which reduce the electricity consumption of lighting equipment by increasing energy efficiency.

WDR climate marathon on all channels:

Every-day climate protection

Six families in North Rhine-Westphalia have made it their aim to save as much CO₂ as possible in their everyday lives and will be accompanied by the German broadcaster WDR television station for one year in the process. Their efforts will be reported on the radio on WDR 2, on WDR 5 and also on Funkhaus Europa as well as Cosmo TV. The WDR climate marathon is being organised by WDR in cooperation with EnergyAgency.NRW.

First, the task was to minimise use of electricity, heating energy and fuel in one week in the form of the “climate sprint”. By means of immediate measures, such as the use of switchable multiway connectors and energy saving bulbs, turning down the heating, changing the way in which rooms are ventilated and drastic reduction in car use, the families succeeded in saving between 30 and 62 percent of the greenhouse gases which damage the climate.

The families are reporting on their experiences in the WDR climate blog on the Internet at www.wdrblog.de/klima/. The Amprazis family from Troisdorf, for example, were very pleasantly surprised about the effects of their efforts in the Sprint week. “We still can’t believe it! All the members of the family really were very highly motivated, but none of us expected that we would be able to save so much.” Instead of the expected 20 percent, they actually saved 54 percent of CO₂. Following the short sprint phase, the important thing now is to integrate the one-week efforts of the families permanently into everyday life. To give a little support, the WDR is providing each of the three families with 3,000 euro which is used for climate protection measures in agreement with the advisors from EnergyAgency.NRW. Up to now, investments have been made in CO₂ compensation of a holiday flight, the exchange of a hydraulically regulated instantaneous water heater for an electronically-regulated model, purchase of energy-saving large electrical appliances and installation of a solar heating system. Participation in fuel training provided by the German automobile club ADAC is also part of the programme.

Even if there is still a long road ahead before the end of the marathon, one thing is already clear today: the aim of the Federal Government to reduce 20 percent of greenhouse gases by the year 2020 can be achieved by the families involved in climate protection within one year through changes in behaviour and low-cost investment. Further information: Dirk Mobers, Tel. 0202/24552-63, e-mail mobers@energieagentur.nrw.de.

Association for new NRW players in the market

Climate protection projects which run according to the procedural rules of the Kyoto Protocol (Joint Implementation JI, Clean Development Mechanism CDM) are developing into an export market for technology and project management companies. The objective of JI and CDM projects is to bring climate-friendly technologies into use in threshold and developing companies as rapidly as possible. In order to facilitate access to this market for companies from NRW, EnergyAgency NRW is starting a JI/CDM interest group. Project management companies are invited to take part in the same way as potential investors and manufacturers of energy efficiency technology and companies from the renewable energy sector. Information: Rainer van Loon, Tel. 0211/837-4225, e-mail vanloon@energieagentur.nrw.de.
The Argentinean author would probably have been extremely happy in the warehouse of the Bielefeld publishing house Cornelsen – and perhaps even happier if he had known that the new buildings, covering an area of 5,000 m² are heated with climate-friendly geothermal heating.

Cornelsen Verlagskontor (CVK) is one of the largest book suppliers in Germany, and around 42 million books are currently in store at the company’s premises. In spring 2007 the company celebrated commissioning of a geothermal heating and cooling system and since then, this environmentally friendly technology has provided heat in winter and cooling in summer. “We have created an ideal room climate for our staff and for our books”, summarises Chief Executive Horst Keplinger. Bielefeld architects Wannenmacher + Möller and the Gütersloh planning consultancy CONTEC checked the feasibility of the geothermal installation beforehand. With an investment of 400,000 euro plus 150,000 euro for the underfloor heating, the system initially cost 30 percent more than a natural gas heating system. However, the operating costs are 45 percent less. If prices for natural gas and electrical energy rise only moderately, the project will have paid for itself in seven years – even sooner if prices rise more rapidly.

28 geothermal probes reach down to a depth of 130 metres. The probes remove heat from the ground by means of a water circulation system, and this is used for the underfloor heating. If it is hot in the summer, the water transports cold from the soil layers. In addition, the waste heat from a neighbouring building is discharged into the ground. As result, around 120,000 kWh of energy enter the ground each summer for “intermediate storage”. In winter, this heat provides a higher source temperature and the heat pump works more efficiently.

Altogether, the planners have calculated that the use of a geothermal system can reduce primary energy consumption for heating by around 58, and for cooling by around 86 percent. The total primary energy requirement amounts to 38 kWh/m²a.
Gelsenkirchen continues to work on its transformation from the city of a thousand furnaces to “city of a thousand suns”. The company Scheuten Solar has now installed 1,764 polycrystalline solar modules on the roofs of the LOXX logistics centre in Gelsenkirchen. Each of these generates an output of 205 Wp, and the LOXX photovoltaics installation there has a nominal output of 361,62 kWp. This makes it the largest PV installation in Gelsenkirchen as regards surface area, and also the highest-performance plant when it comes to power yield. Investment: around 1.6 million euro. And the installation not only generates power, it also looks good. Ingo Demutat from Scheuten Solar points out that the symmetrical arrangement of the solar modules is displayed to excellent advantage on the large, even roof surface.

Sun for Schalke
The “Schalker Verein” solar power plant was already put into operation in the spring. The plant, which at its current stage generates around 320,000 kWh of electricity each year with a peak output of 355 kWp, can be extended to generate an output of 400 kWp. The plant was installed on the ore and coal bunker of the former Schalker Verein steel works. It will enter the history of the “solar city Gelsenkirchen” as the “longest solar bunker in the world”, and acts as a symbol of the structural changes which are taking place in the former coal and steel town of Gelsenkirchen. The plant, which is around 5,800 m² in size, is provided with 1,621 solar modules.

Worthwhile ventilation
Ventilation systems are becoming more important for healthy living and working, but most systems still have potential for optimisation from the energy point of view. For example, energy consumption sinks to an eighth, if the rotational speed of the fans is halved. “There is particular room for cost-savings if use of ventilation equipment is requirement based”, says Dipl.-Ing. Dirk Wollenhaupt from Energy-Agency.NRW.

The company Salzgitter Mannesmann Präzisrohr GmbH, a steel tube manufacturer in Hamm, is saving a great deal of energy with its canteen ventilation system. In the past, the system was in operation at all hours of day and night with an 18.5 kW motor. Now the plant is controlled by a timer and is only switched on when the canteen is being used. This means that around 100,000 kilowatt hours of electrical energy are saved each year.

The company Diagramm Halbach produces special papers in Schwerte. The paper waste is sucked off using two suction systems working continuously with motor output of 35 kilowatt (kW) each. Originally, there were simple flaps in front of the suction nozzles which opened when the machine was started up. “The amount of air which was sucked off always remained basically the same, it was only distributed over a varying number of suction nozzles”, says Wollenhaupt. Now, the waste air motors are controlled based on requirement using a frequency converter. Depending on the number of machines in operation, the motor output can be reduced down to 70 percent by means of a pressure sensor. Based on 6,600 operating hours each year, annual energy savings of around 140,000 kWh result. Soon, the company will renew the central intake and exhaust air system for the production factory. Here, it is considered that use of efficient motors and fans with speed regulation and also halving of the air volumes from 96,000 m³/h to 48,000 m³/h will reduce the power consumption of the motors from its present level of 116 kW down to 45 kW. Energy saving: around 470,000 kWh.

The company Advansa GmbH, manufacturer of polyester fibres, has gone one step further in Hamm. There four identical ventilation systems with intake air volumes of 250,000 m³/h are installed and these supply the production area round the clock with fresh air of a defined temperature and moisture content. Up to now two systems constantly operating at full load were mostly operated by hand. To achieve increased use of the waste heat and requirement-based operation of the systems, it became necessary to invest 140,000 euro – an amount which was covered within one year of operation. Energy consumption was reduced by a total of 2,400 MWh. The savings were achieved through optimised use of recirculating air and requirement-based operation of the washers and fans. Instead of allowing two systems to run at full loading, as was originally the case, the same volumetric flow was divided over four systems, which only work at half load and only require one sixth of the energy consumption. A 90 kW intake air fan motor only requires 15 kW of power. This was achieved by the use of frequency converters, which are used at the intake fans and the washer pumps. By means of this measure alone, Advansa saves 740 MWh of electricity each year. In addition, the proportion of recirculating air which is combined with the intake air in the mixing chamber was increased. This means that the heat required to bring the intake air to the “operating temperature” of 20 degrees is less. Energy saving: around 1,700 MWh. Advansa GmbH was recognised as an Ecoprofit company in 2007.
Interview with Andreas Steinert, Chief Executive of Radium in Wipperfürth

What activities are associated with this?
We always make sure that no materials whatsoever which are damaging to the environment are used in our products. As far as energy efficiency is concerned, we always work intensively on optimising our processes in an integrated way, and this starts with our source products. This means that we can achieve considerable, and above all sustainable, energy savings. In addition, our customers demand that our behaviour as regards the environment is above reproach. On an international level, the bar is set very high for us. In fact, from the beginning, we want to exceed expectations, and this is also in our own interest, as it encourages loyalty on the part of our customers.

But it is not only in the production area that Radium can take energy savings forward. What energy-saving products do you have in your range?
For the private user we can offer innovative low-energy bulbs in all shapes and wattages and also low-energy halogen bulbs. In area of LEDs, which have a particularly long lifetime, we offer solutions with standard sockets which can be used in existing lamps. For the industrial area, Radium has in its range highly-efficient halogen metal vapour bulbs with an elliptical ceramic element, which can save a huge amount of energy in on sales floors, for example.

What developments do you see for the future?
Intelligent light management systems will become considerably more important, as they make it possible to save a great deal of energy. In addition, LED lighting will play an important role in the future. Radium is also active in other areas which are not concerned with visible light. Clean drinking water is also the theme of the future. For several years now we have had special UCC bulbs in our range which make it possible to sterilise water or air without the need for a large expenditure of cost, time or effort. We by no means only manufacture bulbs for lighting in the traditional sense.
"mission E" spreads its wings

The German UNESCO Commission has recognised the "mission E" initiative of EnergyAgency.NRW as an official project of the UN decade of education for sustainable development.

With the help of "mission E" – the E stands for Energy, Efficiency, Energy-saving, Emission and Engagement – it is possible for industrial companies and public administration bodies to reduce their consumption of heat and electricity solely through the motivation of their employees. The German UNESCO commission has in particular recognised a method for know-how transfer which has been used by EnergyAgency.NRW for transferring "mission E" to the German armed forces on a broad basis. "Over time, more and more companies and local authorities have turned to us because they are interested in a mounting a similar energy efficiency campaign to reduce their energy consumption", summarises Tom Küster from EnergyAgency.NRW. "We therefore had to develop a consistent method in order to transform the philosophy, strategy, activities and communication of "mission E" as used in the armed forces into a concept suitable for general use."

Therefore EnergyAgency.NRW created a package which makes it possible to companies and local authorities to implement a long-term internal motivation campaign on their own behalf.

The campaign compendium

The transfer method for multiplication of "mission E" comprises eight components. Particularly worthy of mention is the introductory seminar, lasting one and a half days, which includes a large number of exercises. These include exercises concerning user motivation and the factors which are decisive for the success of "mission E". Two employees with "multiplier" functions from each of the interested companies and local authorities attend this seminar. At the heart of the know-how transfer is the campaign compendium comprising 320 pages, which also includes a CD-ROM and provides a wide range of background information and working aids. A particular highlight from the advertising point of view is the fact that each partner is permitted to use the "mission E" wordmark in a colour of their choice. Further information: www.energieagentur.nrw.de/mission_E

German army saves over 700 m kWh

After the German armed forces were able to reduce their electricity and heat consumption by 578 million kilowatt hours in 2007, they again saved 192 kWh in the first half of 2008. This means that since January 2007 there has been a reduction of a total of 770 million kWh or 14 percent. At the same time, "the troops" have lowered energy costs by 55 million euro and CO₂ emissions by 255,000 tonnes. This volume of CO₂ is the equipment of a forest covering an area of 6,200 km² – an area larger than the Balearic Islands. On average, each member of the armed forces has improved his or her energy balance by 2,200 kWh and the CO₂ balance by almost 730 kilograms since the beginning of 2007. And in fact the enormous energy savings achieved within 18 months and the success of all 350,000 members of the armed forces are the result of many different measures and instruments. But above all: the improvement is the result of serious efforts – in the areas related to buildings and the technical area and also as regards organisational measures and changes in behaviour, on which "mission E" has been concentrating since October 2006.

The objective of the Ministry of Defence is to lower the energy consumption of the German armed forces by five percent each year until 2011. Related to the reference year 2006, this corresponds to a reduction of more than 22 percent – an ambitious target, which the armed forces have already almost two-thirds fulfilled after just 18 months.

Online computer determines personal CO₂ balance

How much carbon dioxide (CO₂) is created while heating the home? What effect does a holiday or a more economical car have on the personal CO₂ balance? Anyone who is interested in such questions can make use of the CO₂ calculator of EnergyAgency.NRW to find the answers. This calculator translates the user's personal lifestyle into greenhouse gas emissions and compares the annual CO₂ emissions for the particular use with the German average.

After entering his data, the user finds out his personal CO₂ footprint and he finds out what he can do in order to reduce it. The CO₂ calculator represents five areas of day-to-day life: living, mobility, food and drink, personal consumption and general consumption, i.e. the activities of the state to the benefit of the citizens such as infrastructure and education. In addition to CO₂, this online tool also takes further important greenhouse gases into considerations, such as methane (CH₄) and laughing gas (N₂O), for example from the area of agriculture. These play an important role when considering food and drink. The CO₂ calculator, which is available at www.energieagentur.nrw.de was developed in cooperation with the Heidelberg Institute for Energy and Environmental Research (ifeu) and the Federal Environment Agency. Companies and local authorities from North Rhine-Westphalia can obtain the calculator for their websites from EnergyAgency.NRW.
“50 percent by 2050” is the short formula of the G8 states, as stated in Toyako in Japan for international climate protection. What is meant is the halving of global greenhouse gas emissions in the coming decades. While the energy sector and energy-intensive industries in many states are coupled to international climate targets by means of emissions trading, such a higher-level arrangement does not yet exist with regard to buildings. This despite the fact that according to estimates made by the United Nations Environment Plan (UNEP) the buildings sector accounts for between 30 and 40 percent of energy consumption worldwide.

Zero emissions building
Bayer MaterialScience from Leverkusen wishes to demonstrate that energy-efficient building is possible, even under difficult conditions. The organisation is constructing its new office block in Greater Noida near New Delhi in India as a zero-emission building. The foundation stone was laid in May 2008, and completion is due in 2009. In order to supply electricity to the around 1,200 m² of useful area and the neighbouring exhibition hall, the experts from Leverkusen are planning a 600 m² solar installation, which is intended to make the building independent of supply of electricity from the outside. By means of special insulation, a ventilation system and other factors, it is intended to reduce energy consumption to the extent that the building does not consume any more energy than it produces itself. The cost calculation resulted in the conclusion that the additional investment required as a result of the desire to protect the environment would be covered in ten years.

Potential of stock hard to raise
The situation with existing building stock is more difficult than with new buildings. Together with the NRW Economic Affairs Ministry, EnergyAgency.NRW made use of the climate protection conference in Bonn in order to examine the climate protection instruments Joint Implementation (JI) and Clean Development Mechanism (CDM) along with experts from UNEP and the German Energy Agency (dena) for their suitability for application to the buildings sector. A dena pilot project in St. Petersburg, for example, revealed efficiency potential of 60 percent for multi-storey buildings. However, these energy-saving reserves are difficult to raise by means of JI projects. Modernisation from the point of view of energy efficiency requires a series of individual measures such as heat insulation, replacement of windows and renewal of the heating system. Up to now, separate validation and verification must be performed for each of these individual measures. This means that the project costs rise and climate protection measures become less attractive. According to UNEP, the methods used for JI and CDM must be considerably simplified in order to make climate protection measures with regard to buildings more attractive. Further information: www.en-consulting.com/Side-Event-2008/

New manager in NRW Economics Ministry

Since 1 July, Michael Gessner (43) has been the new head of the energy, climate protection and mining sector in the Ministry for Economic Affairs and Energy of North Rhine-Westphalia.

Gessner studied geology in Cologne and Aachen with special emphasis on raw material exploration, hydrogeology and geophysics. Following ten years of work in various management consultancies, after 2002 there followed six years in the energy sector. As head of Energy and Environmental Policy, one of the areas for which Gessner was last was that of basic questions of energy management at the municipal utility Stadtwerke Düsseldorf. The energy sector knows Gessner from, among other things, several publications and talks regarding sustainable energy policy and emissions trading, and through his work in several specialist committees of the industry associations VKU, ASEW, BDEW/VDEW.

Gessner’s predecessor Dr. Volkhard Riechmann retired in June 2008.
New programmes for climate protection: 400 million euro

With a total of five new programmes, the Federal Environment Ministry is as from now supporting investments for climate protection in industry, in local authorities and also in private households. This year up to 400 million euro are available for this purpose, which originate from the sale of CO₂ emission rights. Of this sum, 280 million euro will be used for national measures and 120 million euro will be channelled into international projects. The main focus of the climate protection initiatives is on projects which serve to advance future-orientated technologies, and also initiatives which help to overcome the barriers to implementation of climate protection measures which have existed up to now.

The new “National Climate Protection Initiative” comprises the following elements:

- Guidelines for the funding of climate protection projects in local authorities and social and cultural institutions,
- Climate protection stimulus programme for the installation of mini heat and power cogeneration plants in private households and industrial companies,
- Climate protection stimulus programme for industrial cooling plants,
- Programme for optimisation of biomass for energy generation,
- Expansion of the existing market stimulus programme for regenerative heating.

A further component is an action programme “Climate Protection in Schools and Education Establishments”. Among others, model projects for the “zero emission school”, qualification of teachers and initiatives for energy efficiency and use of renewable energy are funded.

The international climate protection initiative is aimed at bilateral projects in threshold and developing countries and also in Central and Eastern Europe. One of the main focuses of funding is the development of sustainable energy supplies.

Applicants from North Rhine-Westphalia receive support from EnergyAgency.NRW when preparing the necessary documentation.

Further information is available from Stefan Leuchten, e-mail leuchten@energieagentur.nrw.de and Rainer van Loon, e-mail van.loon@energieagentur.nrw.de and on the Internet at www.energieagentur.nrw.de.

New energy-saving building

Since July 2008, the controversial energy passes have been mandatory by law. And now along comes the Renewable Energies Heating Law – certain again to be much discussed.

With the Renewable Energies Heating Law (EEWärmeG) Berlin has grasped the next nettle. With this law, the use of renewable energies is made mandatory for the (exclusively) new building of residential and non-residential buildings in future. Possible limitations on the use of renewable energies are circumstances which render the use of renewables impossible from the technical point of view or which lead to inappropriately high costs or excessive work. Examples of such circumstances are, for example, unfavourable geothermal conditions with regard to use of geothermal heating, roof surfaces which are shaded in the case of solar energy or too great a building density, which prevents wood pellets from being delivered by tanker.

Renewables can be widely used if there is success in presenting the benefits of the use of the “new energies” when the law is applied,” explains Dipl.-Ing. Joachim Decker from EnergyAgency.NRW. In contrast, it would be fatal for the renewable energies sector if the positive image of heat pumps, solar installations and so on were to be destroyed by the existence of the obligations, says Decker.

However, still further innovations are due in the buildings sector. The federal cabinet has passed the amendment to the Energy Saving Ordinance (EnEV 2009). The intention is that the quality of new buildings should in future be considerably better from the energy point of view than it has been up to now. Requirements are also being made considerably stricter with regard to the modernisation of old buildings, by an average of 30 percent. This may seem exaggerated. However, if the developments in energy prices are considered, the requirements do not seem so extraordinary. The energy values which have to be fulfilled at present have not been changed since the EnEV regulation of 2002 (price level 1999). The heating oil price, in contrast, has risen since then by 200 percent from less than 30 cent per litre to the current level of around 85 cent per litre.
Summer insulation: hot outside, cool inside

The records of the meteorologists are clear enough: in 2008 every month (up to now) has been too hot. Bright sunshine during the day, and at night tropical temperatures of more than 20°C – this no longer seems to be the exception, but the rule. Living, working and sleeping in closed rooms can then become tiring.

Following the focus on heat losses in winter as a result of the previous thermal insulation and energy savings regulations, EnEV 2007 concerns itself in detail with the risk of overheating in the summer. While in the past, proof of summer heat protection was explicitly required for buildings with a window surface area of more than 30 percent in relation to the area of the facade, now this proof has to be provided as soon as a window surface of more than 10 percent is to be implemented in relation to the floor space (except for north-facing rooms). Only one exception is regulated by the relevant standard, DIN 4108 Part 2: proof need not be provided for houses inhabited by one or two families whose east, south and west windows are provided with sun protection on the outside. Proof of summer heat protection must be provided for all other buildings, including those with air conditioning. In cases where the simple procedure according to DIN is not sufficient, “more precise calculation methods employed by engineers”, in other words, dynamic building simulation, can be used. The aim is to take precautions against unreasonable temperature conditions or huge air-conditioning costs by means of building measures already considered at the planning phase of a building.

Integrating sun into planning
From the building point of view, there are various well-known and tried-and-tested possibilities, such as overhanging balconies and effective roof projections, which prevent sun from shining directly into the room beyond in summer when the sun is high in the sky, but which allow it to enter in winter when the sun is low.

Movable sun protection on the outside of the building is also a proven method of keeping the heat outside. In contrast to this, protection on the inside should rather be called dazzle rather than sun protection, for the heat is already in the room when this form of protection, which may even have reflective characteristics, takes effect.

Twin-pane sun protection glazing (coating of the inner side of the pane facing outwards) provides superb sun protection, combined with relatively good heat insulating characteristics. Triple-pane glazing optimises this characteristic. Innovations like phase change materials (PCM) can contribute to the prevention of overheating in summer.

Ventilation vital
Besides these building measures, the ventilation concept is just as important for the interior room climate and is therefore taken into consideration in the DIN standard and in the simulation programs. In particular, night ventilation, which the possibility of “discharging” items or materials which store heat by means of cool air is one of the most effective measures in connection with protection against overheating in summer.

Further information:
Joachim Decker, EnergieAgentur.NRW, Tel. 0202/24552-69
Solar power is becoming cheaper

According to information from the solar energy federation, Bundesverband Solarwirtschaft - BSW-Solar, the price of solar power installations has fallen by 15 percent over the past two years. While a photovoltaic system with one kilowatt capacity still cost around 5,000 euro (plus VAT) in 2006, the net price for completed installed solar energy plant of this size fell to on average 4,275 euro by the second quarter of 2008. This was the conclusion reached by the photovoltaic price index issued by the BSW-Solar each quarter.

EnergyAgency.NRW at Haus & Wohnen

Energy saving is on trend, but is also a sheer necessity for many. Those who wish to have tips on energy saving are recommended to visit Cologne between 20 and 23 November. The “Haus & Wohnen” fair which takes place every two years in the Kölnmesse exhibition centre is considered to be the most important exhibition of ideas concerned with building and living. The event in 2008 focuses very strongly on energy, energy saving and all that is linked with it. EnergyAgency.NRW is represented with the energy bus and information stands. Information: www.hausundwohnen-koeln.de

Modern power plant technology – for schools

Where will electricity come from in future? How and from what is it generated? Commissioned by the NRW Economic Affairs Ministry, the NRW Power Plant Technology Competence Network of EnergyAgency.NRW has created a brochure which gives information on modern power plant technology and which is also addressed among others to pupils, teachers and other multipliers in the education area. In the debate for and against this or that energy source the non plus ultra has not yet been found. This means that it is all the more important, not only to retain an overview of the complex energy supply strategies of the State of North Rhine-Westphalia, but also to receive information regarding what is and is not technically possible. The brochure “Hightech aus NRW” (“High-tech from NRW”) can be downloaded in German or English at unterwww.kraftwerkstechnik.nrw.de or can be ordered by fax (0209/167-2822) or e-mail (thomeczek@energieagentur.nrw.de).

5. Photovoltaic module workshop

EnergyAgency.NRW and TÜV Rheinland Group will be organising the 5th workshop on photovoltaic module technology (“Photovoltaik-Modultechnik”) on 27 and 28 November at the TÜV Rheinland group in Cologne. For an event fee of 230 euro plus VAT specialist visitors interested in the sector can gather information about the latest developments and trends in PV module technology and can also make contact with very many different people and companies. The main themes include among others building-integrated photovoltaics, methods of sealing, characteristics of glass, lifetime of photovoltaic modules, quality assurance and recycling. Programme details are available as from October at www.energieagentur.nrw.de. Registrations by e-mail please to thorsten.loellgen@de.tuv.com or by Fax 0221/806-3280.

Special “Energy” edition offers 1000 tips

The special new “Energy” edition of the magazine “Test” from the consumer body Stiftung Warentest offers a wide variety of tips and information for lowering energy costs and for environmental protection. These range from optimisation or replacement of heating systems through innovative heat insulation to use of ambient heat with heat pumps. Testing of different solar collectors for provision of hot water is also discussed in the magazine, along with passive houses and the subject of useful energy-saving bulbs and there are also tips on how to save electricity at home. Further information: www.test.de

Annual Fuel Cell and Hydrogen Conference

The NRW Fuel Cell and Hydrogen Competence Network of EnergyAgency.NRW is issuing invitations to its eighth annual meeting. The meeting will take place on Thursday, 20 November 2008 in the Hilton Hotel in Düsseldorf where a balance sheet will be drawn up of network activities this year and information will be provided regarding the current status of fuel cell and hydrogen technology. The event will extend over the whole day.