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Dear Readers,

More than half of the energy consumption in North Rhine-Westphalia is attributable to heating, which places NRW above the German average. Among other factors, this is due to the type of businesses in the region, which require a great deal of process heat, and to the fact that NRW is the most densely populated state in Germany and therefore has a particularly high demand for space heating. We all know that climate protection goals can only be achieved if we realise the potentials for reducing CO$_2$ emissions, including in the heat sector.

It is equally well known that these potentials lie in energy saving and in increasing energy efficiency and the share of renewables. In Germany as a whole, approximately 12 per cent of heat is currently generated from renewable sources; in NRW, the percentage is only about half of that. In several studies regarding the potential for renewable energy in the region however, the State Agency for Nature, Environment and Consumer Protection in NRW (LANUV) showed that a significantly larger portion of the demand for space heating can be met using energy from regional renewable sources such as solar, biomass, geothermal energy and warm pit water, and with technologies that are already available on the market.

At the moment we are analysing the potential of using industrial waste heat to meet the needs of the heat sector. We hope to gain valuable insight into how existing operational waste heat can be recovered – for example with the help of heat networks – in order to satisfy the high demand for process and space heat. This would increase the efficiency of the energy system, protect the environment and create additional income for the businesses involved, in turn helping to make NRW more attractive as an industrial location and securing its future by establishing regional value chains.

LANUV supports the energy transition by providing planning-relevant data for the promotion of renewable and efficient energy sources. Up-to-date information about the current status and the potentials of renewable and efficient heat sources in NRW are pooled in the heating inventory in the Energy Atlas NRW (www.energieatlas.nrw.de), a compilation of technical information which provides an overview of the local heat demand. Heat networks will be also be included in the near future.

The heat turnaround is a multi-faceted issue which requires communication and cooperation between the many players involved. I hope that reading this edition of “innovation&energy” will motivate you to take part in the exciting transition process and that it will give you an interesting perspective on the heat supply of tomorrow.

Dr. Thomas Delschen
President of the State Agency for Nature, Environment and Consumer Protection North Rhine-Westphalia
New EA.TV films

The new film “Well combined: heating listed buildings in a climate-friendly way” illustrates how well the symbiosis between old and new can work in a heritage environment. It is a portrait of a heritage listed house whose owner has decided to heat it with wood. A pellet-fired boiler installed in 2015 is combined with a solar thermal system with eight tube collectors and a 1000-litre buffer storage tank to supply heat both to the main building and the adjoining barn. “It is important to communicate and coordinate with the heritage authority at an early stage. In our experience, wood pellet heating can also be suitable for use in unusual renovation projects,” explains Larissa Mathiszik, director of the wood pellets initiative of EnergyAgency.NRW.

Overview of energy-efficient household appliances

Refrigerators and freezers, washing machines, tumble dryers and dishwashers are purchased to last for many years. Apart from good performance our main expectation is that they should be reliable. And more and more importantly: we expect them to be energy-efficient! In order to make things easier, EnergyAgency.NRW has updated its overview of energy efficient household appliances. Extremely efficient models can be found among the more than 5,000 fridges and freezers, 1,400 washing machines, 2,700 dishwashers and 450 tumble dryers which were available on the market in autumn 2017 and which are now listed in the 16-page brochure. The efficiency rating ranges from class A+++ to D, but for certain appliances, only A+++ is really efficient in practice.

The brochure is free and available for download at: www.energieagentur.nrw/qr122

Sector coupling in NRW: Options

A group of experts from the networks and storage systems network of EnergyAgency.NRW has published a paper entitled “Sector coupling as a challenge and opportunity for the energy state NRW”.

The 70-page EA paper identifies a number of options and is intended to initiate a discussion. The most important output of the expert paper are ten central statements which are intended to help further analysis of sector coupling in the state and address both the challenges and the opportunities. The expert paper is addressed to a target group consisting of representatives from the industry (energy industry, plant engineering, extractive sector), investors and capital providers as well as politicians and representatives of civic society. The paper is available online.

www.energieagentur.nrw/qr139

www.energieagentur.nrw/qr121
“Green” hydrogen can be used in many ways – for example as a basic chemical in refineries, as fuel in the transport sector, as an energy storage medium in the natural gas network and for reconversion in fuel cells. In order to present the many facets of this issue in connection with new business models, and in order to highlight opportunities and solutions, the 8th German Hydrogen Congress is dedicated to the “business factor hydrogen”. The event will take place in Berlin on 06 and 07 June 2018 and EnergyAgency.NRW, together with DWV e.V. (the German Hydrogen and Fuel Cell Association) and NOW GmbH (the National Organisation Hydrogen and Fuel Cell Technology) will use the occasion to discuss possible applications and potentials with representatives from business, science and politics.

www.h2congress.de

Jüchen recognised as “NRW energy saver”

The local authority in Jüchen, a municipality in the Rhine district of Neuss, has successfully increased the energy efficiency of six public buildings: the school centre at Stadionstrasse has received a new combined heat and power plant and the town hall was equipped with a gas-powered air heating pump. It is already the 20th award of the “NRW saver of energy” badge to the town. “Jüchen will continue to set a good example – energy renovation of buildings is an important contribution to climate protection, and it also makes economic sense,” as Matthias Nerger from the NRW ministry of economics says (shown on the right). “We are proud of this award, which will spur us on to continue with our commitment,” explained the mayor, Harald Zillikens (pictured on the left). The state uses the “NRW savers of energy” project organised by EnergyAgency.NRW to promote the modernisation of existing buildings according to the latest standards as well as the construction of climate-friendly new buildings.

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Exemplary CO₂-neutral heat supply

The “climate point” of the climate protection estate in Gütersloh-Pavendorf in NRW has now been inaugurated. The estate consists of 23 semi-detached and detached houses with a maximum heating energy requirement of 35 kWh/m²a (three-litre standard). The heating-related CO₂ emissions are fully compensated by solar power generation, and this allows 55 tonnes of carbon dioxide to be saved every year. “Apart from protecting the climate, the estates create new jobs and prospects for the building sector in NRW,” says Dr. Hartmut Murschall from the NRW ministry of economics. Nina Herrling, city building officer for Gütersloh, adds: “The environmentally and climate friendly buildings are sending a signal. They are a good example of how climate change can be mitigated by means of a new building culture.” The “100 climate protection estates” project is implemented by EnergyAgency.NRW on behalf of the NRW ministry of economics.

www.100-klimaschutzsiedlungen.de
The movement of our heat supply towards more climate friendly options is gaining momentum. But especially in cities, the heat turnaround makes for a complex project. Many local authority enterprises in North Rhine-Westphalia are now establishing a framework – and showing how the quest for the most efficient mix when integrating renewable energy sources into local and district heating networks can be successful.

The numbers speak for themselves: Experts estimate that the target share of 35 per cent renewable energy within overall power consumption set by the federal government in its energy concept for the year 2020 was already exceeded last year. But the heat market is lagging behind: approximately one third of German greenhouse gas emissions are still attributable to heat generation. Heat accounts for about half of the German final energy demand and is still mostly obtained from fossil fuels – at the moment, the share of renewable sources in the entire heat supplied is a meagre 13 per cent. But it has become clear that if the energy turnaround is to be successful, a heat turnaround is also needed. And it cannot be achieved solely by working on the demand side and reducing the demand for heat over the long term by means of building renovation, modernisation of heating systems and construction of energy-efficient new buildings. The supply side must also offer intelligent and integrated approaches to the provision of heat.
Local and district heating networks of the future

Heating networks are key here. From a technical point of view, they are little more than a central heating system which is expanded to cover an entire estate or part of a town. This means that companies and home owners no longer need to have an oil or gas-fired boiler in the cellar, but receive their heat supply from the outside through a specially installed network of pipelines. Small combined heat and power plants (CHP units) can serve entire city quarters and estates in an energy efficient, climate friendly and low-cost way.

The transition to district heating with larger heat volumes and longer pipelines is more flexible. Even if it runs on waste heat from carbon-fired power plants, district heating still protects the climate, because – thanks to cogeneration – it can use the energy input twice over and produce power and heat simultaneously. The centralised heat supply becomes cleaner and more efficient when unused waste heat from industrial facilities like waste incineration plants and de-centralised, high-performing heat suppliers such as large-scale solar thermal systems, deep geothermal energy and large heat pumps are integrated with it. Combinations with energy storage and power-to-heat systems offer yet more innovative approaches for making heating networks sustainable and safe for the future. "One decisive element in fulfilling our efficiency and climate protection targets is the gradual expansion and conversion of the heat supply into a de-centralised and regenerative system. What is important here is intelligent control and sector coupling," says NRW minister for the economic affairs and energy Prof. Dr. Andreas Pinkwart. For by 2050, the greenhouse gas emissions in the state should go down by at least 80 per cent compared with 1990. The upgrading of cogeneration and of the heating networks, together with other measures, offers significant potentials in the sector with the highest energy consumption. In order to tap into these potentials, the state government supports the CHP impulse programme and the "progres.nrw" programme for the expansion of heating and cooling networks. EnergyAgency.NRW provides help with a wide range of offerings in the form of initial consultations. The federal "Heating Networks 4.0" programme supports feasibility studies and network retrofits.

Local authorities in NRW show how it’s done

According to the Federal Association of the German Energy and Water Industries, the expansion of local and district heating is gaining momentum all over the
country – with plenty of room for further improvement. Local authorities and utility companies in many places in North Rhine-Westphalia are examples for how the available heat generation and supply options can be adapted to the local consumer structure in the best and most cost-efficient way so that they allow a flexible transition to other sectors. The CHP model community Bad Laasphe demonstrates that even in rural areas with low demand densities, small local heating networks can operate at high efficiency if they are well planned.

Energy beneath the cobble stones
For the 150 listed buildings in the historic centre of Bad Laasphe, storage heaters and oil heating will soon be a thing of the past. In future, they will be supplied from three centralised cogeneration plants, including one operated with biomethane. A gas boiler will compensate for shortfalls in the heat output during times of peak demand and a generously dimensioned heat accumulator guarantees optimal runtimes for the cogeneration plant, so that the power that is generated by the unit can be fed into the public power grid in a cost-effective way. The 4.7 kilometres of pipeline network will also supply businesses with year-round heat, along with other large heat consumers such as the town hall, a school, a nursing home and several hotels. The overall concept allows for low heating prices, according to project manager Joachim Debus: “Developing cogeneration towards more efficiency and lower CO₂ emissions is worth the effort. On the one hand this is a way of reconciling the preservation of historic buildings and energy efficiency. On the other hand local and regional value chains also benefit.”

Heat for an entire village
The bioenergy village of Wallen, near Meschede, which has built its own heating network to supply its 500 residents, shows how this can work on a smaller scale within a cooperative structure. The network is operated with waste heat from the power generator of a local farmer’s biogas plant, and a wood chip heating plant serves as back-up. The wood is sourced at market prices from local forestry management. A drying plant ensures optimal wood combustion and a high level of efficiency. The kindergarten and the fire station are also connected to the system, which means that the village of Wallen has a completely independent heat supply. The cooperative has invested approximately 1.8 million euros in the heating station and network. “At the moment, we are right within the budget,” the cooperative is pleased to announce.

District heat transition also in towns and cities
Towns and cities with a majority of multi-storey buildings and little space available for technical installations and heat generation from renewable sources are more of a challenge. This is where district heating comes in – and it has a long tradition in the conurbations of North Rhine-Westphalia: with a total of 4,300 kilometres of pipelines and more than 90,000 house substations, this is the densest heating network in Europe. Even at the present time, 80 per cent of the transported heat is produced efficiently by means of cogeneration. As the overall district heating network consists of more than 20 individual networks, the utility companies can follow various approaches when it comes to enhancing their contribution to climate protection when supplying heat.

Reducing CO₂ emissions with new routes
In Duisburg, two district heating networks are in the process of being connected via a new pipeline. This will give the network to the right of the Rhine, which is fed from fossil fuel-powered heating plants, access to the district heating pipeline of the Lower Rhine area, which is operated with over 50 per cent renewable sources such as biomass, biogas and industrial waste heat. This new connection creates several synergies at once: “It increases flexibility on the producer side and promises annual CO₂ savings of around 8,700 tonnes,” according to the calculations of the project partners.

NRW has the densest heating network in Europe
“At the same time, the capacities of the renewable heat generation plants along the Lower Rhine pipeline will be better exploited.” The primary energy factor will fall below 0.3.

A new pipeline in Düsseldorf will connect the airport to the district heating network, which according to estimations by the utility, will bring down the CO₂ emissions of this large heat consumer from around 10,000 tonnes to 4,400 tonnes per year. “With this project, the airport is making an important contribution to the climate neutrality of the city, because at this level, the company already fulfils the German climate targets for 2040.” The new pipeline, which will be built in spring, can also supply the northern parts of the city in the future.

Finding innovative solutions for heating entire districts

The Ruhr University in Bochum (RUB) will become a partner of the municipal public utilities provider and will start producing heat itself: two new cogeneration plants will not only supply the entire campus independently. By means of a supply network, they will provide heat to the neighbouring district of Querenburg for 4,800 rented apartments, 760 single-family homes, and 115 other customers. The cogenerated power will be used by the university itself. “For us, turning from an energy consumer into an energy producer equals more independence,” explains Ina Schwarz, construction and properties officer at RUB. One advantage is that the private consumers in the city districts need heat very early in the morning and in the evenings as well as at the weekend, while university peak demand is during the daytime on workdays. This energy concept of the two partners will help the local authorities save 26,000 tonnes of CO₂ per year in future.

A different type of district-based approach is expected to help modernise the district heating network in the centre of Dortmund in a climate friendly way. It developed historically as a high-temperature steam network, but as structural change is under way, industrial demand for steam process heat is slumping. Therefore the over 25 kilometres of pipelines are to be retrofitted district by district for operation with hot water by 2022 and coupled to the already-existing hot water network in the north of the city in order to form a new district heating infrastructure.

Comment

“Far-sighted district heating and CHP”

“We want to expand CHP units and the district heating infrastructure and make them more efficient,” – such was the announcement in the coalition agreement of Germany’s Grand Coalition. But NRW is already one step ahead, because here we know exactly how important the contribution of CHP and district heating is for reducing CO₂. Nevertheless, the cities and conurbations in the state still have significant potential when it comes to contributing to the climate protection target for 2020.

The high efficiency of cogeneration is one part of this vision for the future; the other is the possibility of using heating networks as an infrastructure which makes new CHP units, renewable heat sources and waste heat from incineration plants or industry facilities capable of efficient exploitation. This is one of the reasons why businesses and the state were in favour of the Rhine Ruhr district heating pipeline. The flexibility and openness towards different technologies offered by this energy and heating network will be of considerable importance, also in view of the imminent structural change in the energy industry.

At the same time, it must be taken into account that district heating companies need reliable and stable conditions in order to manage the change. The state of NRW has already achieved important milestones in this area, not least with the use of funding programmes such as the new heat infrastructure loan issued by the NRW Bank. But the federal government also needs to contribute. Therefore the state government of NRW should plead for an extension of the German Combined Heat and Power Act until 2030 and an upgrade of the CHP target to 150 TWh.

At the same time, the successes achieved by the act must not be placed in jeopardy by excessive tightening of the energy conservation legislation. In any event, it must be ensured that the heating networks continue both to supply existing buildings in a climate friendly way and to provide the capacity to connect with new buildings.

Udo Wichert
President of AGFW, Energieeffizienzverband für Wärme, Kälte und KWK e.V.
a combined district network. In addition, it is planned to replace the gas-based heat supply by integrating industrial waste heat. This would not only result in a primary energy factor of 0.45, but the climate burden would fall to far less than 100 grams of CO₂ per kilowatt hour. In addition, peak load boilers, power-to-heat and CHP units will guarantee the supply to the new combined network. “Replacing the whole steam network whilst at the same time changing energy generation over to intelligent technical solutions is quite a challenge,” says Peter Flosbach, technical director of the public utilities provider in Dortmund, DEW21, “but this option is undoubtedly the most sustainable one.”

The renovation project of Vivawest Wohnen GmbH, which wants to turn the Eicker Wiesen district in the city of Moers into a climate protection estate, is an example of how energy renovation of existing residential buildings can make district heating more efficient. The apartments in the 15 multi-storey buildings from the 1970s are currently still heated directly with district heating, but in future the buildings will also be equipped with small heating substations with buffer storage for heat and hot water as well as transfer stations for hot water for each apartment. The technical advantage of this arrangement is that heat loss is reduced, and furthermore, it ensures that the CO₂ threshold of 12 kilograms per square metre and year for climate protection estates consisting of existing buildings is observed.

Towards the new heat market with the most efficient mix
At the present time, the heat market is a sleeping giant. But many local authorities in NRW are getting ready to awaken it. On the one hand the conversion of the heat supply gets the go-ahead when the available generation options on site are adapted to the local consumer base in the best and most cost-efficient way. And on the other hand existing networks have to be extended, upgraded to accommodate low-emission waste heat and highly efficient cogenerated heat, and combined with supply of power in a way that relieves the public power grid.
Denmark’s heat turnaround – a model for NRW?

Denmark, with a connection rate of 62 per cent of all households to district heating systems, is among the pioneers in the European heat turnaround. The country is home to numerous successful projects in which “waste heat” from industry is fed into district heating networks. Anton Beck, of the Danish energy agency, spoke to us on the ranking of industrial waste heat in Denmark, and other topics.

Mr. Beck, why is Denmark increasingly backing industrial waste heat, and how are heat potentials identified?

Beck: Energy must be used as efficiently as possible, in order to reduce gross energy consumption. The use of waste heat should be promoted, but the generation of heat by industrial processes specifically for sale to district heating suppliers should, at the same time, be avoided. In Denmark, surplus heat is subject to taxation, in order to prevent intentional generation. The Danish government is currently re-evaluating the structuring of this tax.

How is such a fluctuating supply of heat tackled in Denmark?

Beck: The availability of waste heat from industrial enterprises and power-generating plants, solar thermics and other fluctuating sources of energy will not necessarily coincide with times of need for energy. The district heating network in this respect possesses the great advantage that hot water can be stored both day-by-day and also from summer to winter. Heat can thus be put into the system when it is available, and taken out again, when it is needed.

What storage methods and other “flexibility options” are available to balance out fluctuations?

Beck: In Denmark, both large and also smaller district heating operators make use of the potentials for short-term heat storage. This provides flexibility for the energy system, a flexibility which is decisive for the economic and ecological optimisation of the system as a whole. Seasonal storage facilities are nowadays used above all for large-surface solar collectors. These are becoming ever more important, since they enable the use of energy which would otherwise be lost.

What can we in NRW learn from Denmark?

Beck: District heating is a cornerstone of Denmark’s green and efficient energy system, and assists in attaining the country’s long-term energy targets. The Danish energy authority possesses more than forty years of experience in shaping a green industry in Denmark. This experience can also serve as an inspiration to NRW companies in the implementation of similar projects for district-heat supply. We will certainly be glad to pass on our experience during our joint study trip in June 2018.

EnergyAgency.NRW, in cooperation with the Danish energy agency, is organising a study trip to Denmark from 6 to 7 June 2018. The trip will focus totally on the use of industrial waste heat, and participants will be able to view practical examples of how cooperation projects between district heating suppliers and industrial enterprises can be implemented.

The full-length interview and further information can be found online at: www.energieagentur.nrw/international
Megatrends, mega questions – mega answers?

For North Rhine-Westphalia, Germany’s energy and industry state No. 1, the energy turnaround signifies a profound change in its energy system, which has grown organically in the course of many years.

The Virtual Institute “Transformation – Energy Turnaround NRW” institute supports and promotes the sustainable modernisation of the energy-supply system in NRW. The research focus of this think tank is on non-technical questions. The central emphasis here is, in fact, on questions of the democratic involvement in shaping the energy turnaround, individual handling of the energy turnaround, and the transformation of industrial infrastructures. In future, greater attention is to be directed toward the interactions of the energy turnaround with higher-level topics.

These trends are modifying the economic practices and ways of life of the population in a large-scale dynamic. The necessity of monitoring these developments in the context of the energy turnaround is easily apparent. Many of the topics involved have already been influencing the development of industry for years, and some for decades. They affect the level of affluence and have close interactions with the sustainable development of society. There has, however, up to now been scarcely any systematic and holistic examination of the interfaces of these trends with respect to the implementation of the energy turnaround. This is where the Virtual Institute, with its trans- and interdisciplinary expertise alignment, can link up with existing research work and combine it with a specific focus on the energy turnaround to create a complete new field of research.

The following research questions typically represent the necessity of better understanding the complex and, in some cases, also contradictory interactions between urbanisation, digitisation and the ageing society, on the one hand, and the energy turnaround, on the other: digitisation, for example, promises to be an important factor in the optimisation of energy infrastructures and in the acceleration of the energy turnaround (watchword: smart energy). It will, however, on the other hand demand enormous input of resources and energy. At the same time, the energy turnaround itself will influence global megatrends (including the rate of conversion to electromobility, for example). There will, therefore, obviously be a mutual interdependency, which has to date not been adequately scientifically analysed, if at all.

www.energieagentur.nrw/qr123
The world’s tallest server tower?

A reinforced-concrete tower, 13 metres wide and 150 metres high: a large amount of empty space that could be productively used, the more so, since it already has excellent infrastructural features, such as cooling, and grid and Internet connections. Such an idea has been taken up and developed by Johannes Lackmann, director of the WestfalenWIND Group, jointly with the SICP – Software Innovation Campus of Paderborn University, to arrive at the so-called “WindCORES”. This research project focuses on the fusion of wind-energy installations with the power-intensive IT services provided by computing centres. Specialists from the previously more mutually remote sectors of renewable energy and IT were consulted on the development and implementation of the WindCORES idea. In February, the first computing centre installed in the tower of a Type Enercon E-115 wind-energy installation, which is located in a wind farm within the County of Paderborn, was commissioned as a prototype.

Four fire-resistant and intruder-proof, TÜV-certified IT security cabinets of availability class III provide space here for 248 server units. Capacity suffices for accommodation of the data of around 50 medium-sized enterprises. The first customer for the world’s probably highest server tower is the Centre for Information and Media Technologies of the nearby Paderborn University, which had been looking for an additional external standby server meeting the strict security requirements applicable, for the data stored within the university. Customers know precisely where their data is located and where the computing operations take place.

This form of IT outsourcing is not only sustainable and regional, but also has economic benefits, since power costs for energy-intensive computing can be reduced by up to 50 per cent thanks to direct on-site consumption. The burden on cables is, in addition, also immensely lessened. “These computing-intensive machines here obtain their power directly from the generator of the wind-energy installation. There are no grid charges for use of low- and high-voltage transmission cables, and this enables us to supply this power at such low cost”, explains Frithjof Dubberke, director of WestfalenWIND IT. The assurance of uninterrupted supply of power for the processes taking place in a computing centre was the highest priority. The power supply is triple assured by means of the wind-power from the system in which the computing centre is housed, by the surrounding installations on the wind farm itself, and by further independent transmission grids. Connection to the Internet is accomplished via glass fibre and via direct radio. There are already more than 3,600 wind-energy installations turning in NRW alone, and many of them could accommodate computing centres in their turbine towers. “This can be accomplished in existing installations. Provided there is sufficient free space, hundreds of towers throughout Germany could be retrofitted”, adds Johannes Lackmann. WestfalenWIND IT and Paderborn University have proven in their joint project just how fruitful cooperation between science and industry can be, and have shown what genuine “Green IT” is.
Virtual power plants
Elements, benefits and markets

S
carcely any discussion of the ener-
gy industry can now be conducted
without using the terms “digitisa-
tion” and “virtual power plants”. But what
does the combination of differing genera-
tion and consumption units by means of
a smart communications infrastructure
really signify? For whom is this option of
interest, and what business models can
be derived from it? EnergyAgency.NRW
facilitates newcomers’ entry to this com-
plex subject with its “EA.paper” on virtual
power-generating plants. This electronic
“paper”, which can be perused on Energy-
Agency.NRW’s Internet pages, concen-
trates the relevant information and pro-
vides it in a comprehensible form.

In addition to the technical challeng-
es involved with the system as a whole,
and their conceptual solutions, the in-
creasingly decentralised structures of
the energy system, and their interlinking
to form the virtual power plant, also gen-
erate challenges and potentials, including
economic ones. Virtual power plants, for
example, provide potentials for various
market players to make a contribution
to system stability and, in addition,
helps achieve extra revenue.

The “EA.paper” pro-
vides a structure to the large
range of definitions and ap-
plications and thus provides
a basis for all players wishing
to examine this subject, but
currently possessing not even
preliminary knowledge. The contents in many cases de-
fine perspectives, outline
the current status of dis-
cussions and provide a
preview of possible devel-
opments. EnergyAgency.
NRW thus supports the
ongoing debate on the potential costs
and benefits of virtual power-generating
plants. For this reason, the electronic “pa-
er” also examines current obstacles and
the potential prospects of virtual power
plants. “To summarise, it can be stated
that virtual power plants have the poten-
tial to supply cost-efficient answers to a
range of requirements in system transfor-
mation. The question of how, in terms of
microeconomics, a holistic whole is to be
achieved from the individual elements is
just as decisive as that of how to adjust
regulatory mechanisms”, the quartet of
(female) authors affirms. The “EA.paper”
has been drafted by: Lisa Conrads, Natalie
Ebersbach, Judith Litzenburger and Jas-
min Wagner.
KRING Transfer-Wärme-Technologie GmbH is an enterprise in North Rhine-Westphalia’s environmental industry. KRING has been developing modular district- and local-heating transfer stations and special systems, home control stations and heat-transmission networks for twenty years. Director Rainer Klöckner explains to us his motivations, and what makes his company special.

What motivates you to go to work each day?
Klöckner: There are occupations in which there is talk of the “vocation” needed to do your job properly. This feeling can also occur in our industry – who wouldn’t enjoy working on something that pursues ecological aims? I am lucky in having the privilege of working in an environment where fairness, respect and collegiality are lived out to the full every day, and where you meet, on a daily basis, friends that you can look forward to meeting again.

What distinguishes KRING TWT from other products on the market and what is it that makes your company special?
Klöckner: KRING is one of Germany’s most important suppliers in the special field of heat recovery, with the focus at all times on boosting energy-efficiency. The energy-economical, fast and space-saving installation of compact-design home control stations to supply hygienic and fresh drinking water also augment KRING’s portfolio, as do ultra-modern control and instrumentation (C&I) technology tailored to customers’ special needs. Numerous specialist building automation system (BAS) planners, energy suppliers, industrial users and residential-housing construction companies value our solutions orientated around extremely diverse customers: BAS operators, municipal utilities and energy-supply organisations, and also landfill operators. And KRING also designs the entire heating system for hospitals and fitness studios, and manufactures multi-piece modular systems to accommodate ultra-low ceiling heights in existing buildings, for steam-distribution systems, for example.

What innovations are currently “in” with respect to the topic of district and local heating?
Klöckner: The thermal applications of sunlight are currently being tested, and their economic benefits evaluated, in a range of district heating test installations in Germany. KRING is participating in the implementation of such a research project in cooperation with the Stadtwerke Düsseldorf municipal utility and the Steinbeis Solites research institute. Another fascinating development takes the form of innovations in the field of the implementation of LowEx local-heating systems. More than thirty transfer stations for supply of heat to a development zone via the use of well water and with the integration of special filters are currently being produced at KRING’s production facilities.

What are your needs in the political environment to succeed as a company?
Klöckner: The industry is assuming that the climate targets for 2050 can be achieved only by the major expansion of heat systems. At current primary-energy prices, market-incentive programmes which will actually make economic implementation at all possible are necessary for the attainment of these aims. The ever shorter “half-lives” of the German renewable energy act and other financing models make it difficult for all players in the industry to repeatedly readjust to frequently changing boundary conditions. Clear political requirements and a recognisable long-term concept incorporating corresponding conditions would be a rung on the ladder for all the companies working in this industry.
Wood-based heat supplies from local to district

Regenerative, versatile, natural – three genuine attributes of wood as a source of energy

From the heating boiler in the basement up to full-scale biomass power plants feeding into local and district heating systems and capable of supplying complete urban districts – wood is a suitable fuel for practically all applications. EnergyAgency.NRW’s new “Modern heating using wood” brochure illustrates the entire bandwidth of potential uses. And innumerable facilities in NRW underline the versatility of this energy source.

One such wood-fuelled heating installation went into operation in Voerde in 2015 and has since been supplying biogenic heat to some 2,000 residential units. Fernwärmeversorgung Niederrhein GmbH ensures with its CHP plant that the annual demand of a good 7,900 MWh is met at all times. To achieve this, heat is generated in two heating boilers fuelled by untreated wood chips obtained from the region and fed into the around 7 kilometre long heating system. The recyclables dealer commissioned is able to monitor the filling level of the fuel bunker on a screen and dispatches a lorry-load of wood chips to the cogeneration plant whenever necessary. Great importance is attached to quality even at the fuel-procurement stage, and there is therefore no clinker generated in combustion. A clean solution with potential for expansion – the operator is not disinclined to expand its district heating system.

An expansion project with a view to climate-neutral heating also took place in Alpen in 2017. The proprietor of the “Burgschänke” pub decided to go further than just modernising his heating system and thus replacing his old gas and oil boiler. Since the beginning of this year, two pellet-fired boilers with underfeed stoking have been supplying the 4,500 m² of the hotel plus the Burgschänke and three neighbouring multi-family residential buildings with climate-friendly heat. Electricity to supply the hotel is obtained from a small CHP plant unit which, in emergencies, is responsible solely for power supplies to the pellet-fired heating system. The heating installation is connected to two buffer storage tanks, each of 2,000 litre water capacity, which permit supply of hot water to the thirty-seven rooms of the hotel and the residential units. The local-heating system achieves an enormous reduction in energy consumption, in view of hotel capacities.

The small local-heating system installed in Alpen on the basis of wood pellets can also be implemented just as well using wood chips: the Dieckmann family of Isendorf, in the Münsterland region, supplies an independent brewery and adjacent catering area, and also a number of holiday residences, with heat generated from wood. Where agricultural machines used to stand, you will now find the heating-equipment centre, complete with wood chip bunker. The big plus is that the operator is virtually self-sufficient. Annual needs, amounting to 800 bulk cubic metres of wood chips, is obtained primarily from the family’s 8 hectare privately owned forest. The wood-chip boiler provides hot water for heating and showering, and at the same time underpines operation of the brewery, which needs hot water at 110° C to meet the applicable hygiene standards.

www.energieagentur.nrw/qr126
Energy-saving contracting makes it possible

Cologne University’s biocentre saves 500,000 euros/a

It needs only little water, optimally absorbs nutrients, is pest-resistant and generates a lot of biomass: we are talking here about the ideally efficient cultivar, which could assist in boosting agricultural yields. The route to the creation of this plant is something researchers at the University of Cologne’s Biosciences Centre are investigating. Despite the fact that the research subjects are very much concerned with efficiency, this Biosciences Centre has to date been anything but efficient in energy terms, however. This situation is now set to change thanks to modernised building automation.

Around 1.4 million euros – this has been the order of magnitude of energy costs for the new building on the Zül-picher Strasse every year up to now. The calculation was performed by Markus Greitemann’s team from the university’s Building and Property Management department. Investigations were then therefore conducted to see how this energy consumption could be reduced.

In 2015, the university commissioned Cologne’s Engie Deutschland GmbH as a cooperation partner on the modernisation project. It also consulted with the German Energy Agency (dena) – with support from EnergyAgency.NRW – on the decision in favour of energy-saving contracting. Following a two-year construction period, the modernisation work, for which a combined tendering procedure for technical building management and energy-saving contracting was implemented for the first time anywhere in Germany, is scheduled for completion this summer.

Air supply is now to be controlled on a needs-orientated basis, taking account of flexible research activities. In addition, a high-efficiency refrigeration unit and free cooling assure supply of refrigeration and a well-conditioned research environment. Energy-saving and easy-on-the-eye lighting of the building is guaranteed, moreover, by 1,800 illuminants featuring the latest LED technology.

Investment costs amount here to 2,465,550 euros. And this input is worthwhile: in future, the enhanced efficiency now achieved is expected to save nearly 500,000 euros of energy costs. The modernisation work – calculated on a static basis – will thus pay for itself within just five years. The greatest planning challenge for Michael Effertz, of Engie Deutschland GmbH, was that of harmonising technical implementation with the needs of the scientists: “Our aim was not only to save energy, but also to retain the comfort and functionality provided by the room climate and the lighting system”. The fact that this target was achieved is confirmed by Prof. Ute Höcker, of the Botanical Institute: “We tested the recommended modifications, including LED lighting, for example, in the laboratories in advance, and didn’t notice any difference”.

New motion sensors mounted above the doors and connected to the ventilation system also, for example, contribute to the greatest possible working flexibility. They enable the rooms to be optimally air-conditioned precisely as required, and irrespective of whether the biologists are present in the laboratory in the early morning or late evening.

After around six months of planning and two years of implementation, the work will soon be completed. Ute Höcker is pleased: “Now, we are not only researching into efficiency in plants, we are also, in practical terms, boosting our own energy-efficiency and thus making our own active contribution to climate-protection”.

www.energie-agentur.nrw/qr127
Suddenly, waste turns to heat

Can you please Wuppertal citizens with waste? Yes, you can! As from 2018, a 3.2 kilometre long heat pipeline will connect the Abfallwirtschaftsgesellschaft Wuppertal (AWG) municipal waste-management organisation’s waste-fuelled CHP plant with the existing district heating system in Elberfeld and Barmen, thus supplying residents with environmentally friendly district heating obtained by incinerating waste. This source of heat is also environmentally friendly because 50 per cent of the fuel used – waste – is “biogenic”, i.e., of biological origin.

“Interlinking” of the district heating system did involve significant technical complexity. The route, for example, was obliged, inter alia, to pass under the L 418 road in front of the AWG waste-fuelled CHP plant. Tunnelling under this local trunk road serves to connect the waste-fuelled CHP plant to the district heating system in the valley of the River Wupper.

A drilling machine of 6.80 m in length, and weighing 60 tonnes, which had to be brought onto the site using a 550 tonne crane, was deployed for this purpose. The cutterhead with its outer diameter of 2.40 m forced its way through the underground soil at a rate of advance of six to ten metres per day. The machine required just around one week to complete the 60 m length of tunnel. Supply of heat from the waste-fuelled CHP plant makes it possible to decommission the coal-fired CHP plant operated by the Wuppertaler Stadtwerke (WSW) municipal utility in Elberfeld. And this will signify not only ecological improvements, but also economic benefits for WSW and AWG. The provision of district heating from the incineration of waste will permit CO$_2$ savings of 450,000 tonnes annually in the future. This quantity is equivalent to 60 per cent of Wuppertal’s annual CO$_2$ emissions from road traffic. In other words: the new district heating line will make a very significant contribution to climate and environmental protection in the locality. In addition, the amount of renewable energy sources used in WSW’s district heating system will thus rise to above 40 per cent. Another beneficial environmental effect: the heat burden on the River Wupper will be reduced, since it will no longer be necessary to take cooling water for the Elberfeld power-generating plant from, and return it to, the river. To assure this new energy form of numerous users, Wuppertaler Stadtwerke (WSW) is providing all interested persons with attractive opportunities ranging from detailed advisory services up to and including individual offers for installation and financing of the new heat supply.

For Wuppertaler Stadtwerke the energy turnaround is – on its own admission – also a “heat turnaround”, since 25 per cent of the city’s CO$_2$ emissions result from heating needs. Heat plays the major part in Germany’s final-energy consumption and therefore has a great potential for reduction of CO$_2$ emissions. Commissioning of the new district heating route is scheduled for the start of the 2018/19 heating period.

www.energieagentur.nrw/qr128
Modernised school to new building standard

The two three-storey extensions (built in 1968 and 1976, net surface area around 7000 m²) at the Schiller-Gymnasium grammar school/high school – located in the city centre of Münster – required modernisation. At the time of the expansion phase the use of adhesively bonded split tiles, a clinker brick facade, aluminium windows with insulated glazing and integrated pull-cord systems, combined with high-cost tropical woods, were all considered ultra-modern. After more than forty years of use of these buildings, modernisation was necessary, in order to eliminate defects in the facade elements, damp damage to the walls and rotted-through window elements.

The City of Münster’s building guidelines require that the annual heating-heat consumption of existing buildings be significantly below 70 kWh/m²a of gross surface area (GSA). Where all components and systems of the building’s technical equipment is also additionally modernised, approximately the Energy-Saving Ordinance 2009 level for new buildings, at 50 kWh/m²a GSA, is to be achieved. Numerous energy-improvement provisions have already been implemented during the past twenty years. These included, for example, partial insulation of the roofs, conversion to district heating, hydraulic calibration, demand-regulated ventilation of the auditorium by means of a rotary heat exchanger, control technology in the form of direct digital control (DDC), and integration into the municipal building management system.

Currently, only further windows are being renewed, parts of the lighting system converted to LED technology, and facades, roofs and basement ceilings insulated. Line meters, the data from which is read out and evaluated at monthly intervals, have been installed for evaluation of the modernisation work.

Investment costs for the two comprehensively modernised extensions at the Schiller school totalled 3.7 million euros, equating to approx. 800 euros per square metre of upgraded surface area. It has thus proven possible, after a series of technical modifications, to cut heat demand from its around 220 kWh/m²a in 1990 firstly to some 120 kWh/m²a and then, by means of the modernisation described above, to only about 30 kWh/m²a. This is approximately the level specified for new buildings.

Ennigerloh backs CHP and hydrogen

A 5.5 kW, mini heat+power cogeneration (CHP) unit and a 1.5 kW, SOFC fuel cell have been in use to meet the electrical and thermal base load in the Stadtwerke ETO GmbH & Co. KG municipal utility’s Ennigerloh administrative building since early 2017, replacing the outgoing condensing cascade. The supplementary condensing water heater is used only to cover peak loads. A 1,000 litre buffer tank has been installed to reduce CHP unit motor starts. The heating circuit manifold has also been replaced, and the entire system hydraulically calibrated.

The fuel cell used is a long-range type with a constant electrical output of 1.5 kW, permitting annual generation of around 13,000 kWh of electricity. Thanks to the fuel cell’s high electrical efficiency of 60 per cent, thermal output is only 0.6 kW, and total generated heat is around 5,000 kWh/a. The mini-CHP unit (14 kW) is operated as a function of heat demand and runs for around 4,500 hours annually. The constant power take-up of the server room – required for operation and cooling – means that all the electricity generated is used directly on the site.

Construction costs were 86,000 euros. Stadtwerke ETO GmbH & Co. KG, Ennigerloh were able to obtain this system at reduced cost thanks to manufacturer subsidies for fuel cells under the European “ene.field” fuel-cell initiative. This programme is operated on the basis of an energy concept formulated in 2013. The aim of the investigation was that of outlining solutions for enduring enhancement of energy-efficiency, saving primary energy, and cutting emissions of greenhouse gases (GHG). Stadtwerke ETO’s function as an example for its customers was a further objective. As a result, around 20 tonnes of greenhouse gases are now saved annually (SOFC: 2.5 t/a and CHP unit: 17.5 t/a). Power consumption has been reduced from 102,500 kWh/a to 65,000 kWh/a. Gas consumption, conversely, has risen, but only slightly, from 82,000 kWh/a to 102,000 kWh/a.

www.energieagentur.nrw/qr129

www.energieagentur.nrw/qr130
Funding programmes make e-mobility attractive

Electric cars are fun to drive, they are quiet, they don’t emit exhaust fumes and they need servicing less often. The funding programmes launched by the state of North Rhine-Westphalia for private users, municipalities and companies provide further incentives to drive electric vehicles.

Electric mobility – yes, basically a good idea, but the cars are too expensive – and where can I actually fill the tank? Nowadays you can often still hear this and other reservations when it comes to possibly switching from a car with internal combustion engine to an electrically powered one. The state of North Rhine-Westphalia has now set out to further electromobility as a climate-friendly alternative. It’s offering a whole, series of funding opportunities to help municipalities, companies and private individuals make the switch and to make driving electrically powered vehicles yet more attractive.

Subsidies for company and individual charging stations
A big hindrance when it comes to buying electric vehicles – both for private use and for companies – is the inadequacy of the current charging infrastructure. The answer to this problem may be to install one’s own power filling station. The advantage of this would be being able to charge your vehicle directly in front of your house, in your garage or on your company site in a few hours using a wallbox or charging station. The state of NRW provides subsidies for this: private individuals can receive as much as 1000 euros from the state if they install a charging unit for private use only. The same amount is available to companies for charging points which they use exclusively for their own fleet. If you want to provide public access to your charging points as well, the subsidy can amount to 5,000 euros per charging point.

Comprehensive funding for municipalities
When it comes to switching to electromobility, the municipalities play a major role. But at the same time setting up a fleet of electric vehicles is no trivial matter. That is why the state of North Rhine-Westphalia is funding implementation consultancy for municipalities to highlight the potential of switching to electromobility to a maximum of 80 per cent of the costs – with an upper limit of 50,000 euros. Municipalities which then proceed to implement the change will be entitled to grants for a publicly accessible and non-publicly accessible charging infrastructure and will also be granted a substantial subsidy for procurement of the vehicles: up to 30,000 euros per vehicle is available for battery-powered electric vehicles and for fuel-cell vehicles a maximum of 60,000 euros on top. Municipalities intending to convert their local public transport system will also receive assistance from the state of NRW: funds will be available for the procurement of battery-powered and hydrogen-powered buses, as well as for infrastructure required to operate the system and to equip repair shops.

ElektroMobilität NRW first body to contact
In addition to the funding programmes mentioned, municipalities, companies and members of the general public can take advantage of other forms of assistance, such as low-interest loans from the NRW Bank or funding programmes of the federal government. ElektroMobilität NRW provides an overview of all the programmes available. This is the first body to contact in the state of NRW on the subject and it is at your disposal for personal consultations.

www.elektromobilitaet.nrw.de
Ten North Rhine-Westphalian municipalities and one district administration were presented with the European Energy Award within the framework of the 1st Bochum Climate Forum. The city of Bochum was the only “Gold” laureate. At the event hosted by the EnergyAgency.NRW economic affairs minister Professor Andreas Pinkwart praised the state’s municipalities and districts: “The significance of the towns and district administrations as an engine of structural change cannot be emphasized too greatly. Their successful participation in the European Energy Award shows how many municipalities in North Rhine-Westphalia are enhancing their energy efficiency and expanding the use of renewable energy sources, thus setting a good example to their citizens.”

The Energy Agency.NRW supervises the European Energy Award certification procedure in NRW on behalf of the state’s economic affairs ministry. The reward for successfully completing this procedure is the eponymous award. The European Energy Award is given to a municipality of this implements at least 50 per cent of the measures proposed since the start of the process by accredited EEA consultants. The municipalities and districts are assessed for various projects – from climate-appropriate mobility planning with electricity charging stations for cars and e-bikes in Bad Berleburg to the 43,000 cubic metre district heating storage facility of the municipal utility Stadtwerke Duisburg.

The Gold EEA for implementation of 75 per cent of the measures was given to Bochum this year. This is already the third time that the host city has been certified with the Gold EEA. Bochum’s mayor Thomas Eiskirch said: “We fell highly honoured in the truest sense of the term: receiving the European Energy Award in Gold for the third time provides admirable confirmation of our commitment to climate protection. And of course we continue to be active in terms of resources conservation and sustainability.”

Other European Energy Awards this year went to Bad Berleburg, Duisburg, Everswinkel, Gelsenkirchen, Hamm, Ibbenbüren, Lippstadt, Moers, Oberhausen and the district of Soest. The EEA is a certificate which is recognised throughout with respect to municipal activities in climate protection and energy efficiency. In North Rhine-Westphalia 104 municipalities and districts undergo this procedure. “Municipalities are important allies when it comes to enhancing climate protection potentials. With the EEA we give them an instrument to help them meet the challenges,” Minister Pinkwart continues. “The European Energy Award is a process. Once they have been audited the municipalities must verify their achievements at regular intervals. After all, climate protection is an ongoing task, Lothar Schneider, Director of EnergyAgency.NRW explains, and he adds: “The award enjoys a high status among the municipalities because with it they are systematically given practical options and an organisational capability in the field of climate protection and efficiency enhancement.”

Municipalities which are not so well off can also profit from this because the award is funded by the state.

The awards ceremony with more than 250 guests followed on from the 1st Bochum Climate Forum, which was held jointly by the Ruhr city and the EnergyAgency.NRW. The major themes included climate protection and climate adaptation, renewable energy sources and climate-friendly mobility. There were a total of eight specialist papers, including those by Professor Rolf Bracke of the Geothermal Energy Centre at the Ruhr University of Bochum on the potentials of deep geothermal energy for the heat transition, a specialist paper by the meteorologist Sven Plöger and a discussion forum on the subject of “Climate Policy and Municipal Involvement”. Then six exemplary Bochum projects were given the Bochum Climate Protection Award. In addition the forum presented an exhibition entitled “Climate Protection and Science in the Network University”.

www.energieagentur.nrw.de/eea
Innovations for the energy turnaround

Those actively involved in the energy industry and the transport and distribution networks will be faced with new challenges during the energy turnaround. The conference "Smart Innovations for the Energy Turnaround" to be held on 7 June 2018 in Düsseldorf is intended, among other things, to highlight the innovation trends which can be expected in the future and the role digitalisation will play. It is being organized by the cluster EnergyResearch.NRW and the Energy Economy Network of the EnergyAgency.NRW.

www.cef.nrw.de

Wind Energy Industry Day

The Wind Energy Industry Day NRW will take place on 12 and 13 June 2018 in the van der Valk Airport Hotel. It will be creating quite a stir there. About 100 speakers from industry, politics and research will be reporting on promising trends in the market. More than 50 exhibitors along the whole value chain will be represented at this venerable event. The EnergyAgency.NRW is a cooperation partner of the event and the Wind Energy Network will be showing off its portfolio on a stand.

www.energieagentur.nrw/qr136

2nd student energy conference

On 18 June 2018 the Ruhr West University of Applied Sciences (HRW) will be joining with the cluster EnergyResearch.NRW to hold the 2nd student energy conference. The conference is to take place on the HRW Campus in Bottrop and is an ideal platform for an exchange of views between students and representatives of industry and science. The specialist discussions will spotlight current topics and development in the energy and water resources economy. Interested students will be given the opportunity to showcase their project work in the form of talks, presentations and posters. In addition to bachelor and master theses some modules will include project assignments by students with reference to specific tasks set by customers in industry.

www.energieagentur.nrw/qr131

Sector coupling

The “Competence Centre for System Transformation and Energy Infrastructure” run by the EnergyAgency.NRW is a cooperation partner of the event and the Wind Energy Network will be showing off its portfolio on a stand.

6.7.2018

18.6.2018

Wind-Updates.NRW

On 11 September 2018 the Wind Energy Network will be holding its annual conference Wind Updates.NRW in the Science Park in Gelsenkirchen. It is the central meeting place of the year at which the entire wind energy industry networks and exchanges views. Innovative specialist talks, the presentation of best-practice examples from NRW and speed-dating for start-ups and established companies from this industry will provide an informative fringe programme. All information will be available shortly at www.energieagentur.nrw/windenergie

13.9.2018

Annual NBWE meeting

On 13 September 2018 the annual meeting of the Fuel Cell and Hydrogen, Electromobility Network of the EnergyAgency.NRW will take place in Wuppertal. About 300 people are expected to attend. The conference will again be dedicated to the whole range of topics from electromobility powered by battery and fuel cell, hydrogen/power-to-gas technologies through to fuel cells for the energy supply.

www.energieagentur.nrw/nbwe-jahrestreffen
In the middle of 2016 the funding programme 433 “Energy-efficient Construction and Improvement – Fuel Cell Subsidy” was launched. This programme is financed by the federal ministry of economic affairs (BMWi) and supports the market launch of stationary micro CHP plants based on fuel cells with an electrical capacity of 0.25 kW\textsubscript{el} to 5 kW\textsubscript{el} in new and existing residential and non-residential buildings. In a workshop held by the EnergyAgency.NRW and ZBT Duisburg experience gained in the programme was discussed. The general tenor was that most customers know hardly anything about this CHP technology but are interested in the resulting energy savings potential. The number of units produced by the manufacturers are still low and the purchase price is high compared to that of conventional heating systems, but the price paid can be recuperated quickly thanks to the statutory payments and improved efficiency, in other words the energy yield from the gas used.

The funding programme 433, which can be applied for through the bank Kreditanstalt für Wiederaufbau (KfW), provides a fixed amount of 5,700 euros, and in addition there is an amount of 450 euros per 100 Wel of the unit. At present this concerns the units from the manufacturers Bosch (Buderus und Junkers), SenerTec, SOLIDpower and Viessmann. With this sliding scale of payments all end customers will receive for a unit with 1.5 kW\textsubscript{el}, for example, an amount of 12,450 euros and for the smallest available unit (0.3 kW\textsubscript{el}) 7,050 euros. To date almost 2,000 applications have been submitted to the KfW bank. In addition there are further benefits and payments for the electricity and heat generated.

For the sixth time there will be a joint corporate stand representing the state of North Rhine-Westphalia at the Japanese Renewable Energy Industrial Fair (REIF) in Fukushima prefecture. Together with NRW.International and NRW.Invest the EnergyAgency.NRW is organising NRW’s presentation and an NRW symposium from 7 to 8 November 2018. This is being staged as part of a partnership between NRW and Fukushima prefecture.

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www.energieagentur.nrw/qr132
GasCom Equipment backs mobile gas supply

NRW is definitely a source of innovation and nothing illustrates this better than GasCom Equipment GmbH from Troisdorf.

GasCom Equipment is a family-owned concern specialising in the mobile supply of natural gas and over the past few years it has become established as one of the leading service providers in this sector. It serves numerous customers of different sizes and from different sectors, and it has a profound expertise when it comes to handling natural gas. The service portfolio of this 19 year old company includes the mobile supply to municipal grids and industrial customers of CNG and LNG, as well as the testing of natural gas tanks and provision of mobiles natural gas filling stations it has designed itself, for instance for use in motor racing.

In this way the company makes available the technology which can be used to an emergency power supply. The actual emergency power supply becomes necessary, for example, when grids have to be shut down for construction work and whole residential districts or company complexes still have to be supplied with gas. For such a contingency Gascom puts a complete supply unit on the road, consisting of a semitrailer with a tank and an evaporation unit to bring the cooled gas up to the correct temperature. The vehicle fleet also includes cylinder transporters and gigantic compressors. These are transported in containers to pumps gas into the grids at the necessary pressure.

To demonstrate that gas is suitable for use as a vehicle fuel GasCom Equipment GmbH included a semitrailer tractor fuelled by bio LNG in this year’s carnival procession in Troisdorf. When LNG is used as a fuel 70 per cent less nitrogen oxides are produced. In the case of fine particulates further savings of about 96 per cent are obtained in contrast to comparable diesel vehicles. With the use of renewable bio LNG as much as 80 per cent of the CO₂ emissions can be cut.

Given the discussions currently underway concerning vehicle prohibitions or limits to deliveries made by diesel vehicles, natural-gas-powered cars, vans and trucks can help avoid such prohibitions in urban centres. By using natural gas (CNG and LNG) it is possible to cut fine particulate and nitrogen oxide pollution to a minimum.

Furthermore the use of renewable methane in the form of CNG or LNG has the potential to minimize CO₂ emissions further.
The energy-efficient fridge

Helping to ensure a successful energy transition with energy-efficient fridges: Prof. Dr.-Ing. Jadran Vrabec of the competence Centre for Sustainable Energy Technology (KET) at the University of Paderborn has for years been conducting research in his refrigerator laboratory to create the fridges of the future.

Prof. Dr. Vrabec, when did you start to research the subject of energy-efficient refrigerators?

Vrabec: The refrigerator laboratory has existed since 1980 at the University of Paderborn. It was established by my predecessor’s predecessor, Dieter Gorenflo. In January 2009 I started working there. The idea for the research project with refrigerators and polymer-bound phase change material (PCM) was formulated by the student Dipl. Wirt.-Ing. Gerrit Sonnenrein together with the technician Dipl.-Phys. Ing. Andreas Elsner. Mr Sonnenrein is currently doing a doctorate on this subject.

In fact research work has been in progress on this subject for decades and there are already a large number of patents, but it has never been put into practice. In technological terms no-one has yet mastered large-scale series production. The reason for this may be that the two large German refrigerator manufacturers also have a list of research and development topics on their agenda of course.

What precisely is it possible to achieve with this phase change material and where is it applied?

Vrabec: Latent heat storage systems in the form of PCM are acknowledged to be a relatively new material with which a number of things can be done, for example laying it on or under plaster to store heat or “cold”. It then dampens temperature fluctuations. In a refrigerator heat is transported from the cooling chamber into the environment. This heat is then discharged at the back and emerges there, which is why that is always the warmest place. In addition the refrigerator operates in intermittent mode. This means that during the time it is running it transports heat to the outside, becomes cold and then slowly warms up again. So it switches itself on and off. In terms of thermodynamics this is not very smart and continuous operation would be better. By using phase change materials it is possible to extend the heat absorption and heat discharge. This comes close to ensuring continuous operation of the refrigerator. The material is inserted where the heat leaves the refrigerators before it reaches the refrigerating machine with the working fluid. The material therefore absorbs the heat from the interior of the refrigerator and discharges it over an extended period.

The refrigerator’s mode of operation sound a little crazy. Just imagine that you live on the second floor and you are on the ground floor. First you go into the cellar, then up to the third floor in order to finally arrive at the second floor. With this example I want to show that it is actually always warmer than necessary behind the refrigerator and colder than necessary within it. In other words the temperature outside is too high and that inside is too low. The phase change material brings these temperature levels closer together. The refrigerator research project was funded by the Federal Environmental Foundation (Bundesstiftung Umwelt) and has now been concluded. We hope it will be put into practical application. By using the phase change material we have been able to obtain energy savings of 17 per cent at relatively low cost. That’s already a great achievement.
Gilgen’s recipe

Production up, pollution down!

At Gilgen’s the baker in Hennef efficiency is the watchword in the bakery: with its goods and cash management system “Gilgen’s Bäckerei & Konditorei” created the basis for sustainable production as early as 2004. In 2016 this system was the reason why this traditional company won a special prize in the first EnergyInnovationAward.NRW organised by EnergyAgency.NRW.

At the beginning of 2014 the company introduced an energy management system to the ISO 50001 standard. The aim of the efficiency measures was to cut energy consumption annually over a period of five years by 2 per cent, which means about 80 MWh of electricity and 40 MWh of natural gas every year – with company growth factored in. Since 2015 an energy measuring system has monitored the largest energy consumers in production and has determined their optimum utilisation – the related figures have been taken from a bachelor dissertation commissioned by the company itself.

The lighting has been converted to LED with motion detectors – this alone yields an annual cut of 41.7 tonnes of CO₂. In the production division and the 41 branches the running times of ovens, refrigerating and air-conditioning systems have been checked and optimised. Energy losses due to malfunctions or incorrect settings are prevented with a comprehensive maintenance scheme, through to the coffee machine and automatic door at the entrance.

Since the award two years ago the staff at “Gilgen’s” have continued to work on energy efficiency: since 2017 the burners in the ovens have been renewed, insulated and are now preheated by an energy-efficient cross-ventilation system. The ovens are tempered using a thermal oil. This will in future also heat the automatic proofers in an extension via a circuit, which is at present operated by electricity. It is planned that a holistic heat recovery system will supply hot water to production from this year and this will save 133 tonnes of CO₂ every year.

The first electric vehicle is just about to go into service. At “Gilgen’s” consideration is being given at present to an electricity supply network for the fleet of delivery vehicles to the branches.

The upshot is that pollution emissions have been cut as planned by almost 6 per cent since 2014 despite an increase in production demand. The costs have also been reduced: by 1.6 per cent since 2014 in spite of increased sales of more than 10 per cent. “In all probability we will surpass by a long way the goal we have set ourselves of reducing pollution by around 225 tonnes of CO₂/electricity and 40 tonnes CO₂/gas in five years,” is the proud boast of Heinz Alexander, Assistant to the Management and the company’s Environmental Officer. “A bakery needs a lot of energy in the form of electricity, gas and vehicle fuel. It should be possible for coming generations to continue to get bakery products made from good and healthy raw products – that’s what motivates us.” It’s this kind of commitment which will be rewarded this summer with presentation of the second EnergyInnovationAward.NRW (eip.nrw 2018) at a company conference.

www.energieagentur.nrw/qr138
Tool computes losses from heat pipes

Wherever heat pipes cover considerable distances there are of course heat losses – this is also true for local heat pipes. The EnergyAgency.NRW has now made a tool available online which calculates pipe heat losses.

For the operators of heating networks it is important that the heat losses in the network are in reasonable proportion to the quantities of heat transported. This is because the losses have to be covered by the heat generation but they do not appear on customers’ heat meters. It’s important to take these matters into account when planning the networks. But even during ongoing operation the losses always have to be factored in and minimised.

The heat loss essentially depends on the temperature difference between the medium in the pipe and the ambient temperature. The losses are reduced by insulating the pipes, but they are never equal to zero. The level of loss (kWh) depends not only on the temperature difference but also on the duration of such difference.

The difference between the heat quantity generated and that sold in relation to the heat quantity sold can be used as a reference quantity. In good heating networks the losses are less than ten per cent of the quantity of heat sold.

For hygienic hot water provision the flow temperature must in many heating networks be at least 70 degrees Celsius. It is easier to influence the return temperature, which should be as low as possible because this not only reduces the heat losses but also the pumping capacity.

To estimate how high the heat losses are for local heating pipes buried in the ground there is an Excel program for calculating pipe heat losses on the web site www.energieagentur.nrw/tool/leitungsverluste.
5th CHP Forum in Düsseldorf

On Thursday, 27 September the fifth NRW CHP Forum will be held in Düsseldorf. The Forum has become established as a regular meeting point for experts in this sector, and not only from North Rhine-Westphalia, to exchange views, knowledge and ideas. This year the EnergyAgency.NRW will again be presenting current trends and projects from research and practice in everything to do with the subject of combined heat and power generation, as well as local and district heating. Further information and registration at:

www.energieagentur.nrw/qr134

Mould guidelines from Environmental Agency

The German Environmental Agency (UBA) has published the new “Guidelines for Preventing, Recording and Clearing Mould in Buildings”. The guidelines describe how mould is identified and assessed in buildings, and how clearance concepts should be drawn up. It is aimed at specialist firms, craft companies, microbiological laboratories, building users affected, as well as housing companies and local authorities who wish to have mould clearance supported or monitored. The updated guidelines cover among other things statements and recommendations for ventilation systems in connection with the development and avoidance of mould, especially in buildings with low energy demand. It can be downloaded free of charge form the UBA web site.

www.energieagentur.nrw/qr135

Quick check for energy saving contracting

Energy saving contracting (ESC) is a tried and tested energy service model which is used successfully in Europe in the energy modernisation of buildings and installations. Within the framework of the EU-funded project guarantee, Berliner Energieagentur has developed an Online Quick Check for ESC to provide an initial assessment of contract suitability. A query is submitted to the Online Quick Check and this will then be able with a high degree of probability to establish quickly and simply whether energy saving contracting will be an economically viable way of saving energy and costs. The Online Quick Check can be found at:

www.energieagentur.nrw/qr133

Transformation of the energy system

Together with the Virtual Institute “Transformation – Energy Turnaround NRW” the cluster EnergyResearch.NRW has published that brochure “Gemeinschaftswerk Energiewende in Nordrhein-Westfalen” (“Energy as a Joint Project in North Rhine-Westphalia”). The new brochure provides insight into the research results, presents the partner institutes and tackles the central challenges of the energy turnaround. The Virtual Institute accompanies and supports the sustainable conversion of the energy supply system in North Rhine-Westphalia. This think tank’s main research concern is the socio-economic and cultural implications of the energy turnaround.

www.cef.nrw.de

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