

CHP Journal



Energy Revolution.
Quo vadis?

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Preface

Dear Readers,

The Energy Revolution is complex, ultra complex, in fact. And what appears as clear as daylight for some is simply shortsighted for others.

When, for example, the FAZ newspaper reported in January on power cuts in northern Germany and cited forecasting errors for renewable energy sources as the cause, it was immediately contradicted and a wrong market design was argued as the real cause.

Now the German Federal Audit Office writes that the sluggish expansion of new power lines poses an increasing risk to the security of supply. The Ministry of Economic Affairs has already been quoted as saying that the security of supply in Germany remains very high by international standards. Well, imagine a French minister praising the quality of French red wines with the words "still very high by international standards".

So let's just stick to the facts: There is nowhere near sufficient capacities to transport wind and solar power from Sylt (Germany's northernmost island) to Sindelfingen (near Stuttgart in southern Germany) or even from Borkum (North Sea island) to Bochum (in North Rhine-Westphalia). And this is not set to change in the foreseeable future either. The Energy Revolution or the electricity revolution will certainly (have to) get by without it.



Friedrich Pehle

The experts at the Federal Audit Office are already wondering about how overfed grids could be spared and grid capacities used to better effect. What's more, they propose building new power generation plants closer to centers of consumption, even in places where wind and solar power yields are lower. What a good thing it is that these decentralized, consumer-oriented power generation plants already exist.

You guessed: CHP plants achieve exactly what the Federal Audit Office recommends. And unlike solar or wind farms and unlike cable runs, CHP plants can be realized without surveys investigating the factors of soil, birds, noise, species and the protection of historical monuments, without mediation procedures, citizens' initiatives and petitions, without decade-long planning horizons and ultimately without social upheaval.

We expect more good years for our CHP solutions. Have fun reading!

Friedrich Pehle
Member of the Managing Board of 2G Energy AG

2G wins Handelsblatt Energy Award

Hydrogen CHP awarded as the most innovative project of the Energy Revolution in the "Industry" category

2G Energy AG was selected at the renowned Handelsblatt Energy Awards 2018/2019 as the award winner for the most innovative project in the Energy Revolution in the "Industry" category.

2G had submitted its self-developed combined heat and power plant, which is operated with pure hydrogen, to the competition and convinced the jury in the criteria "energy efficiency", "environmental friendliness", "digitalization and networking", "creativity and economy" and "scalability".

The award from the renowned jury underlines the pioneering role that 2G plays, among other things, as part of the Energy Revolution with its in-house development of a CHP unit powered exclusively by hydrogen. "We assume that hydrogen is an important storage medium for the delayed use of electricity generated from renewable

sources," says Christian Grotholt, CEO of 2G Energy AG. "2G power plants can convert this regeneratively produced hydrogen back into electricity and heat in a highly efficient, economically attractive and technically robust way."

The Energy Awards ceremony has taken place since 2013 and this year was part of the Energy Summit organized by Handelsblatt with more than 1,200 participants from business, politics, and the media.



Delight at the award ceremony (from left): Tijen Onaran (presenter), Christian Grotholt (CEO 2G Energy AG) and Dr. Wolfgang Dierker (National Executive, GE Germany & Austria, Government Affairs & Policy Leader).

“The Energy Revolution continues in the UK too”

Christian Grotholt and Mark Holtmann in dialog about the Heek site, the upcoming Brexit and the Energy Revolution

2G has become increasingly international in recent years. How important is the Heek site?

Christian Grotholt: The Heek site is still very important for us, of course, because we have our production here, but also a large part of our expertise. Last year we created 6,000 square meters of additional storage capacity here in order to optimize service logistics. This also applies to transport logistics for aftersales and our online shop.

Do you feel the shortage of skilled workers in the Münsterland region of North Rhine-Westphalia?

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The declared goal is to further increase sales abroad.

Christian Grotholt | CEO of 2G Energy AG

Christian Grotholt: Not necessarily on the academic side, but especially among production specialists, we certainly do feel it. Jobs do remain vacant at times.

What do you expect for the current financial year? Are you worried about the economic slowdown?



Christian Grotholt, CEO of 2G Energy AG

Christian Grotholt: We are in a positive mood for the 2019 financial year. Because 2018 went rather well, we still had a backlog of orders, which we have taken over into the current financial year. This can be seen from the delivery times, which can be up to six months.

Why is internationalization so important?

Christian Grotholt: What we are trying to do with internationalization is to become independent of local markets in order to ensure full production capacity utilization in Heek. The declared goal is to further increase sales abroad. Generally, we distinguish between A and B markets. A markets are North America, Central Europe, Japan and Australia. B markets are Russia, China, Southeast Asia, North Africa and South America. We are concentrating on the A markets, because the Energy Revolution is happening there and this is where middle classes exist that can invest.



Mark Holtmann, 2G Sales Manager in England

How large is the share of foreign business?

Christian Grotholt: It's currently around 35 percent – in terms of total sales. The share is higher for new plants. In Germany, however, the service business is bigger.

2G has been active in Great Britain since 2011 with its subsidiary. Mr. Grotholt, what went through your mind when you heard the result of the Brexit vote?

Christian Grotholt: At first, it was hard to believe. That a European nation is convinced that it can hold its own despite continuing globalization – against 1.4 billion Chinese, 1.3 billion Indians and 330 million US citizens. Later, it turned out that participation in the referendum was not that high. Nevertheless, I cannot understand how Great Britain can get on better without the Union with 500 million Europeans.

Mr. Holtmann, you are sales manager of the British 2G subsidiary. How is the mood among your colleagues in England?

Mark Holtmann: The mood among colleagues in England is good, despite the current uncertainty. Our forty employees reflect a diverse society. So there are opponents and supporters of Brexit.

And economic development?

Christian Grotholt: There was a functioning biogas market there, which almost came to a standstill due to the discontinuation of feed-in remuneration. It was therefore necessary for our team on site to manage the transition from the biogas to the natural gas market and to other energy sources. This was achieved for the first time in 2018. In 2018, we achieved higher sales and a better earnings than in previous years.

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The mood among colleagues in England is good.

Mark Holtmann | 2G Sales Manager

Mark Holtmann: Our products and services have unique selling points in terms of efficiency and low pollutant emissions, which are also in demand in the Great Britain. Brexit or no Brexit. Emissions is a dominant topic, in England too. And the energy supply must be maintained, irrespective of the political constellation, for which we offer the right solutions.

Christian Grotholt: After all, for decades, the opportunity to invest in infrastructure in good time has been missed. And so it is no longer an option, but an obligation to build modern power plants. The existing stock of power plants has largely come to the end of its lifecycle. Modernization is therefore an attempt to replace inefficient, old power plants with modern, economical ones. At

the same time, we are committed to global climate protection goals.

Mark Holtmann: Much of London's infrastructure dates back to Victorian times. The conurbation with 8 to 9 million inhabitants needs more and more energy. The required power plant capacity cannot be created centrally due to the lack of transmission capacity of the distribution networks. For this reason, combined heat and power generation is a valuable energy source in the basement on site in order to maintain a secure and affordable supply.

So you do not fear a collapse of business due to the upcoming Brexit?

Christian Grotholt: We still expect positive business development in Great Britain because the Energy Revolution will continue there. Firstly, we have an increasing number of projects in the natural gas sector and secondly, we have long-running service



It is no longer an option, but an obligation to build modern power plants.

Christian Grotholt | CEO of 2G Energy AG

contracts with 10 to 15-year terms. There is a positive contribution to overall earnings that is already being generated in Great Britain today and we do not see this as endangered. Not even if Brexit has negative effects for a certain period of time.

What are the specific effects?

Mark Holtmann: One problem, for example, is the falling pound. As an exporter, we are naturally counting on a weak euro. The pound has fallen by almost 15 percent, and for high-investment goods this can be a real body blow. Because it puts pressure on the overall profitability of a project in England.

But you do see the situation with a critical eye, don't you?

Christian Grotholt: Of course we're not happy. All in all, it alienates us. In particular, that the people who pushed for Brexit did not accept responsibility for it.

What precautions have you taken?

Christian Grotholt: A few weeks ago we increased the storage capacity in the UK to 1,000 square meters, also for the event that Brexit is delivered without a deal. This allows us to maintain a higher stock level in case of import difficulties for our products. These are decisions that are out of our hands.



The Board of Directors and Supervisory Board of 2G Energy AG welcomed 240 shareholders and guests to the Annual General Meeting.

“We expect more good years for 2G”

Annual General Meeting approves dividend increase to EUR 0.45 per share

Around 240 shareholders and guests accepted 2G Energy AG’s invitation to this year’s Annual General Meeting on June 25, 2019 in Ahaus. They voted for a dividend of EUR 0.45 per share – and thus for the third increase in succession.

Earnings structurally improved

As CEO Christian Grotholt and CFO Friedrich Pehle pointed out, 2G Energy AG developed positively and sustainably in 2018. At EUR 209.8 million, 2G generated 10.8% higher sales and its EBIT of 11.5 million euros was 56.2% higher than in the previous year. The 2G EBIT margin increased from 3.9% to 5.5%. The foreign share was 35% overall. 2G reported consolidated net profit of EUR 7.6 million (previous year: EUR 4.9 million) for the year under review.

“With the increase in dividend to EUR 0.45 per share, we are expressing the structural improvement in 2G’s earnings,” Grotholt

made clear. The CEO paid tribute to the entire 2G team for its great performance in the year under review and expressed his sincere thanks.

Above-average growth in Service

Around 37% of 2G’s sales were generated in the Service division (previous year: 34%). Once again, this division grew disproportionately to total sales by more than 20% to EUR 78.0 million in the year under review and also made a significantly stronger contribution to EBIT than in the previous year. Friedrich Pehle was particularly glad to point out that more than a quarter of Service revenue was generated abroad. In Germany, 2G acquired 50% of the shares in HJS Motoren GmbH, a company based in Baden-Württemberg, in order to tighten up its service network in southern Germany.

The French subsidiary, which has been growing strongly since it was founded in

2016, has established itself in both the biogas and natural gas markets. In North America too, 2G intends to dedicate itself more intensively than ever to marketing its products and services. To better serve customers and partners, 2G has opened two new offices: in the USA (Maryland) and Canada (Ontario).

Digitalization as a success factor

“The positive development in sales and earnings of our business in recent years has benefited significantly from the fact that we invested early in the digitalization of CHP operations and in the internal processes of our services,” reported Christian Grotholt. 2G plants can therefore be integrated into compound power plants, remote-controlled and flexibly mobile.

In 2018, 2G implemented the in-house developed I.R.I.S. software (“Intelligent Report Information System” platform) for the first time. The production and status data of all 5,000 CHP or so plants worldwide are aggregated in real time, evaluated and intelligently linked with each other in order to draw logical conclusions about the current and future status of the plants. In this way, potential faults can be identified and predicted and the appropriate countermeasures initiated. “For our customers, this means efficiency gains and higher profitability,” according to Grotholt.

As part of the “Digitalization” lead project, 2G has also set up an online shop for 2G parts – with an ambitious goal, as Grotholt announced: “We want to become the global online distributor of CHP spare and wearing parts.”

The most innovative project of the Energy Revolution: hydrogen CHP

At the renowned Handelsblatt Energy Awards 2018/2019, 2G Energy AG was selected as the award winner for the most innovative project in the Energy Revolution in the “Industry” category. This was met with a resounding round of applause from the shareholders and guests.

2G’s hydrogen CHP will be on display at the World Expo 2020 in Dubai, together with an electrolysis system from Siemens.

Profitability rise set to continue

Against the background of continued strong order inflow at home and abroad, as well as the consistent advancement of Group-wide efficiency and standardization measures, the Executive Board expects the sustained profitable growth trajectory to continue in the current financial year. The forecast for 2019 envisages Group revenues between EUR 210 million and EUR 230 million and an EBIT margin of 5.5% to 7%.

Beyond 2019, “we expect more good years for 2G,” said Friedrich Pehle. Looking into the year 2024, “a turnover of EUR 300 million has been targeted – with an EBIT of EUR 30 million”.

Blackout at 2G

Power outage on May 9 rectified after just a few minutes with our own technology

At 1.05 pm the lights went out at 2G in Heek. A main supply line had been damaged during earthworks in front of the company building. Almost nothing worked any more in the offices. Lighting, telephone, computer, printer, refrigerator, coffee machine – basically everything that needed electricity – was no longer available. This situation once again made it all too clear how dependent we are on a reliable power supply.

Self-help within minutes

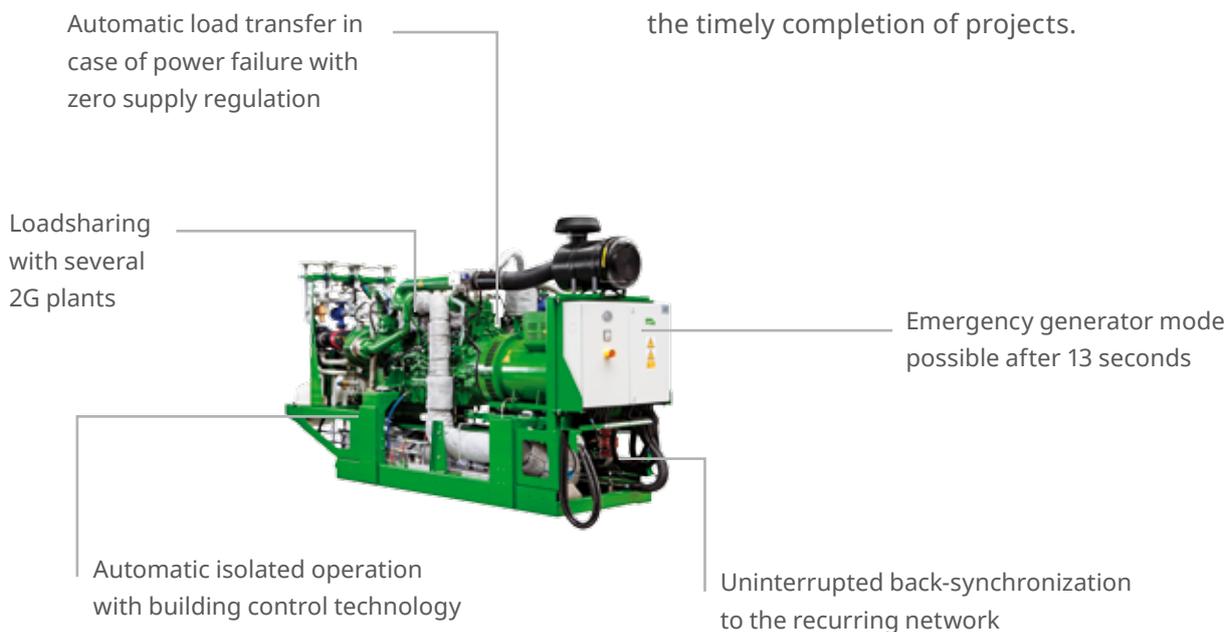
It took only a few minutes and all office rooms were supplied again, the computers were up and running again and we could continue to phone. What happened? An agenitor 406 power plant from 2G switched in and produced the required electrical and thermal energy.

agenitor 406 in island mode

Many 2G power plants can be used in so-called island mode. In this operating mode, a 2G power plant can start independently of the general supply grid and set up an isolated network for independent supply. This works for single 2G CHP plants as well as for modular plant concepts. However, once the grid from the power supplier is available again, reconnection to the public grid can take place with the help of a superordinate on-site section switch. The 2G power plant can be back-synchronized with the power grid once a secure supply is provided.

The repair took six hours

For 2G this was only the case after six hours. Only then was the defective line repaired and the supply ensured again by the network operator. The agenitor 406 thus prevented a major operational failure and contributed to the timely completion of projects.



New partner in Israel

Shmerling-Synchro Energy Engineering Ltd. takes over sales and service in Israel

The new partnership between Shmerling-Synchro Energy Engineering Ltd. and 2G Energy AG was celebrated on December 18, 2018. Shmerling-Synchro Energy Engineering Ltd., led by CEO Ofir Cohen, now represents the 2G brand in Israel and is responsible for sales and service of the 2G combined heat and power plants.

Shmerling-Synchro Energy Engineering Ltd., founded in 1968, is an established company in the field of design, manufacturing, assembly, sales and service of its own diesel

generators as well as those from renowned manufacturers. "Israel only opened up to the CHP market quite recently, because large natural gas deposits were discovered off the coast of the country," says Johannes Gausling, who is in charge of international partner business for 2G Energy AG. "This makes Israel a country independent of natural gas, where the raw material is available in large quantities. Against this backdrop, the use of combined heat and power plants is extremely attractive in many areas of application."



From the left: Rammy Molcho, CEO Ofir Cohen (both Shmerling-Synchro Energy Engineering Ltd.), CEO Christian Grotholt and Johannes Gausling (both 2G Energy AG).

Real added value for customers

Service cooperation between 2G and HJS Motoren is well received

The routine maintenance on the agenitor 406 after 2,000 operating hours is easy for Martin Butscher, Technical Service Manager at HJS Motoren GmbH. In addition to the compulsory oil change and adjustment of the motor mechanics and ignition, his service work on the biogas plant of Alfred Liebhart in Attenweiler, Baden-Württemberg, on 24 July also included an exhaust measurement. "I'm delighted that I only have one contact partner for my combined heat and power plants", states Alfred Liebhart, who also operates two Scania power units in addition to the 2G module. "This makes communication easier and minor service work can usually be carried out in one visit."

2G acquired 50% of HJS shares

2G Energy AG in Heek and HJS Motoren GmbH in Amtzell (Baden-Württemberg) have entered into a service cooperation as manufacturers and service providers for biogas CHP. This is based upon a 50% equity holding by 2G in HJS. The two partners contribute around 50 years of experience to the newly established cooperation for the service business.

Christian Grotholt, CEO of 2G Energy, and Hans-Jürgen Schnell, HJS Motoren, see considerable advantages for southern German operators of 2G and Schnell CHP plants by pooling their activities. "Together with HJS, we are further expanding 2G's existing comprehensive service network, particularly in southern Germany, and are thus redoubling our performance both technologically and in terms of personnel. We combine the respective

experience from the development of modern engine concepts and overall solutions for CHP plants to create real added value for our customers," says Grotholt, explaining the motivation for the cooperation.

For Hans-Jürgen Schnell, the use of synergies in cooperation with 2G is an important cornerstone for success: "In addition to our service competencies, we are also contributing our particular innovations in the field of engine development to the cooperation so that individually adapted solutions can optimize existing CHP plants for operation and make them fit for the future." In addition, spare parts logistics



New sites will optimize spare parts logistics and expand the competence center for Scania generators throughout Germany.

Hans-Jürgen Schnell | HJS Motoren GmbH

will be optimized through new sites and the competence center for Scania generators at HJS will be expanded across Germany, Schnell adds.

For example, HJS has developed an innovative technology for Schnell CHP plants to convert the gas engine with old BlueRail



Through the new cooperation, 2G and HJS are further expanding their joint service network for biogas CHP, thereby increasing their technological and personnel capability.



Together with HJS, we are further expanding 2G's existing comprehensive service network, particularly in southern Germany.

Christian Grotholt | CEO of 2G Energy AG

technology from an active to a passive pre-chamber. This means that a BlueRail box and gas valves are no longer necessary, and the box's electricity consumption of 1.7 kWh is eliminated. The electrical efficiency remains the same, but the thermal efficiency increases. The service life of spark plugs increases to up to 8,000 operating hours. The emission values are reduced considerably and so the development contributes to the fact that the requirements of the 44th Federal Immission Control Ordinance (BImSchV) are reliably met.

2G Energy, for its part, has optimized widely-used existing engines by developing new V36 cylinder heads that can be used for

MAN's 28-series lean-burn engines, MDE generators as turbo engines, Mercedes industrial engines and most MAN replicas. A technical design for 30,000 operating hours and doubling maintenance intervals to 4,000 operating hours makes existing systems future-proof. By converting to V36 cylinder heads, systems are rendered fit for permanent compliance with 500 mg/Nm³ NO_x in accordance with the 44th BImSchV immission control ordinance. An SCR catalytic converter specially developed by 2G for CHP operation is also now available to ensure compliance with the applicable limit values.

More space for 2G Energy SAS

More options at the new site in Nantes, France

The French 2G subsidiary – 2G Energie SAS – founded in 2016, moved into a larger building in Carquefou (Nantes, France) in December last year.

Around 200 m² of office and administration space as well as 300 m² of storage space with corresponding high shelves are available at the new site. 2G Energie SAS serves the French and Belgian markets from Nantes with a total of 20 employees.



“We are pleased to be able to resume work at the new location with expanded options in order to be in a stronger position to serve the French and Belgian markets,” says Jürgen Klein, Managing Director of 2G Energie SAS.

The twenty-strong 2G Energie SAS team is pleased about the larger premises at the new location in Nantes.

Energy Revolution – quo vadis?

Combined heat & power generation as a key technology in the Energy Revolution

The German Energy Revolution at a glance

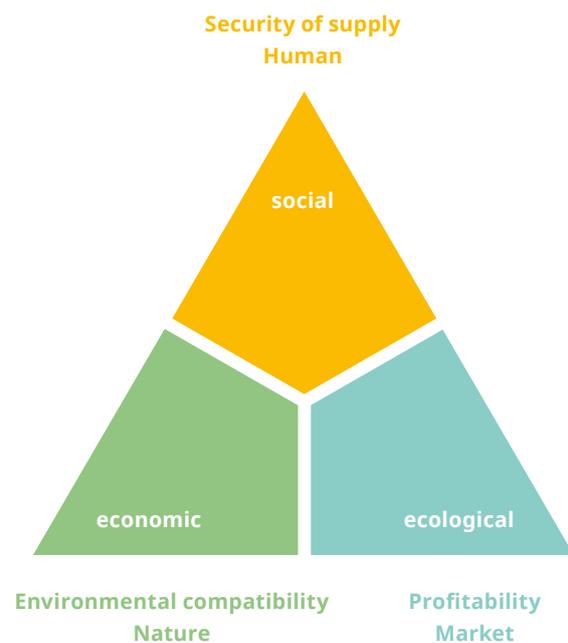
Objective	Status	Conclusion
Withdrawal from the nuclear energy program	agreed	up to 2023
Withdrawal from coal energy	agreed	up to 2030
Expansion of renewables to 80% of electricity generation	ongoing	up to 2050
Complete decarbonization of the electricity sector 100% renewable energy sources	in planning	up to 2080

Nuclear power stations, coal-fired power stations – they will soon be a thing of the past. The energy supply of the future will differ significantly from that of today. Renewable energy sources and the sustainable use of fossil fuels are increasingly in focus. With the Paris Agreement (COP 21) in 2015, the German government launched the “Energy Revolution” project. The aim of the Energy Revolution is to replace the conventional energy industry with a more efficient and sustainable energy supply using renewable energy sources.

The withdrawal from nuclear energy is to be completed by 2023. This will be followed by the withdrawal from coal and finally complete decarbonization of the electricity industry. Implementation of the Energy Revolution is based on the three pillars of sustainability. This means that the Energy Revolution can only succeed if ecological, economic and social goals are taken into account in equal measure.

The role of combined heat & power generation

Taking into account the “three pillars of sustainability”, the Energy Revolution is not to be realized exclusively on the basis of



Article 1 (1) of the German Energy Industry Act (EnWG): The purpose of the law is to achieve the most secure, cost-effective, consumer-friendly, efficient and environmentally friendly grid-bound supply of electricity and gas to the general public, which is increasingly based on renewable energy sources. Storing energy and using it as needed: electricity to gas – gas to electricity.

renewable energy sources due to the volatility of solar and wind energy. Renewable energy generation systems lack flexibility, security of supply and energy storage capacity. It is precisely these capabilities that combined heat and power plants can contribute. Modern CHP plants can be operated with biogas, sewage gas or natural gas. These “green” gases (CO₂ emissions 60% lower than in conventional coal-fired power generation) can be fed into the existing natural gas network in the event of oversupply. In other words: The Germany-wide natural gas network is a huge gas storage facility that does not have to be built from scratch. If required, a CHP plant can retrieve the energy stored there and convert it into electricity or generate heat in a highly flexible manner. Not only can peak demand be covered at short notice, CHP plants also serve to stabilize public electricity grids.

Storing energy in the form of hydrogen

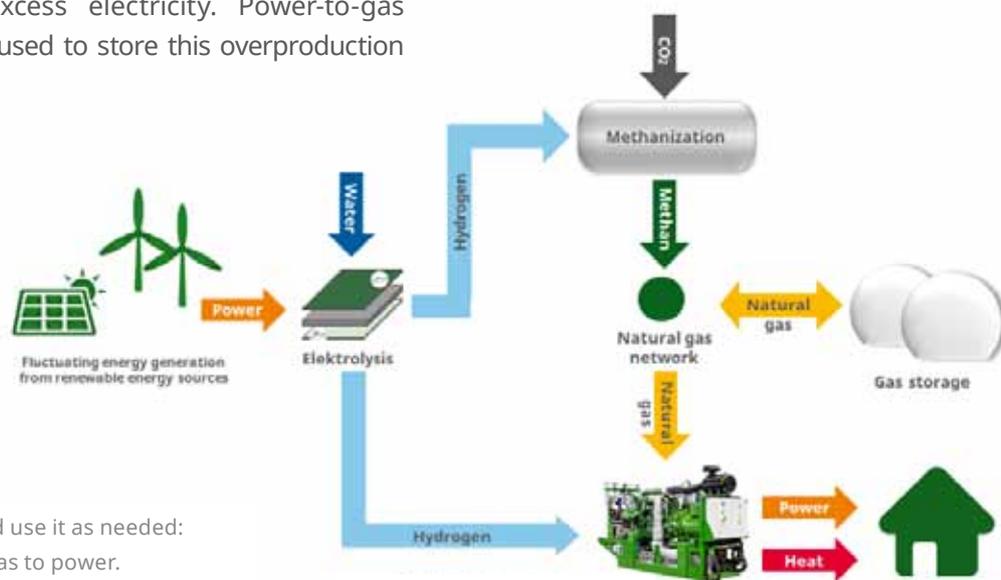
The conversion of hydrogen into electricity is also set to play a major role in the implementation of the Energy Revolution. At present, for example, excess wind power in the public grid is given away to neighboring countries or the neighbors even get money for taking excess electricity. Power-to-gas technology is used to store this overproduction

of electrical energy and use it within the country. Electricity from renewable energy sources is converted into hydrogen or synthetic natural gas, which can be easily transported and stored and, if required, re-introduced into combined heat and power plants.

Decentralized production and networking

Another useful feature of combined heat and power plants is their ability to generate energy where it is needed. They do away with long power lines. Transport losses are minimized or eliminated. What’s more, combined heat and power plants with a special control technology can be combined with other power generation units to form a virtual power station. In this way, a network of decentralized energy producers can cover the demand for thermal and electrical energy in a system-oriented, coordinated and highly flexible manner and make an essential contribution to the worldwide realization of the Energy Revolution – with combined heat and power generation as the backbone of the Energy Revolution.

Store energy and use it as needed:
power to gas – gas to power.



g-box 50 plus with more power

Redesign enables greater scope of functions and performance



Frank Grewe, Manager for Research and Development

“The comprehensive redesign of the successful g-box 50 model forms the essence of continued advancement in line with market requirements and a reaction to the changed directives for connecting generation plants to the public grid,” says Frank Grewe, Manager for Research and Development at 2G Energy AG, as he classifies the new generation of the g-box at its presentation at the E-world trade show in Essen, Germany.

In its twelve-year history, the g-box 50 (50 kW_{el}, 102 kW_{th}) has become a successful 2G model with around 600 installations worldwide. “The new g-box 50 plus not only has more power thanks to a more powerful engine-generator unit, but has also been completely reconfigured as a module,” Grewe continues. The overall efficiency was increased from 103% to 104.7% (34.7% electrical, 70.0% thermal). The efficiency data refer to the heating value (Hu). With a power reserve of approx. 15% at NN (sea level), the generator has wide-ranging

characteristics in which full load is possible. With this control reserve, it also fulfills the prerequisites for achieving the guaranteed performance data for high-altitude locations such as mountain hotels.

Cost-effective

The wide-ranging characteristics also have a positive effect on the availability and operational load of the generator, which in the long term leads to a reduction in the total cost of ownership (TCO).

Installation and service-friendly

In addition, the height of the CHP unit reduced by more than 40 cm facilitates installation and erection even in confined spaces. Regrouping the temperature-sensitive components of the CHP plant in a “cold” part of the generator reduces their thermal load and, at the same time, has a positive effect on service friendliness and space requirement, as all service work can be carried out from three sides, thus enabling space-saving wall installation. Nevertheless, the water-cooled g-box 50 plus does not require any additional cooling with ventilation systems at the installation site, so the generator meets the strictest noise emission requirements. Compared with the first generation, the new g-box 50 plus is characterized by a considerably wider range of functions and features.

Virtual power plant

Not only can it be heat-operated (with and without buffer operation), power- or grid-oriented, but it can also be integrated



The new g-box 50 plus was met with a positive response at E-world in Essen.

into a virtual power plant, e.g. using the VHPready (Virtual Heat and Power Ready) interface standard or other interface specifications. The use of the C-series software developed by 2G for the more powerful agenerator class modules was new in the field of software and digitalization of operation of the g-box 50 plus and enabled extensive remote maintenance and predictive fault management based of a service contract.

Future-proof

Adaptation to the new regulations of VDE-AR-N 4110 (medium voltage) as a replacement for the German Federal Association of Energy and Water Management (BDEW) medium voltage directive and VDE-AR-N 4105 (low voltage) make the new g-box 50 plus future-proof, as the old regulations of the BDEW directive were repealed on April 27, 2019. After the redesign, both isolated operation and active network support by stabilizing the frequency are now possible, thus further increasing the benefit of the g-box 50 plus for the safety of network operation.



Successful redesign:
the new g-box 50 plus.

Globus opts for the g-box

Ten Globus stores equipped with g-box 50



Globus stands for good products and sustainability.

Location:	Germany-wide
Operator:	Globus SB-Warenhaus Holding GmbH & Co. KG
CHP type:	10 x g-box 50
Gas type:	natural gas
Electrical output:	10 x 50 kW
Thermal output:	10 x 100 kW
Installation:	Energy center



The g-boxes increase the profitability of our stores and are a reliable energy supplier.

Guido Koch | Project Engineer and Energy Officer Globus Hypermarkets

Founded in 1828 in St. Wendel, Germany, the Globus Group is a family business rich in tradition that operates hypermarkets, DIY stores and consumer electronics centers. Globus employs more than 44,900 people at more than 170 locations in Germany, the Czech Republic, Luxembourg, and Russia.

The German Globus hypermarkets operate a restaurant, a bakery and a butcher's shop in addition to the actual store in order to round off the range of services for their customers.

However, this results in a high demand for electrical and thermal energy. A g-box 50 has therefore already been installed in ten different stores throughout Germany to ensure the basic cost-effective and ecological supply of the individual buildings. The g-box 50 with its electrical output of 50 kW and thermal output of 100 kW produces around 250,000 kWh of electrical power and a good 500,000 kWh of heat per year and contributes to the basic supply. "The g-boxes increase the profitability of our markets and are a reliable energy supplier," says Guido Koch, Project Engineer and Energy Officer at Globus hypermarkets. Each plant will have paid for itself after a term of just over five years. "Further g-boxes have already been ordered and will be installed in other branches over the next few months," says Managing Director Björn Böhmig of Thies GmbH, which acted as general contractor for the projects.

Energy-efficient right from the start

agenitor 406 generates decentralized power and heat for the ETS compound feed plant

Location:	Ladbergen
Operator:	ETS Mischfutterwerk GmbH & Co. KG
CHP type:	agenitor 406
Gas type:	natural gas
Electrical output:	250 kW
Thermal output:	304 kW
Installation:	existing building



With the agenitor 406 the ETS saves considerable energy costs.

In 2017 agritura Raiffeisen eG and Eilers Futtermittel GmbH & Co. KG jointly built a modern compound feed plant in Ladbergen on the Dortmund-Ems Canal. ETS stands for "Effiziente Tierernährungs Strategien" (Efficient Animal Nutrition Strategies). With the help of state-of-the-art technology, sustainable animal nutrition and a fourfold benefit are guaranteed: Benefit for the animal, the environment, the consumer and the farmer.

So it was only logical to focus from the outset on efficiency in energy supply as well. pbr NETZenergie GmbH, which was commissioned with the energy concept, worked together with ETS Futtermittelwerk to compile the key energy data for the project and created various supply variants with the corresponding economic feasibility studies and funding options.

"The 2G agenitor 406 had a decisive advantage for the project from our point of view," says Tobias Peselmann, engineer and Managing Director of pbr NETZenergie. "For the animal feed plant, the priority was on steam and electricity generation and use. Since the agenitor 406 has a lower engine cooling circuit heat output than other engines, it was the ideal generator for the project."

The CHP plant, which is operated with natural gas, has an electrical output of 250 kW and a thermal output of 304 kW. "By using the agenitor 406, we not only save a considerable amount of energy costs, but also increase our security of supply as well as the flexibility and environmental friendliness of feed production," says Jan-Bernd Krieger, Managing Director of agritura Raiffeisen eG.

With an electrical efficiency of 41.8% and a thermal efficiency of 48.3%, the agenitor is one of the most efficient and powerful combined heat and power plants in its class. This is made possible not only by the adaptation of the piston geometry of the engine, but also by state-of-the-art system control.

Beside 2G Energy AG, Georg Hagelschuer GmbH & Co. KG, a specialist in steam generation, was involved in the project. "Both companies have a high level of technical competence," says Tobias Peselmann, "which is why the cooperation worked so well. Everyone knew what the goal was and what to do."

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The cooperation was excellent.

Tobias Peselmann | Managing Director
of pbr NETZenergie



ETS Mischfutterwerk lives up to its name ETS – Efficient Animal Nutrition Strategies – with efficient energy supply by means of combined heat and power generation.

Systematic and sustainable cost savings

BEWITAL petfood already covers more than 70% of its electricity requirement with 2G CHP units



Since mid-2016, electricity and steam for the production of pet food at BEWITAL have been generated with the help of agenitor 408.



We want to save more and more energy and CO₂.

Stefan Olthoff | Technical Operations Manager
BEWITAL petfood GmbH & Co. KG

Location:	Südlohn
Operator:	BEWITAL petfood GmbH & Co. KG
CHP type:	agenitor 408, aura 404
Gas type:	natural gas
Electrical output:	360 kW, 100 kW
Thermal output:	389 kW, 167 kW
Installation:	sound reducing encapsulation

In 2016 the first 2G plant was put into operation with the agenitor 408. An aura 404 followed in 2019. With both CHP plants, BEWITAL petfood GmbH & Co. KG has succeeded in producing more than 70% of its electricity requirements in-house with top efficiency and low emissions.

The responsible use of natural resources and energy efficiency have always played an important role for the manufacturer of healthy pet food based in Südlohn in Münsterland. "We want to feed animals healthily while protecting the environment,"

BEWITAL®
UNTERNEHMENSGRUPPE

says the company's website. Raw materials and energy are used sparingly. Residual materials are recycled. And in production, electrical energy is used that is generated 100 percent from hydroelectric power, solar energy and alternative fuels. The ECOPROFIT program, which BEWITAL successfully completed as one of the first participants in 2010, also aims to save costs by protecting the environment.

Environmentally conscious production as a corporate objective

As an energy-intensive company, BEWITAL petfood is increasingly obliged to take decisive measures to reduce energy consumption in order to significantly reduce harmful emissions. A system installed for operation, machine data and energy management according to ISO 50001:2011 ensures that processes and production facilities are optimally configured for maximum performance and minimum energy consumption.

For the specific implementation of an innovative energy concept, support was sought from an external partner with relevant experience in implementing far-reaching energy concepts. The choice was made for D.E.V. Energiesysteme from Oberhausen, which had already successfully implemented numerous projects, particularly in the field of decentralized energy supply. In autumn 2015, the planner Peter Bangert from D.E.V. began to analyze the production processes and the associated energy flows at BEWITAL petfood. The analysis showed that combined heat and power generation would provide a comprehensive solution for the energy and environmental objectives pursued.

CHP Project No. 1: Primary energy use and CO₂ emissions both reduced by 30%

Detailed planning of the first CHP project began early in 2016. Within the scope of the detailed planning, the decision was made in favor of the agenerator 408, which at 42.5% had the highest electrical efficiency of the CHP plants available for selection for the planned purpose. With an overall efficiency of 88.5%, the agenerator produces 360 kW of electrical and 389 kW of thermal energy.

As a result of the targeted planning, the entire plant was already put into operation on July 1, 2016. Since then, the main task of the agenerator has been to supply electricity and steam for the production of pet food at BEWITAL. In order to ensure that the process is suitable for production, the plant is heat-operated. This means that CHP control is based on the heat requirement of the waste heat steam generator used for steam production. The 207 kW of heat provided by the agenerator 408 generates around 210 kg of heat recovery steam per hour, which is fed into the production process.

In order to use the remaining 182 kW of recovered engine heat as efficiently as possible, two buffer storage tanks with a total volume of 10,000 liters were integrated into the CHP heating network. With the help of these buffer storage tanks, the heat requirement for the process heat in production is initially covered. The unused residual heat passes to the neighboring BEWITAL Plant 2 via a specially constructed underground heat transfer line, where it is fed to the central site heating system.

In the first two full years of production, 2017 and 2018, agenerator 408 covered more than 50% of BEWITAL petfood's total electricity

requirements. Due to the high energy efficiency of the CHP, around 30% of primary energy was saved. Likewise, CO₂ emissions were reduced by the same amount as compared with exclusively sourcing external electricity. According to the results achieved so far, the capital invested in the first CHP project will have paid for itself after about three years, despite high additional investments for heat recovery steam generators, buffer storage and heat transfer line.

Thanks to the successful realization of this CHP project, D.E.V. was commissioned to develop a comprehensive concept for a decentralized energy supply for the entire BEWITAL site.

CHP Project No. 2: Improvement to 43% less primary energy and CO₂ emissions

At the end of March 2019, the first CHP plant from the expansion planning was put into operation. It is intended to replace the external electricity still required with in-house electricity, independent of production. The choice was made for the highly efficient aura 404 developed by 2G with an electrical output of 100 kW.

The aura 404 is characterized by a very high overall efficiency of 97.4% with extremely low emissions. So the aura 404 fits perfectly into the company's environmentally conscious energy strategy and, with emission values of less than 50 mg/Nm³ NO_x, meets the requirements for low nitrogen oxide limits. As a reliable "endurance runner", the aura contributes to BEWITAL petfood being able

BEWITAL petfood in Südlohn has reduced primary energy consumption and CO₂ emissions by 43%.



to cover more than 70% of its electricity requirements with its own CHP power in the future, and a further 167 kW of thermal power is available.



With an overall efficiency of 97.4%, the aura is highly efficient and, with less than 50 mg/Nm³ NO_x, extremely low-emission.

A brief comparison with the 100 kW photovoltaic system from BEWITAL petfood shows how economically the aura 404 works. For an alternative power output of 660,000 kWh (100 kW x 6,600 operating hours) per year using the PV system, four times the power output of the aura 404 would be required. In addition, due to the low number of hours of sunshine (1,560 hours in 2018), an electricity storage system would have to be used in order to have the electricity available in line with demand. The bottom line is that the investments would have been many times higher than for the aura 404 CHP project. It should also be considered that the aura 404, in contrast to a PV system, contributes an additional 1.1 million kWh of heat annually.

The temporarily unused CHP power is fed into the public power grid, such that the aura can continue to run continuously even in the event of a power surplus. "In addition, it is

interesting from an economic point of view that, due to the continuous operation of the aura, 100 kW of CHP power is available as soon as production starts. As a result, temporary peak loads at the start of production are 100 kW lower. This additional effect will yield the company additional cost savings of more than EUR 25,000 per year due to the lower grid tariffs," explains Peter Bangert.

One challenge appeared to be the limited space available on site. Thanks to the compact design of the aura, it was no problem to establish the plant on an unused gallery, however.

Special attention should be paid to the environmental benefits of this project. The joint power supply by the two CHP plants can save more than 43% of both primary energy and CO₂ emissions annually.



There was great interest on behalf of the participants at the opening event of the “CHP Tour 2019” at the wastewater treatment plant operator Hale Avenue Resource Recovery Facility in Escondido, California.

2G on “CHP Tour 2019” in North America

2G Energy Inc. provides information on the possibilities of combined heat and power generation

With the opening event in Escondido, California, 2G Energy Inc. started this year’s “CHP Tour” through North America. The aim: to show prospects from various industries the possibilities that combined heat and power generation offers.

The Hale Avenue Resource Recovery Facility (HARRF) kicked off on April 3. HARRF operates a sewage treatment plant and uses the resulting sewage gases with an avus 800b installed by 2G for the production of electrical and thermal energy. Aaron Tasin of 2G, together with 2G Sales Partner Ben Edgar of White Harvest, Texas, and Project Engineer Jeremy Metts of Anaergia, California, spoke about the use of combined heat and power and presented the highlights of the project to HARRF.

“The first stop of our tour was a complete success, not only for us, but especially for the participants of the event,” reports Aaron Tasin. “Many interesting topics were addressed, from California emission control to economics.” The second and third stops on April 24 in Gaithersburg, Maryland, and on May 9 in Calgary, Alberta, Canada, were also a complete success. Further presentations are planned in Canada, the USA, and Mexico.

***The dates will be announced shortly:
www.2g-energy.com
We look forward to your participation.***

Lots of praise for the new g-box 50 plus

New module presented at E-world in Essen



E-world energy & water in Essen is the leading trade show for the energy industry in Europe. With the mounting importance of decentralized power generation systems for implementing the Energy Revolution, this year's E-world was also an important occasion for 2G Energy AG to meet national and international decision-makers. In its trade show presentation, 2G focused on the new g-box 50 plus. The considerably wider functional and performance range of the module met with a very positive response.

You can find out more about the new g-box 50 plus in this issue on page 17.



The 2G trade show team was delighted about the high level of interest among the visitors.

Visit us at the trade fair!

The next trade fair dates

10/23/2019	mcTER	Verona	Italy
10/28/2019	6. Energiewendeforum	Bonn	Germany
12/10-12/12/2019	BIOGAS Convention & Trade Fair	Nuremberg	Germany

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