

Annual Report 2016

RESPONSIBILITY

NEW START

DIALOGUE

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Journal 2016

RESPONSIBILITY

NEW START

DIALOGUE

AMPRION – A BRIEF PROFILE

Amprion GmbH is one of four transmission system operators in Germany.

The company can draw on many years of experience in planning, constructing and operating the extra-high-voltage grid. Amprion employs a workforce of around 1,250.

~63 GW

the total installed generation capacity in the Amprion grid area.

79,200 KM²

the area covered by the Amprion grid, stretching from Lower Saxony down to the Alps.

11,000 KM

the total length of power lines that make up the Amprion transmission system; it is Germany's longest EHV grid.

~29 M

the number of people supplied with electricity via the Amprion grid.

~170

the number of substations that connect the Amprion grid to the downstream distribution systems.

THE AMPRION GRID



GRID EXPANSION AT AMPRION

2,000 KM

the total length of upgraded and new extra-high-voltage lines Amprion intends to build by 2026.

€ 5.6 BILLION

the amount Amprion will invest in grid expansion by 2026.

510

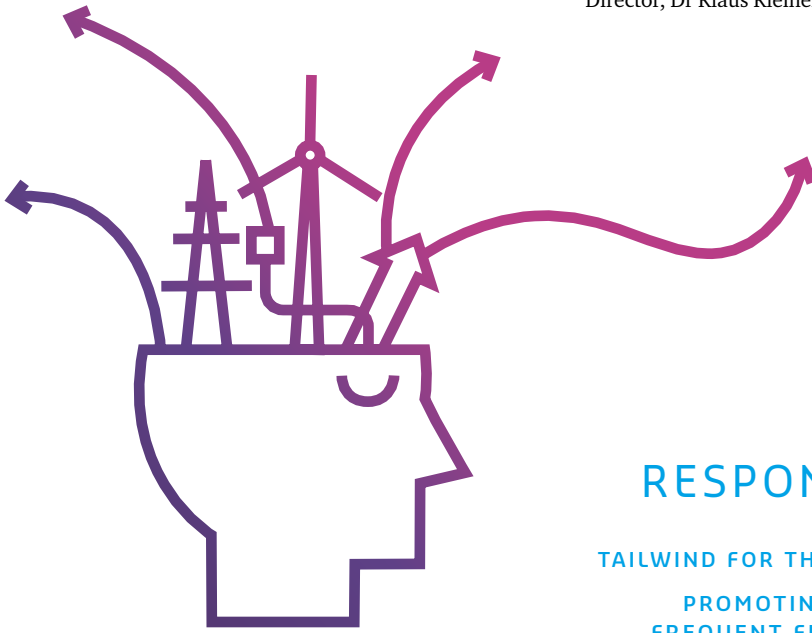
the number of dialogue events Amprion held in 2016 on the topic of grid expansion.

As a transmission system operator active in Germany and Europe, we're helping to shape the NEW START *[page 10]* into the energy world of the future. Our power lines are the lifelines of the national economy. By operating and expanding our network, we're assuming our share of RESPONSIBILITY *[page 28]* for guaranteeing a reliable power supply in the era of the energy transition. To enable us to overcome the challenges of this transition, we're developing innovative solutions and actively engaging in direct DIALOGUE *[page 42]* with citizens, politics and business.

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POWER TO THE FUTURE

The energy transition poses a massive challenge to system operators, grid component manufacturers and scientists alike. It depends on how ingenious and innovative they are, say Prof. Armin Schnettler and Amprion's Managing Director, Dr Klaus Kleinekorte.



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FRESH THINKING

Innovations are crucial to Amprion. Employees are busy developing new concepts, integrating innovative technologies and finding solutions for the energy world of the future.

RESPONSIBILITY

TAILWIND FOR THE REGION *_pages 30–35*

PROMOTING FLEDGLING
FREQUENT FLYERS *_pages 36–41*

NEW START

POWER TO THE FUTURE *_pages 04–09*

FRESH THINKING *_pages 12–21*

COSMOS OF INNOVATIONS *_pages 22–23*

DIGITALISATION IS
CHANGING THE GRID *_pages 24–27*



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TAILWIND FOR THE REGION

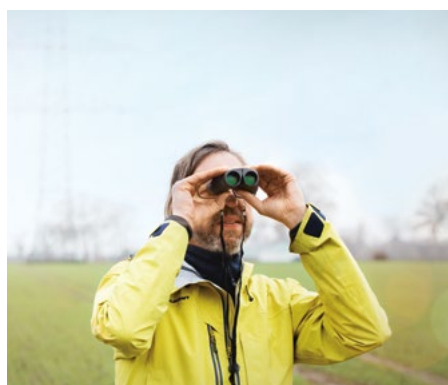
Amprion is investing more than 500 million euros in grid expansion every year. This is guaranteeing jobs in small and medium-sized businesses – such as in the construction industry.

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PROMOTING FLEDGLING FREQUENT FLYERS

Is that a nest on that pylon? Amprion’s bird protection experts are helping birds of prey, such as Eurasian hobbies and peregrine falcons, to nest at dizzy heights.



DIALOGUE

AGREED!_pages 44–47

QUESTION TIME_pages 48–51

*THE DIALOGUE
FACILITATORS_pages 52–57*



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AGREED!

Getting public approval for a grid expansion project – is that possible? Yes, if citizens, town and parish councils and grid operators work together in a spirit of mutual trust. Here’s an example of how it’s done.



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THE DIALOGUE FACILITATORS

People like Jonas Knoop are the “face” of Amprion – in contact with local residents, authorities, clients, service providers and potential new employees.



PROF. ARMIN SCHNETTLER AND DR KLAUS KLEINEKORTE

spend a great deal of their time imagining and predicting how the energy world is going to look in 20 years' time. To ensure we're properly equipped for this future energy world, we need to initiate innovations right now.

POWER TO THE FUTURE

The energy transition poses a massive challenge to system operators, grid component manufacturers and scientists alike. The success of this transformation depends on how ingenious and innovative they are, say Prof. Armin Schnettler, Head of Research in Energy & Electronics at Siemens Corporate Technology, and Dr Klaus Kleinekorte, Managing Director and Chief Technical Officer at Amprion.

PHOTOS · MARCUS PIETREK INTERVIEWER · VOLKER GÖTTSCHE

INNOVATION IS AN IMPORTANT ENTREPRENEURIAL CONCEPT. BUT WHAT PRECISELY ARE INNOVATIONS?

DR KLAUS KLEINEKORTE For Amprion, innovations are new and sustainable solutions that we require for the energy transition. They are hugely important from a strategic point of view, because they help us to fulfil our duty as a transmission system operator.

PROF. ARMIN SCHNETTLER For us at Siemens, innovations are characterised by the transfer of new know-how to products that prove their value in the field. Without them, we, as a technology provider, would not survive. We systematically analyse technical developments and market trends in order to then invest strategically in those that are of most relevance to us, including ones that are disruptive.

KLEINEKORTE Take this example: we are innovative when we transfer successful technologies from one field to another field – with fascinating results. If someone had said to me 20 years ago that Amprion would be involved in the development of a tunnel boring machine, then I would have said, “I’m an electrical engineer. What has my job got to do with these moles?” Today, we need the technology that was used, for instance, to drill the new Gotthard Base Tunnel for installing underground cables – just a much smaller version, of course.

THE ECONOMIST JOSEPH SCHUMPETER LINKS INNOVATIONS WITH THE “CREATIVE DESTRUCTION” OF THE OLD. IS THAT WHAT IS CURRENTLY HAPPENING IN THE ENERGY INDUSTRY?

SCHNETTLER We are indeed experiencing more disruption in the energy supply industry than evolution. “Decarbonisation” is perhaps the biggest challenge currently faced by mankind – the switch from fossil and nuclear to renewable energy sources. We need to completely rethink our energy supply – technically, structurally and commercially.

» We cannot say, 'Let's wipe the slate clean and start all over again.' We are in the process of making a paradigm shift to renewables, but we have to be able to continue to operate our grid safely and reliably.«



DR KLAUS KLEINEKORTE

KLEINEKORTE That is not possible in the real world. We cannot say, "Let's wipe the slate clean and start all over again." We are in the process of making a paradigm shift to renewables, but we have to be able to continue to operate our grid safely and reliably. This is one of our duties as a transmission system operator. There are days we ask ourselves whether it is actually possible to combine the two, but so far we have always managed it. I have complete confidence in the engineering skills we have here at Amprion.

SCHNETTLER We have to achieve disruption without making the energy supply system vulnerable. And we have already travelled quite a long way down this road. Twenty years ago, we believed the system would be capable of integrating no more than ten per cent of its total capacity in the form of volatile photovoltaic and wind energy. Today, we are studying how we can operate the system with more than 80 per cent renewable energy sources.

WHAT TECHNICAL INNOVATIONS NOW AVAILABLE WOULD YOU HAVE NEVER THOUGHT POSSIBLE BACK THEN?

SCHNETTLER One example is lying right there on the table: my smartphone. It is incredible what has gone on in the field of information and communication technology. Or take photovoltaic installations that are today generating outputs in the gigawatt range. I would never have thought such rapid development possible. The massive expansion of renewables has led to falling costs for green electricity. In the Middle East you can now purchase a kilowatt-hour of power generated by photovoltaic plants for less than it costs us in Germany to even run a conventional power station. The more PV installations and wind turbine generators are connected to the grid, the more complex it becomes to control them. The only way to do so is to use power electronics. Speaking of which, I would never have expected their performance and price levels to have developed so quickly, either. The power grid is increasingly turning into a digitally controlled, electronic network.

KLEINEKORTE Extra-high-voltage direct-current transmission (HVDC) is a good example of that. Twenty years ago, one would have said there was no point in building a power link between Belgium and Germany because absolutely no electricity would flow through it owing to the existing links to the Netherlands and France. The power electronics of HVDC technology make it possible to force this flow of electricity. That is why we are now building this link – and enhancing the security of supply in the entire region. Such technical solutions never used to exist. However, the more power electronics we install, the greater the interdependencies become – and so, too, the demands made on the manufacturers to guarantee the reliability of these new technologies.

SCHNETTLER Siemens is facing up to these demands. We know how important security of supply and a dependable energy supply system are. The eyes of the whole world are on Germany, observing how we are handling the energy transition. We are working on the assumption that all markets around the globe will be developing and switching over to renewables. If we want to be successful in other markets, the solutions we find and implement in Germany will have to prove their worth.

*» We are experiencing more disruption than evolution.
We need to completely rethink our energy supply –
technically, structurally and commercially.«*

PROF. ARMIN SCHNETTLER



WHAT INNOVATION SURGES WILL THE ENERGY TRANSITION GIVE RISE TO OVER THE NEXT 20 YEARS?

KLEINEKORTE That depends on how our future society will deal with the energy issue. It is an issue we at Amprion are devoting a great deal of attention to. I will dare to make a prediction: in just five years from now, consumers will be buying their electricity over the Internet, chopping and changing every two weeks and each time through a different provider. This will be a huge challenge for transmission system operators because transactions that are completed with the aid of digital communication still have to be processed physically.

SCHNETTLER Siemens and RWTH Aachen University are currently working on a “digital twin” of future energy system structures. We are creating digital representations of the present energy system and, with the aid of mainframes, acting out scenarios aimed at depicting how structures, technologies and markets could potentially develop over the coming years. We, too, are working on the assumption that the energy trade will become more fragmented and the degree of digitalisation will continue to grow. At some point, the battery of my electric car will communicate with the photovoltaic system and other electrical consumers, informing them how much energy it requires – or makes available – and when. We expect all sectors to undergo electrification – this is essential if we are to achieve our climate protection goals and, moreover, will lead to the decoupling of renewable power generation from consumption. The chemical and transport industries will generate hydrocarbons from solar and wind power, in conjunction with CO₂ and water.

KLEINEKORTE All this will lead to further growth in the demand for power, demand we will only be able to satisfy by installing more photovoltaic systems and wind turbines. The burning question is: how are we going to orchestrate millions of these systems in a meaningful way? RWTH Aachen University and Amprion are exploring fundamental questions around this issue in a project dubbed the “SwarmGrid”. The idea is to group the systems into swarms. To illustrate what I mean by that: we would no longer control the individual bees, but rather the bee colonies.

SCHNETTLER Perhaps the era of artificial intelligence will soon be upon us, aiding us to determine and control complex systems. There are some highly promising approaches around in this regard, but only if we have the necessary powerful computers and superfast communication networks will we be able to work with such smart systems in real time.

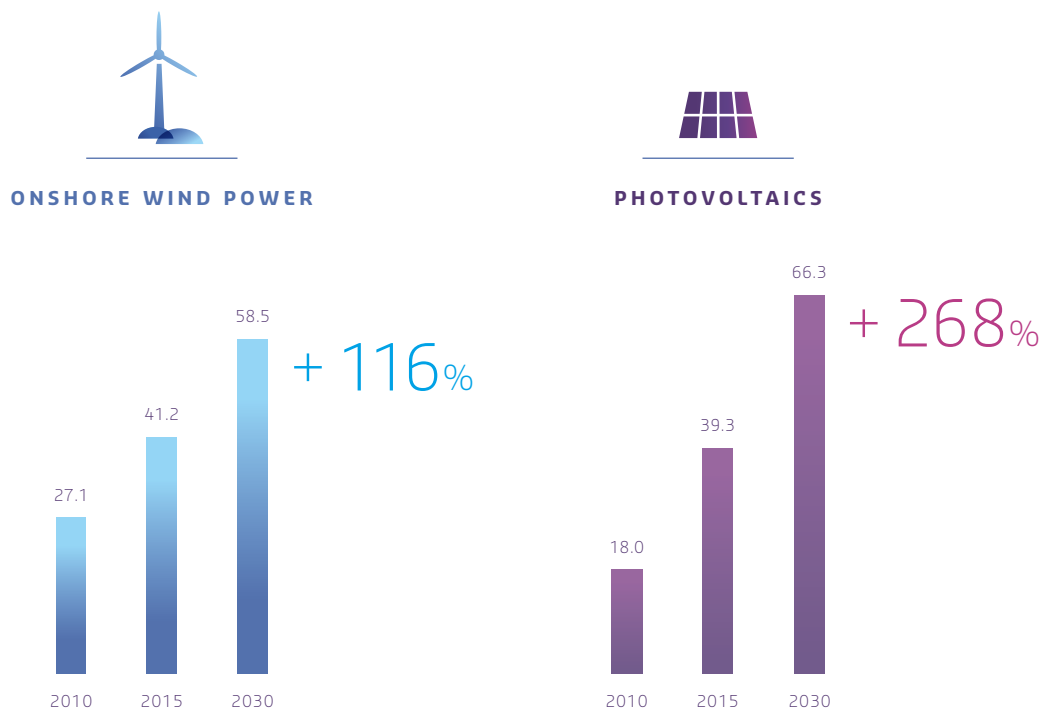
IF YOU HAVE ANY, WHAT ARE THE INNOVATIONS OF YOUR DREAMS?

KLEINEKORTE Whoever discovers how to store electrical energy with a high density deserves a Nobel Prize. If, for example, a mobile phone could go three months without having to be recharged, that would be fantastic. Perhaps we will have to store energy in some other form – such as technologically generated gas. We must not stop looking for such solutions. To my mind, it is important that we do not impose any kind of ban on free-thinking – nothing must be declared off-limits. And we also need to throw ideas back and forth with the research universities. Students’ minds are not weighed down by “mental baggage” they bring with them from previous experience. They challenge existing solutions. This can lead to totally new approaches.

SCHNETTLER The issue of storage is the biggest challenge facing us and that we have to address tenaciously. If we succeed, we can then go about implementing decarbonisation globally. We can only overcome this challenge by working hand in hand with research institutes and industrial partners on mass-storage technologies. What we are really looking for from these partnerships are unconventional ideas – the marketplace will show us what makes sense and what not.

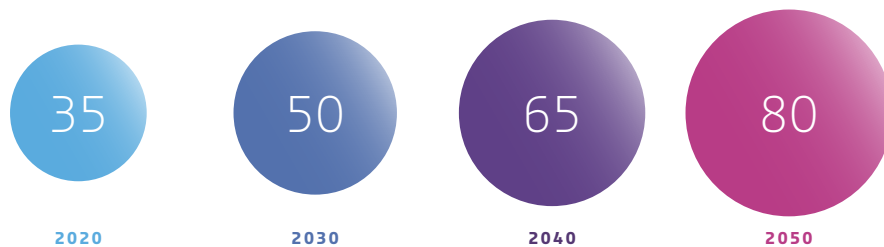
WIND POWER AND PHOTOVOLTAIC SYSTEMS ARE BOOMING

Installed capacity in gigawatts



TARGETS OF THE ENERGY TRANSITION

Increase in the share of renewable energy sources as a percentage of gross power generation



Source: NEP 2022, BNetzA Monitoringbericht 2016, Entwurf NEP 2030 Szenario B 2030



New start

Amprion promotes FRESH THINKING *[page 12]*. To make the grid fit for the challenges of the future, we're combining our concepts with innovative technologies. Together with strong partners, we're creating a COSMOS OF INNOVATIONS *[page 22]* and facing the challenges of the digital transformation: THE DIGITALISATION IS CHANGING THE GRID *[page 24]*. It is getting smarter – and we're also learning new things every day.



FRESH THINKING



Innovations are crucial to Amprion. To make the grid fit for the challenges of the future, employees are busily developing concepts, integrating new technologies and, together with research partners, finding solutions for the energy world of the future.

PHOTOS · MATTHIAS HASLAUER TEXT · VOLKER GÖTTSCHE

It all began with an idea. Stephen Gray knew that friction generates electricity. Could this electricity be transported over short distances? On 14 July 1729, the British physicist and a friend ran a 200-metre-long rope made of damp hemp fibres across a field. They propped it up with beanpoles. And yes, the rope did indeed transmit an electric charge – and the world’s very first overhead power line had worked.

Today, Gray’s heirs no longer work with hemp fibres and beanpoles. They develop conductor ropes made of steel and aluminium that transmit a hundred thousand times the amount of power Gray had been handling. They test control systems and have software programmed that can better forecast the amount of wind and solar power that will be fed into the grid. They work in the laboratories

of universities and research institutes, in the development departments of component manufacturers – and in the offices of Amprion.

One of Gray’s heirs is Martin Finkelmann (48), who heads Amprion’s department for Long-term Grid Planning. The common link between Martin Finkelmann and Stephen Gray is their passion for everything that has to do with electricity. “We too want to try out new things,” says the engineer, “in order to develop innovative solutions for our grid.” These solutions are sometimes the fruit of many long years of intense research. They also arise from Finkelmann and his colleagues working on and further advancing existing inventions, technologies and processes, so that challenges that arise when operating and expanding Amprion’s power grid can be mastered.

» With the aid of innovations, we want to actively shape the transition underway in our energy system.«

DR HANS-JÜRGEN BRICK,
MANAGING DIRECTOR AT AMPRION

Like everywhere else, every innovation at Amprion begins with an idea. Such as the idea to control cross-border electricity flows in a totally new way. Finkelmann and his team came up with this idea around eight years ago. “Back then, the question arose as to how renewable energies could best be used across borders,” he remembers. The growing supply of wind and photovoltaic energy and the increasing amount of trade in electricity within Europe would make it essential to expand the continent’s power grid – and in a way that would give it even greater capacity and flexibility. One important component of this is a direct, controllable power line between Germany and Belgium.

SYSTEM RELIABILITY IN EUROPE’S NORTH-WEST

Together with engineers from Amprion’s Belgian partner ELIA, Martin Finkelmann and his team started looking for a technical solution. Their approach was innovative in two respects: an underground cable that carries a direct current. It will allow the power flows to and from Belgium to be controlled extremely precisely. The short name for this technology is HVDC-cable: an underground cable for the transmission of extra-high-voltage direct current. The link is scheduled to be commissioned in 2020. “Through this project, we’re helping to ensure system reliability not only in the Aachen-Cologne region, but also in Europe’s north-west,” says Finkelmann. At the

same time, the link will help to better integrate Belgium into the European electricity network and market if the country pulls out of nuclear energy by 2025 as planned. A development that many people in North Rhine-Westphalia also welcome.

The new DC link is known as the “Aachen Liège Electricity Grid Overlay” – or ALEGrO for short. “Innovations like this one help us to overcome the energy transition,” explains Dr Hans-Jürgen Brick, Managing Director at Amprion. “More than that, they enable us to actively shape the transition underway in our energy system.”

This transition is far-reaching: by 2030, renewables are to supply half of our total electricity supply. New, large-scale wind and PV farms as well as more and more micro installations are to come on stream. Wind power will mainly be fed into the grid in northern Germany, while the major share of solar energy will be fed in southern Germany. In both cases, the infeed will fluctuate massively owing to their dependence on the weather conditions. Add to these the producers and consumers in neighbouring countries, who influence what goes on in Germany’s grid – and vice versa. The complexity of all the processes involved in the European grid is consequently growing. That’s why the grid has to become smarter and even more flexible. ▶

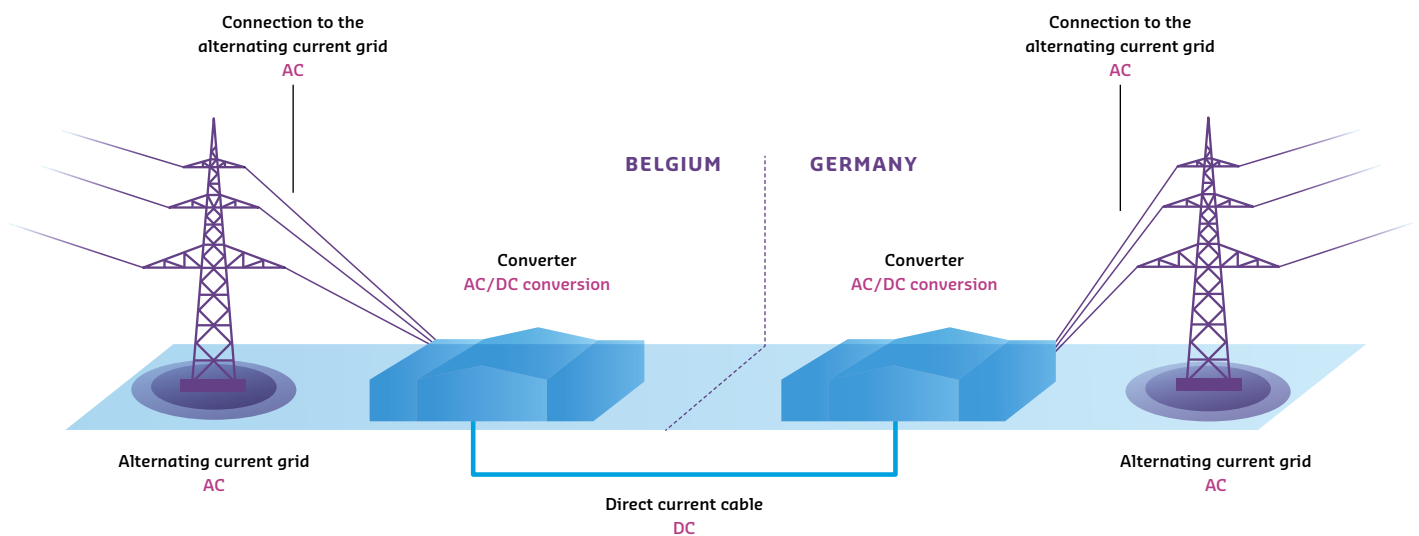
PIONEER WORK FOR SYSTEM RELIABILITY

“ALEGRO” DC LINK



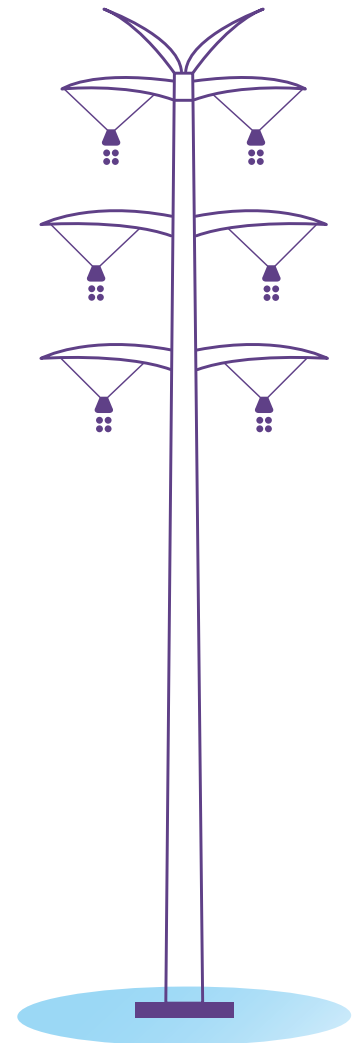
Martin Finkelmann, Head of Long-term Grid Planning at Amprion.

The “Aachen Liège Electricity Grid Overlay” – or ALEGrO for short – sees Amprion combine two innovative technologies to control the flow of electricity to and from Belgium right down to the megawatt-hour. It will go into trial service in 2020. “ALEGrO is one of the first fully controllable DC links in Europe’s meshed AC transmission network,” says Martin Finkelmann, the head of long-term grid planning at Amprion. The 90-kilometre-long section is being built as an underground direct-current cable with a transmission capacity of 1,000 megawatts and a rated voltage of 320,000 volts. At either end, converters will transform alternating current into direct current and vice versa. In total Amprion is investing more than 400 million euros in ALEGrO.





Dr Christoph Gehlen is responsible for power line construction at Amprion.



PILOT POWER LINE CONSTRUCTION PROJECT

NEW DESIGN OF SOLID PANEL PYLON

By adopting a new type of pylon, Amprion wants to expand its toolkit for power line construction. "We are investigating whether the solid panel pylon offers us benefits in respect of construction, operation, cost-effectiveness and public acceptance compared with the lattice pylon," says Dr Christoph Gehlen, Head of Power Lines at Amprion. This new design of pylon is around 60 metres high and

made of steel plates that are rolled and then welded together. This gives the pylon its round shape. The pylons have three levels of curved cross-arms with a projection of 7.5 metres. Solid panel pylons will start to be erected from 2017 as part of a pilot project along a section of the new AC link between Wesel/Lower Rhine and Doetinchem in the Netherlands.

» Innovation is more than just a successful experiment. It encompasses the entire process from the idea through to guaranteed application.«

DR BARTOSZ RUSEK,
HEAD OF TECHNOLOGY MANAGEMENT AT AMPRION

TRANSMISSION FROM ZERO TO 1,000 MEGAWATTS

ALEGrO meets these requirements. When Martin Finkelmann explains how the new HVDC link actually works, the electrical engineer's eyes light up. "We're planning one of the first fully controllable DC links in Europe's meshed transmission network," he continues. To be able to control the transmission of power via the ALEGrO cable between zero and 1,000 megawatts, converters are being built at either end of the link. These high-tech installations convert the alternating current used in the conventional transmission network to direct current and vice versa. According to Finkelmann, the advantage of DC is that "it is controllable and suffers only low levels of loss." This is why the decision has been made to install HVDC lines to transmit, for example, wind power generated in the north of Germany over great distances to the conurbations and industrial centres of southern Germany.

Whereas other links are still at the planning stage, ALEGrO will from 2020 give Amprion plenty of opportunity to collect valuable field experience, allowing the grid operator to work out how HVDC technology can be best put to use in Europe's close-mesh transmission grid. "In a technology-driven industry like ours, innovations are an important success factor," explains Dr Hans-Jürgen Brick, Managing Director at Amprion. Accordingly, the company has begun to develop and implement innovation projects in all areas. The ALEGrO project falls under the area of Transmission Technology. Further projects are

being conducted under the headers of System Operation and Control, Systems Engineering and the "Energy System of the Future" (see pages 22–23).

WORK ON THE INNOVATION PORTFOLIO

"Even the craziest idea requires a degree of order if it's to become reality," says Dr Bartosz Rusek, Head of Technology Management at Amprion. The 39-year-old engineer studied in Poland and obtained his doctorate in Germany. Together with colleagues from other departments, he puts structure into the company's innovation projects. Above all, two questions need to be answered: Which new solutions does the energy world of the future need? How can Amprion meet future challenges that arise from the energy transition?

Rusek and his colleagues go about this task systematically: they set priorities for how the multitude of ideas are to be handled. They do this by organising the projects according to their technological maturity. "In the initial phase, we collect and evaluate what we think are clever-looking ideas," Rusek explains. If the evaluation is positive, Amprion then gets stuck into researching and developing a prototype. "The fact that you've got a prototype that works doesn't necessarily mean it's going to be a simple path straight to regular operation," clarifies Rusek, before turning his attention to the absolute top priority at Amprion when it comes to innovation: every new technology is put through its paces – many, many times. "The transmission grid is the backbone of the ▶

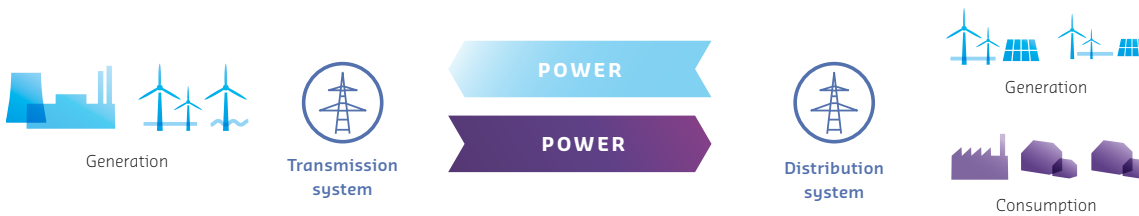


Dr Frank Reyer, Head of Grid Management at Amprion.

PREVIOUSLY



TODAY



SOLUTION FOR THE FUTURE

GRID RESTORATION IN THE ENERGY WORLD OF THE FUTURE

The energy world is undergoing a transformation. New structures require new concepts. For this reason, Amprion is working with research partners on a new strategy for “Grid Restoration with a High Proportion of Renewable Power Generators”, as the innovation project has been dubbed. The starting point for this is the growing number of fragmented wind and solar installations. These are connected not only to the transmission system but also to the distri-

bution systems (see diagram above). “We need new concepts for restoring the grid that take the changing infeed situation into account,” says Dr Frank Reyer, Head of Grid Management at Amprion. “From these, we can then derive strategies that we can implement flexibly, in line with the prevailing infeed levels from wind and PV installations, following a major disruption.” Among our project partners in this field is the Technical University of Kaiserslautern.

» We're developing new solutions in order to meet the requirements of the grid expansion.«

DR CHRISTOPH GEHLEN,
HEAD OF POWER LINES AT AMPRION

German economy. That's why it must always operate safely and reliably," says Rusek. Innovation is therefore more than just a successful experiment. "It encompasses the entire process from the idea through to guaranteed application in the grid." For a new technology, this means it must first prove itself within the framework of pilot projects before it can find its way into the grid as "standard equipment".

PRACTICAL TRIALS UNDER REAL-WORLD CONDITIONS

Take the innovation project "Solid panel pylon" that is now entering the pilot phase: this type of pylon is to be tested along a six-kilometre route in the Lower Rhine region. It belongs to a new AC link connecting Germany and the Netherlands. "We're developing new solutions in order to meet the requirements of the grid expansion," explains Dr Christoph Gehlen. The 48-year-old graduated in electrical engineering and is Amprion's man for power line construction. And he knows: no two grid expansion projects are alike. For instance, the landscape, ground composition and housing and population density differ from region to region. "This is why we are expanding our toolkit for power line construction – so that we can implement each project as best as we can," Gehlen explains. To this end, he and his team have joined forces with pylon constructors to develop these new solid panel pylons. The next step is to gain experience with regard to construction procedures, operation, cost-effectiveness and acceptance by the general public. The overhead power

line is scheduled for completion in 2018. The pylons will then undergo practical trials under real-world conditions, after which this new type of pylon will be assessed to determine whether it is fit for use in other grid expansion projects.

PREPARING FOR THE WORST-CASE SCENARIO

Change of location – to Amprion's System Operation and Control Centre in Brauweiler. This is where Dr Frank Reyer and his team ensure that the power grid functions reliably. And they also investigate how this stability can be maintained in the energy world of the future. At Amprion, such questions are not discussed in abstract terms. "Our staff are far too focused to waste time doing that," says Reyer, who is Head of Grid Management. "If there are signs of a problem arising, our specialists follow it up until they have found a solution." This also applies to the people at the System Operation and Control Centre, who, with our domestic and international partners, regularly train how to restore the grid to full functionality. "This is a situation we never want to experience," Reyer emphasises. "But it's part of our remit to prepare a professional response to the worst-case scenario, should it ever arise."

Until now, the team has followed a rigid procedure whenever training for grid restoration following a crisis: the system controllers would have used conventional power stations with stable infeed into the transmission system to restore grid operation, and then gradually reconnected

consumers back to the distribution system. As a result of the energy transition, the system will change fundamentally, Reyer's team believes. The more power we generate from renewable sources, the more likely we are to face a commingling of generation and consumption in the distribution system. "We need a concept that enables us to respond flexibly to the prevailing infeed situation from wind and PV installations." Amprion is already carrying out research to this end, together with the Technical University of Kaiserslautern and the Fraunhofer Institute for Wind Energy and Energy System Technology. Their objective is to complete this new concept as quickly as possible – long before the majority of conventional power stations have been taken offline.

Collaborations with universities and research institutes are nothing unusual in the world of technology. Amprion, too, fosters an international network that includes some notable universities. "Maintaining a close relationship and exchanging ideas and data with the scientific world are a matter of course for us," says Managing Director Hans-Jürgen Brick. "Given the challenges of the recon-

struction of the energy system, this will no doubt intensify." Amprion doesn't just talk about innovations, but proactively drives them forward – with the declared intention of integrating the R&D results obtained into the grid.

ON THE ROAD TO THE ENERGY WORLD OF THE FUTURE

As such, Amprion is continuing down the same road Stephen Gray went down almost 300 years ago. It's the road along which electrification first took off in Germany in around 1880. Fifty years later, the first extra-high-voltage power line went into service between Brauweiler and the Alps – the starting gun for Germany's transmission system. Once again, 100 years later, in 2030, Germany's energy system is set to complete another fundamental restructuring process, which will make it primarily dependent on renewable sources. In the meantime, the experts at Amprion will continue to work on innovative solutions to bring about a safe and reliable power supply system, demonstrating both their thirst for knowledge and smart ideas – like Stephen Gray.

» If there are signs of a problem arising, our specialists follow it up until they have found a solution.«

DR FRANK REYER,
HEAD OF GRID MANAGEMENT AT AMPRION

INNOVATION - A SUCCESS FACTOR

Amprion aims to continuously strengthen its innovation capacity in all departments.



DR HANS-JÜRGEN BRICK

is Chief Commercial and Chief Financial Officer (CCO/CFO) at Amprion. He is responsible for finance, the economic grid management and communication, among other areas.

HOW IMPORTANT IS INNOVATION TO AMPRION?

It is of huge importance from a strategic point of view. As a transmission system operator, it is our duty but also a genuine desire of ours to actively shape the transition underway in our energy system. To achieve this, we have to develop and implement new concepts, processes and technologies. This will also be to our commercial benefit, because in a technology-driven industry like ours, innovations are an important success factor.

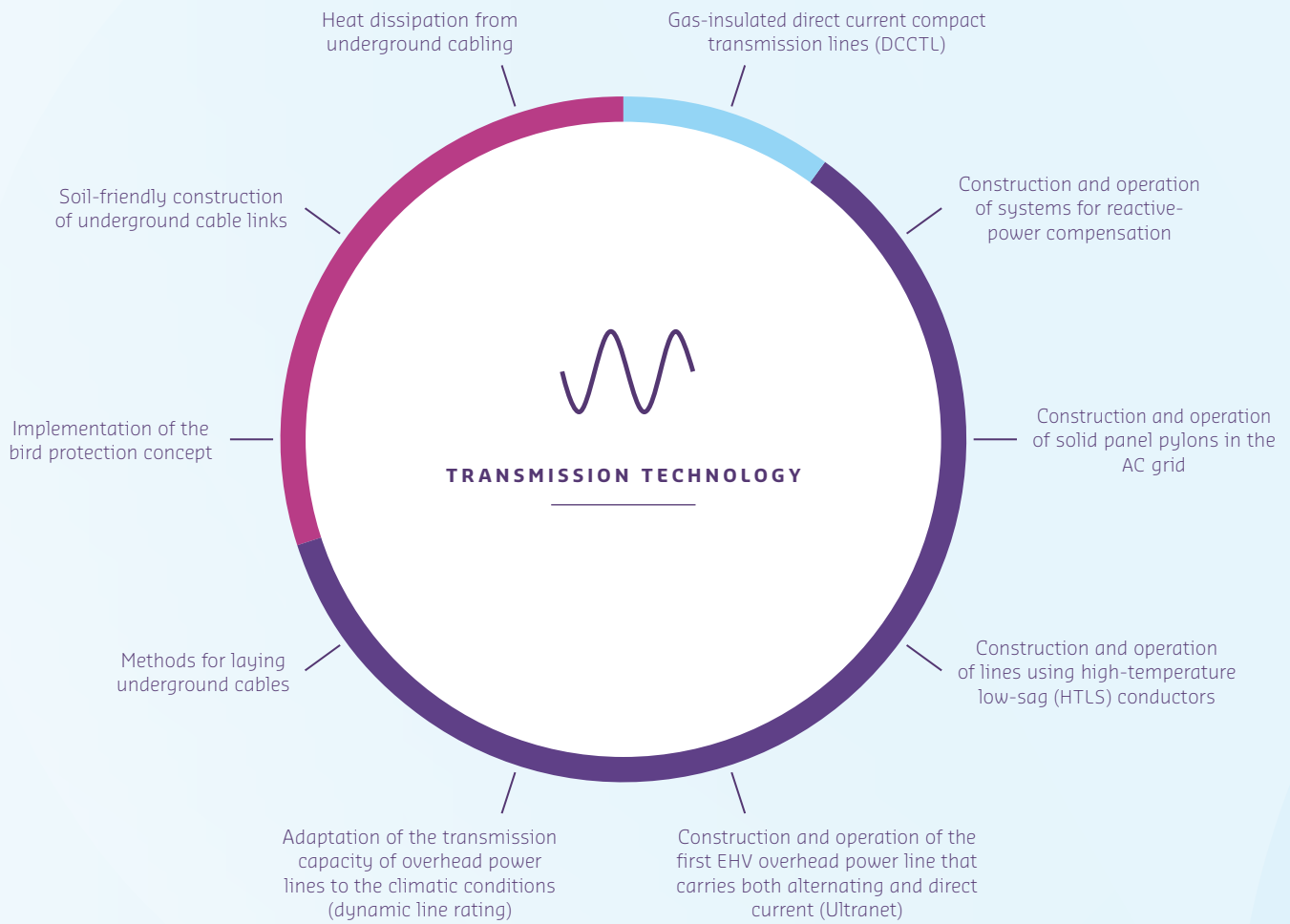
DOES INNOVATION GO BEYOND MERE TECHNICAL PROGRESS?

Absolutely. We also see ourselves as a driving force in the economic grid management, for instance. How will the electricity market function in future? How can the costs associated with the energy transition be apportioned fairly? In project communication, we are using new event formats to expand the dialogue with local residents and other community groups. We need such innovations in order to actively shape the transition underway in our energy system. Therefore, as part of Strategy 2020, we have taken it upon ourselves to strengthen our innovation capacity in all departments.

HOW DO YOU PROMOTE THE INNOVATION CULTURE IN A COMPANY?

To begin with, we have taken a good look at the innovation projects at Amprion. In which areas are we working together with partners? What level of maturity have the projects reached? The information collated will flow into a company-wide portfolio that we want to use to align our long-term innovation activities. The innovation capacity of a company essentially depends on the people who work there. Amprion employs many very good people who are experts in their respective field and who – as is apparent almost every day – identify deeply with the firm and its goals. That's something we can and will build on.

COSMOS OF INNOVATIONS



TECHNOLOGICAL MATURITY



Amprion is working with universities, research institutes and other companies to discover and develop sustainable solutions for the transmission system. The various projects are differentiated according to their technological maturity. Basic groundwork needs to be conducted to lay the foundations required for us to shape the energy system of the future. For instance, within the scope of the MIGRATE project, Amprion and 24 global partners are currently investigating how a high level of stability and quality in the European power grid can

be reconciled with the increasing infeed levels from renewable energy sources. Other innovations in transmission technology have already progressed to the stage that they are currently undergoing trials in pilot projects. This includes a tunnelling method for underground cables. Already approved for regular operation are methods for reactive-power compensation. It's with such technologies that Amprion is helping to shape the new start into the energy world of the future.

First bilateral European Security Service Centre (SSC) and pan-European TSO (transmission system operators) Security Cooperation (TSC)

Improved forecasts as to how much renewable energy will be fed into the grid the next day

Efficient coordination of the transmission capacities in the cross-border electricity trade (flow-based market coupling – FMC)

Concept for better visualization of the system status in the grid control room

Combined operation of underground cable and overhead power line routes in one system

New grid control system and station control technology to meet the challenges of the future (HSL 2020/NBF-NG)

Construction and operation of converters to connect DC links (Ultranet, ALEGrO, A North)

Systematic control of current flows thanks to HVDC technology in Europe's meshed AC grid (ALEGrO)

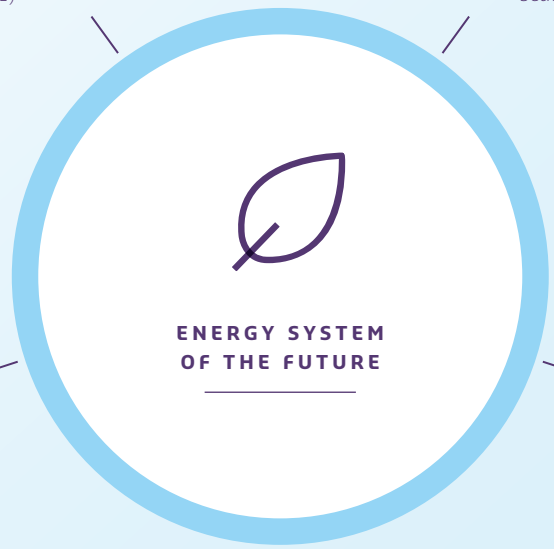
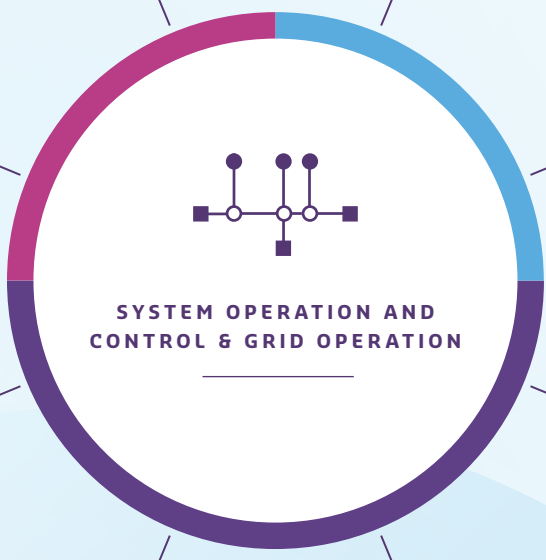
Solutions for grid stability with increased infeed of renewables (MIGRATE)

Grid restoration with renewable energy sources following a large-scale disruption

SwarmGrid – safe operation of electricity grids with swarm-enabled system services

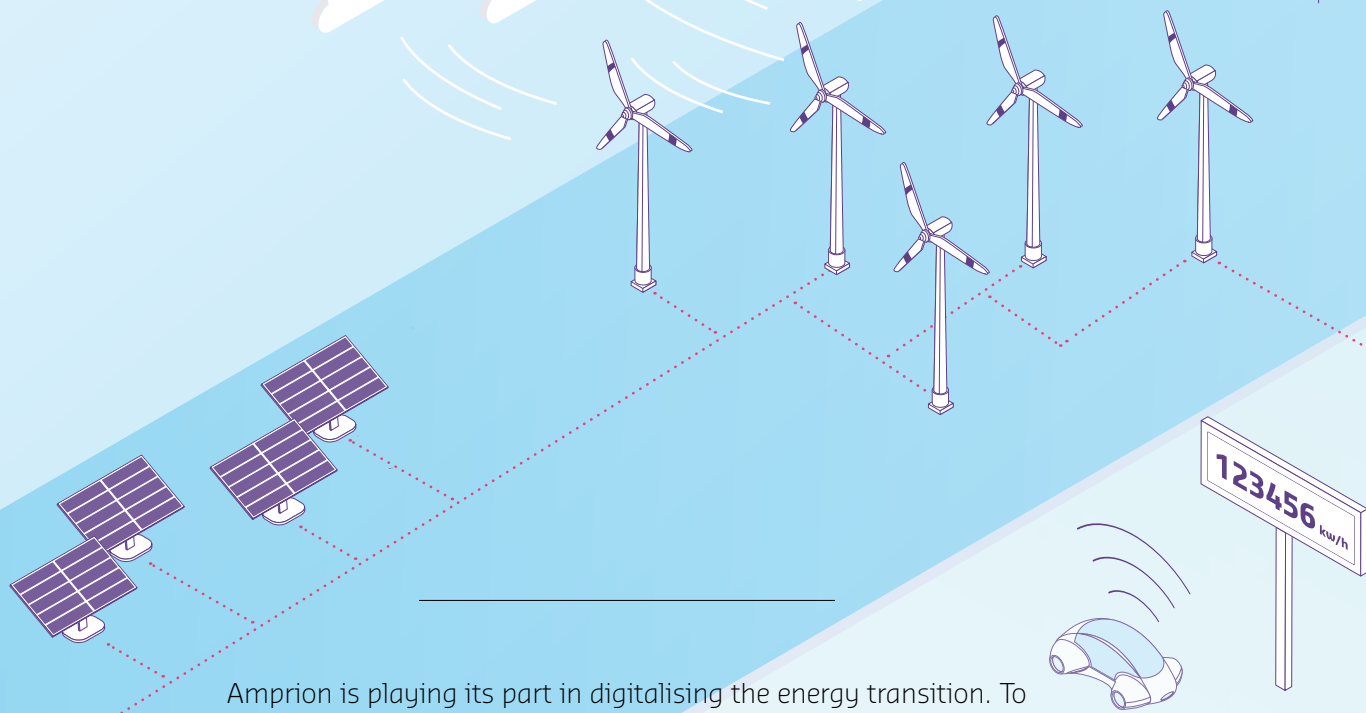
Technology for smart grids with a high proportion of renewables (Designetz)

Modular development plan of the Pan-European Transmission System 2050 (e-Highway2050)



DIGITALISATION IS CHANGING THE GRID





Amprion is playing its part in digitalising the energy transition. To continue to operate the grid safely and flexibly in the future, the company is processing ever greater volumes of data. The future lies with powerful grid control systems and smart electricity meters.

TEXT · ALEXANDRA BRANDT

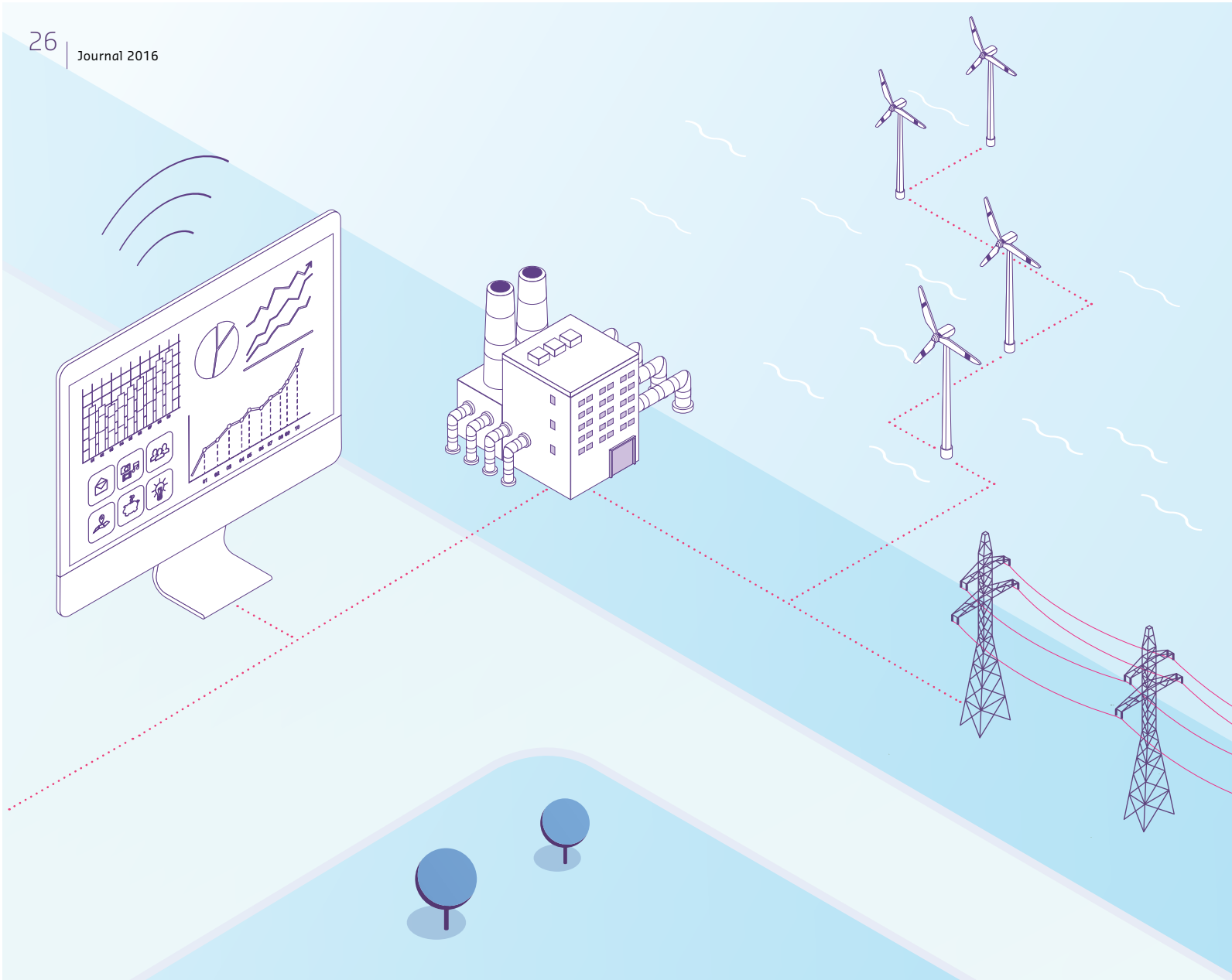
From huge wind farms in the North Sea and Baltic through large numbers of micro-photovoltaic installations on the roofs of houses in southern Germany to electric mobility – our energy system is transforming rapidly. A transformation that presents all players with a whole series of daunting challenges. Among them are Joachim Vanzetta and his colleagues at Amprion’s System Operation and Control Centre. When he looks out of his office window in Brauweiler, just outside Cologne, he so far sees very few electric cars at the parking area. But that will change – and that’s something Vanzetta is absolutely sure about. But when will their owners “fill up” their batteries? “Preferably when electricity is especially cheap,” says the System Operation and Control Manager at Amprion. This will be the case when wind turbines or PV systems are feeding a lot of energy into the power grid. “But there’s one thing in particular that’s required for all of this to work: communication,” the engineer says. “Digital communication between the power utilities, grid operators, power providers and grid users, such as car drivers.” And as far as possible in real time.

Joachim Vanzetta could rattle off a whole host of similar examples: examples from a future energy world that can’t

do without communication and digitalisation because everyone is networked with everyone else – and in which gigantic volumes of data flow. Grid operators such as Amprion have to process all of this data if they want to fulfil their core task: to ensure their grid operates safely and reliably at all times. The stability of the grid depends on Amprion and its counterparts obtaining and processing all such relevant data in order to maintain a constant balance between power generation on the one hand and electricity consumption on the other. At the same time, our engineers have to make sure that none of our transmission lines are overloaded or fail. For this digital data is indispensable. “This is why digitalisation is such an important field of innovation for us, one that is tightly interwoven with our core business,” explains Vanzetta.

THE ENERGY SYSTEM IS BECOMING MORE FRAGMENTED

A few steps away from his office, in Amprion’s System Operation and Control Centre a new grid control system is currently being built. His assignment: to collect and process all data of importance for the safe and reliable operation of



the grid. Even if the future with digitally communicating electric cars has not yet begun, the computers already installed still have to put in a full shift. Among other things, the system has to process data relating to the degree of utilisation and the status of overhead lines, underground cables and substations, weather data, the schedules of power stations and information from Europe's electricity exchanges. The new control system will collate and evaluate all of this information almost instantaneously and inform the control engineers in good time where potential bottlenecks in the grid could arise. "As the expansion of wind turbines and photovoltaic installations advances, our system of power generation is becoming ever more fragmented and management of the electricity flows ever more complex and demanding," Vanzetta stresses. "To enable us to continue to overcome these challenges in future, we are developing new IT concepts. Algorithms from the realm of artificial intelligence are also being employed to make the necessary forecasts even better – for example, to predict the power output of PV installations in Germany."

SMART ELECTRICITY METERS FOR CONSUMERS AND UTILITIES

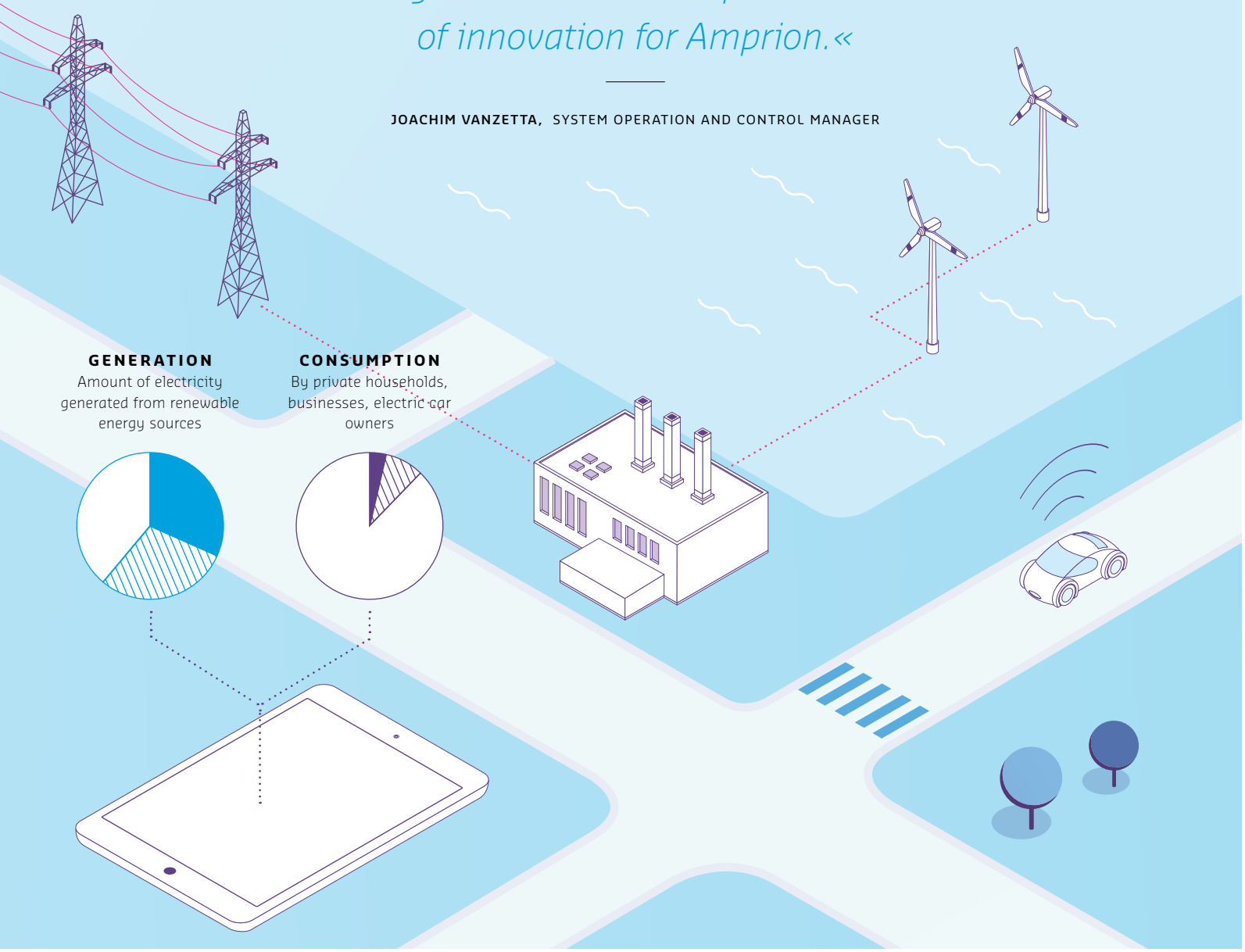
In parallel with construction of the new grid control system, colleagues at Amprion's headquarters in Dortmund are working on ways to manage the new data flows. "In future, it'll all be about measuring and forecasting consumption and infeed levels more accurately than today," says Henner Schmidt, Head of Balancing Group Management at Amprion. The digital smart meter will play a crucial role in this. Whereas conventional meters have supplied merely the total amount of electricity consumed over a long period, smart meters measure consumption at least every 15 minutes. This gives customers a more precise insight into their personal consumption habits. In future, Amprion will also be recording and processing the data from the smart meters installed throughout its entire grid. Around half a million microgeneration plants and some 1.5 million electricity consumers will be kitted out with these new meters. This throws up new questions with respect to legal issues, security and data protection. The law regulating digitalisation in respect of

the energy transition stipulates particular caution when handling the data gathered: the data must be encrypted and sent via specially secured channels. All market operators have until 2020 to install and get this new technology up and running. Amprion will be launching the first phase of this project as early as October 2017. The company will also be using this time to research further into the interaction between data flows and electricity flows. Together with scientists at RWTH Aachen University, company experts working on the “SwarmGrid” project are investigating the potential opportunities in controlling lots of microgeneration units of renewable energy in “swarms” along the lines of “Together we are stronger”. One thing is for sure: the number of fragmented, microwind and photovoltaic installations will continue to

grow. The problem is this: unlike the conventional, large-scale power stations – which are going to be shut down over time – they don’t feed energy into the transmission grid, but rather into the distribution grids of municipal utilities and regional grid operators. In order to still be able to control the flows of electricity in the transmission grids precisely, their operators need to know not only what’s going on across Germany and the whole of Europe at EHV level, but also how the situation in the distribution grids looks like. And the same applies at the other end: the distribution system operators need more information about EHV grids. Yet again, this means data has to be exchanged – and we need powerful computers and some great minds. Another example of Amprion moving a step closer to the energy world of the future.

» Digitalisation is an important field of innovation for Amprion.«

JOACHIM VANZETTA, SYSTEM OPERATION AND CONTROL MANAGER





Responsibility

Amprion bears responsibility for ensuring that the transmission grid is safe, reliable and sustainable. To this end, we are investing more than 500 million euros every year in grid expansion. This opens up opportunities for small and medium-sized enterprises and provides a TAILWIND FOR THE REGION *[page 30]*. We're operating the grid and upgrading it so that nature and the environment are affected as little as possible. That's why we're also PROMOTING FLEDGLING FREQUENT FLYERS *[page 36]*.



Partners on the construction site: Heckmann site foreman Ferdinand Langenkämper (left) and Amprion site manager Olaf Tietz have been working together in Essen-Eiberg since October 2014.



TAILWIND FOR THE REGION

Amprion is investing more than 500 million euros in grid expansion every year. This is boosting the power grid. In addition, these investments are safeguarding jobs and regional value creation.

PHOTOS · MATTHIAS HASLAUER · MARCUS PIETREK TEXT · VOLKER GÖTTSCHE



Planning meeting in the site container: the substation at Essen-Eiberg is being modernised and expanded. Ferdinand Langenkämper and Olaf Tietz discuss the next steps.



Ferdinand Langenkämper trudges through the construction site mud. The loamy soil prevents the rainwater caught between the concrete foundations on which the new switchgear and measuring instruments of the Essen-Eiberg substation are built on. It's been drizzling for hours. Droplets of rain drip from the helmet of the 51-year-old foreman. But he couldn't care less about the wet conditions. "After 35 years on construction sites, I'm used to it," he says. "It's part of the job."

He's been working in Essen-Eiberg since October 2014. Amprion is modernising and expanding the substation, upgrading it and making it ready for its future energy transmission duties. As the site foreman, Ferdinand Langenkämper is responsible for organising the construction works and assigning jobs to skilled construction workers, machine operators and craftsmen. He does so in the typical Westphalian manner – straight-talking, with a dry humour. That's something he has in common with his boss: Werner Schmidt is Managing Director of the construction company Bernhard Heckmann GmbH, headquartered some 80 kilometres away in Hamm. "Our word is

our bond," is the 58-year-old developer's maxim. "We are an archetypal example of a German SME – the 'Mittelstand'," he says proudly. The company employs a workforce of around 430 and has an annual turnover of 85 million euros. "We're the largest construction company in Hamm, and our order situation is currently quite positive," Schmidt emphasises. "Amprion is one of our long-standing customers."

INVOLVING SMES IN CALLS FOR TENDERS

Amprion is investing more than 500 million euros in grid expansion every year – among other things in the construction of stations and transmission lines. One in every four euros flows into civil engineering, with the other 75 per cent being spent mostly on components, such as transformers, structural steel elements, control technology and their installation. The economy profits twofold: the power grid continues to remain stable – and businesses receive orders. Amprion also invites capable, regional companies to bid for contracts. This has a variety of benefits. "It enables us to complete projects on schedule," says Managing Director Dr Hans-Jürgen Brick. "At the same



» We're the largest construction company in Hamm, and our order situation is currently quite positive. Amprion is one of our long-standing customers.«

WERNER SCHMIDT, MANAGING DIRECTOR AT HECKMANN

time, we see that this approach safeguards employment in the region." Another positive aspect in the eyes of the transmission system operator is that SMEs from the region can often respond more flexibly to requirements – an important factor that helps keep the grid expansion process moving along.

"On average, we have around 50 plant engineering and construction sites running in parallel at any one time," summarises Dirk Bannach, Plant Construction Manager at Amprion. The figure for power line construction is slightly higher. For each project, Amprion seeks and commissions construction service providers. One priority of the grid operator in this respect is that these services are put out to tender not just as turnkey projects but in separate contract sections for each trade. "This allows us to realise the projects cost-effectively. We have the requisite technical expertise in-house – people who can define the technological requirements or assure compliance with quality standards."

50

Medium-sized construction companies for whom turnkey projects would be a little too ambitious also submit tenders. "Collaboration with partners from the local region has frequently proven to be highly beneficial for us," says Olaf Tietz, Amprion's site manager at the Essen-Eiberg substation. Such as when unexpected problems have arisen on-site. "Fast response times are crucial to us in such

construction sites are currently running in parallel at Amprion simply in connection with switchgear and substations.

situations. And firms from the region are often particularly good at this." Companies such as Heckmann from Hamm. Heckmann CEO Schmidt estimates that almost ten per cent of his staff are working on an Amprion construction site.

GRID EXPANSION WITH THE SUPPORT OF THE "MITTELSTAND"

Nevertheless, his workers don't perform all construction works required. If a new building is to be roofed, the company hires tradespeople from the local area. "In the case of a project like that in Essen-Eiberg, a good 60 to 80 tradesmen will be involved over the years", Werner Schmidt estimates. In this way, then, Amprion's



» *Amprion is our main customer in the extra-high-voltage segment.* «

SVEN BEHREND, MANAGING DIRECTOR OF SAG GROUP

investments in grid expansion support not only medium-sized developers, but also small, local tradesmen's workshops. What's more, Heckmann purchases the building materials required for Essen-Eiberg from regional suppliers. For instance, prefabricated concrete elements come from the Münsterland region. This, too, helps support the regional economy there.

And it's not only substation upgrade projects where collaboration between construction companies, subcontractors and suppliers has established itself: it's a common modus operandi in power line construction, too. In this particular field, Amprion cooperates with the SAG Group, among others. "Our qualified personnel are up to and up for the demands of grid expansion," says SAG Managing Director, Sven Behrend. The company, headquartered in Langen near Frankfurt/Main, is one of Germany's leading service providers for energy infrastructure. A total of 6,000 employees working at more than 100 locations around the country generate an annual revenue in excess of 1 billion euros. "Amprion is our main customer in the extra-high-voltage segment," says the

90

51-year-old engineer. 800 people are employed in this SAG business unit, some 300 of them in the area covered by the Amprion grid.

INVESTMENT FACILITATES LONG-TERM PLANNING

For companies like SAG and Heckmann, Amprion's investment in grid expansion is more than just an important figure in their order

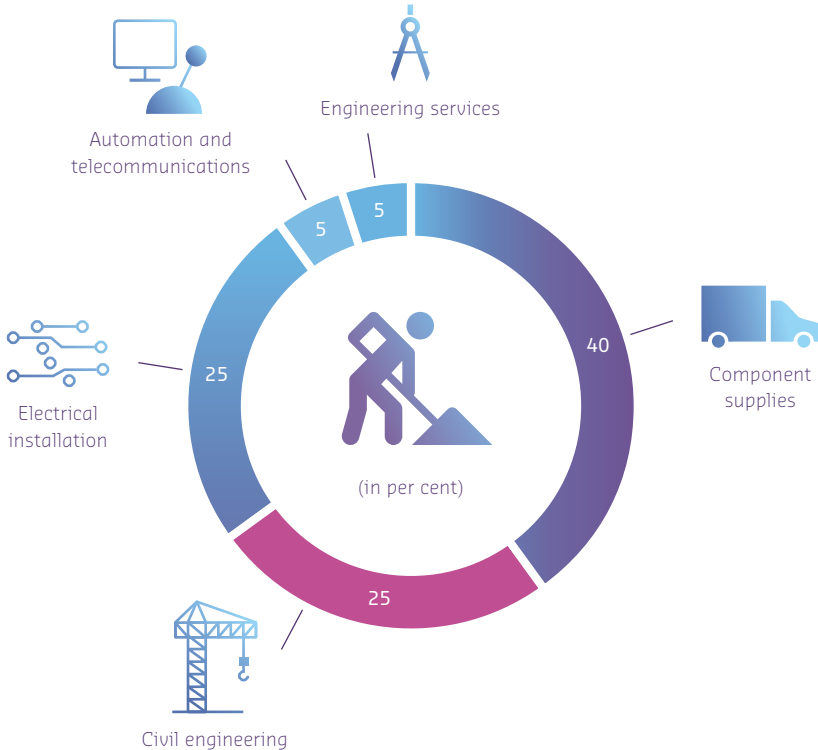
books. Thanks to their long-standing relationships with Amprion, many firms have been able to specialise and build up valuable know-how. The quality and efficiency of their services have improved continuously. "It's enabled us to develop as a company and business," says the SAG manager. "Today, we are a genuine partner to the transmission system operators."

Equally as important to Amprion's service providers is the knowledge that the grid operator will be investing more than 5 billion euros in the expansion of its energy infrastructure over the next ten years. "There aren't that many clients with whom we can plan over such a long period," enthuses Heckmann CEO Werner Schmidt.

is the number of companies Amprion has contracted to perform civil engineering services to run concurrently.

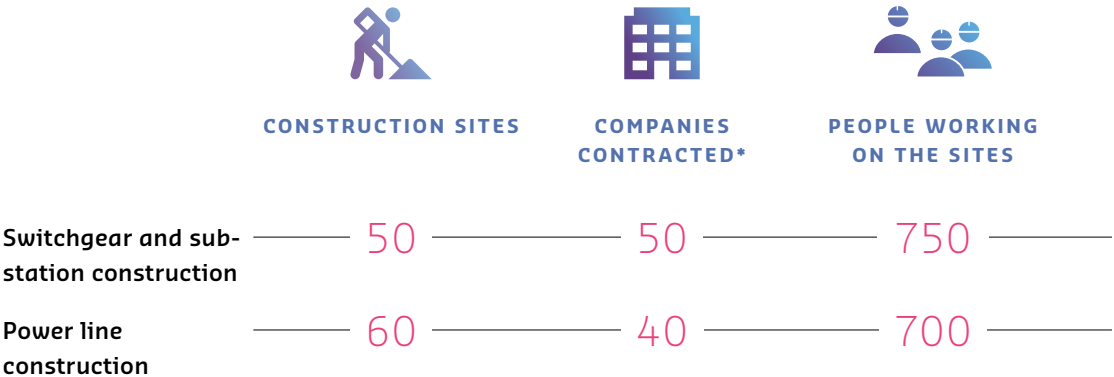
VALUE CREATION IN THE REGION

One-quarter of the sums invested in plant engineering and line construction benefit construction companies.



AMPRION PROTECTS JOBS

The impact of investments



* Excluding subcontractors/tradespeople



Out and about for Amprion in the name of bird protection:
Elmar Pieper observes "air traffic" in the Hellwegbörde.

PROMOTING FLEDGLING FREQUENT FLYERS

Birds of prey such as Eurasian hobbies and peregrine falcons like to nest in abandoned crows' nests perched on power line pylons. Amprion adapts to the situation, protects the old eyries and secures nesting aids at dizzy heights – just one of the many activities of its wide-ranging bird protection programme.

PHOTOS · MARCUS PIETREK · DOMINIK PIETSCH · ALFRED LIMBRUNNER TEXT · ALEXANDRA BRANDT





Up we go! A nesting aid is secured to Amprion pylon 133.

A cold but dry December day at the bird sanctuary Hellwegbörde, near Hamm. This open landscape, characterised by fields and meadows, is home to some rare bird species, such as the corncrake, peewit and Montagu's harrier. Skylarks, hobbies and common buzzards also reside here. Along the edge of the sanctuary, one of Amprion's power lines runs from Dortmund-Kruckel to Hamm-Uentrop. While carrying out preparations for upcoming construction work on pylon 133, workers have noticed an old crow's nest. Today, Claudia Jaehrling, a bird protection expert employed by Amprion, meets up with two colleagues on-site. They remove a dark-brown rattan basket, roughly a metre in diameter, from the boot of the car. "Eurasian hobbies can raise their offspring in this next spring," Jaehrling explains.

Overhead linesmen Sebastian Skoruppa and Tino Herrmann want to install this nesting aid on the pylon's second cross-arm, at a height of 34 metres. That's what people in the trade call the booms or crossbeams of pylons, from which the conductor ropes are hung. "Bird conservation is very

important to Amprion," says Jaehrling. Over the past years, the transmission system operator has put in place a comprehensive bird protection programme for its entire extra-high-voltage grid. Part of this programme is to prepare route sections for the coming breeding season by installing nesting baskets.

PYLONS ARE IDEAL BREEDING SITES

Working at dizzy heights is just part of the linesmen's daily routine. Skoruppa and Herrmann expertly climb the pylon and secure the wicker basket to the cross-arm. Electricity pylons are popular with birds of prey as breeding places: "They offer the animals an excellent view of the landscape," explains landscape architect and qualified ecologist Elmar Pieper, who monitors the bird protection measures as an external expert. The nesting aid on pylon 133 is primarily targeted at hobbies, but peregrines can also breed in it. In the best-case scenario, it'll be used over a period of many years, says Pieper. Many species are faithful to this habitat and like to breed in the same spots year in, year out.



The wicker basket at a dizzy height is an ideal breeding site for birds of prey.





*» Bird conservation is
very important to Amprion.«*

CLAUDIA JAEHRLING, EXPERT
FOR ENVIRONMENTAL PROTECTION AT AMPRION

Nesting aids are mostly installed at spots where birds of prey have at some time already used a nest to breed in. “If the eyries are in the way of construction work lined up along the route, we have to step in. In this case, we transfer the eyrie to a nesting basket, which we then secure at the same height but at a more suitable position on the pylon. We hope that the falcons accept the nest in its new location when they return the next spring,” Claudia Jaehrling explains. If construction work needs to be done on pylons on which protected animals are already breeding, her colleagues usually put off this work to a later date. If that’s not possible, the young affected are entrusted to the care of experienced bird carers. In 2016, while conducting a particular construction measure, Amprion took a number of young hobbies to a bird rescue centre. The animals were successfully reared there and then released to the wild in September.

MARKERS IMPROVE VISIBILITY

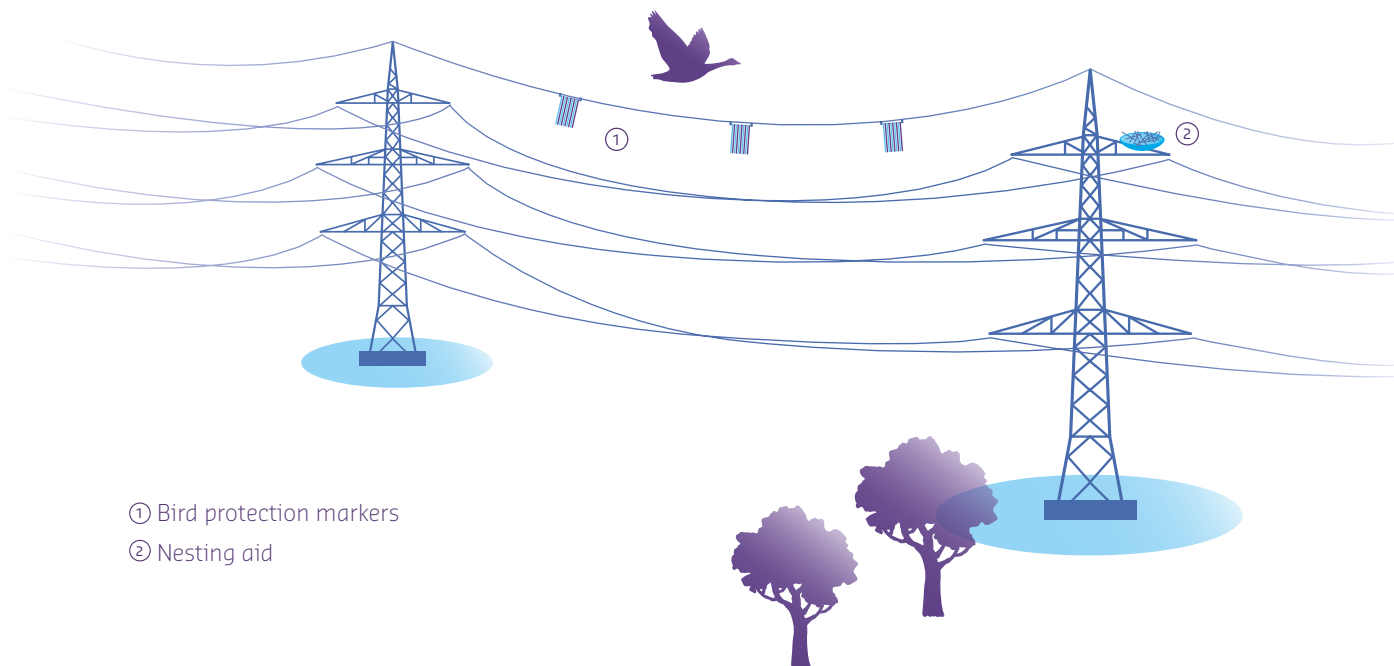
Safeguarding old nests and equipping route sections with nesting aids is just one facet of Amprion’s comprehensive bird protection programme. The grid operator also pays special attention to those species that, unlike the agile hobby, have difficulty identifying and evading horizontal obstructions such as single conductor ropes. “In the case of the thin overhead earth wires that are strung right at the very top of

the pylons, there is a danger of less nimble birds colliding with them,” explains Claudia Jaehrling. In order to better assess how high the risk of this happening is along various sections of its grid, Amprion had a team of ornithologists systematically study its entire network more than 20 years ago and has conducted follow-up studies regularly ever since. “We particularly keep an eagle eye on popular migration routes, as well as lowland and coastal areas and stretches of water,” Jaehrling continues. Along the 410 or so kilometres of power line that experts have identified as especially relevant to bird conservation, Amprion has attached special bird protection markers to the uppermost wires. These small, black-and-white plastic tubes that flap about and rotate in the wind are easily visible to the birds and help them to better pick out the thin overhead earth wires. “Through this measure, we’ve been able to cut the collision risk by up to 90 per cent.” Some sections of Amprion’s lines at the bird sanctuary Hellwegbörde have also been marked in this way.

At the base of pylon 133, Sebastian Skoruppa and Tino Herrmann are gathering up their equipment. The nesting basket carrying the old eyrie sits up high on the second cross-arm at its designated position. Perfect for future residents: they can move in as soon as they return from their winter quarters.

BIRD PROTECTION ON OVERHEAD POWER LINES

Amprion's bird protection programme covers all overhead power lines in the area covered by its grid. In addition to special markers attached to the conductors, selected pylons are fitted with nesting aids.



- ① Bird protection markers
- ② Nesting aid



Using a helicopter to help install bird protection measures: the black-and-white markers help the birds better see the conductors.



Dialogue

Amprion wants to expand its grid in a manner that is as acceptable to local residents as possible. Our goal: to get the stakeholders to say “AGREED!” *[page 44]*. It’s important to us to engage in open discussion with them. QUESTION TIME *[page 48]*: one issue on everyone’s lips is underground cables. Our experts give you answers. They belong to the many members of staff who actively campaign as THE DIALOGUE FACILITATORS *[page 52]* for grid expansion.



Zwiefalten, located in the district of Reutlingen: a fantastic example of successful dialogue with citizens.

AGREED!

Getting public approval for a grid expansion project – is that possible? Yes, if citizens, town and parish councils and grid operators work together in a spirit of mutual trust. A great example of where it led to a positive result for all sides is the municipality of Zwiefalten at the foot of the Swabian Jura mountain range.

PHOTOS · BERTHOLD STEINHILBER TEXT · ALEXANDRA BRANDT

Ulrich Mußmann and Jörg Weber are travelling light. It's mid-November 2016 and the two Amprion employees take the early train from Dortmund to Tübingen in the south-west of the country. Their destination is the regional administrative authority, where they want to submit an application for planning approval for a new construction to replace the old Amprion power line between Reutlingen and Herberingen. The necessary documentation has already been sent by parcel service – 13 folders would have been a bit too much for the overhead luggage compartment.

Mußmann has been working for four years to get to this stage: together with his team, he's drafted plans, performed calculations and obtained expert opinions; he and project spokesman Jörg Weber have provided the local citizens with all the details of the expansion work planned for the almost 61-kilometre-long power line. All in all, the team has held more than 60 dialogue events, and listened, explained and discussed the potential variants proposed for the route. Amprion wants to upgrade the route across the Swabian Jura in order to prepare for the energy transition. Instead of a 380-kilovolt and a 220-kilovolt line, the route is in future to carry two 380-kilovolt lines capable of transmitting much more electricity. This will enable it to transport more wind power from the North to the centres of consumption in Germany's south-west. The volume of the investment: 85 million euros.

On their arrival at the regional administrative authority, Department President Dr Tobias Schneider greets the two men from

Amprion. It is his authority that will be examining the documents submitted and will decide on whether to give the go-ahead for the planning approval procedure. During the course of this procedure, citizens, authorities and associations will be able to review the plans and voice their feelings and reservations, as well as make suggestions. Schneider is full of praise for the preparatory work carried out by Amprion: "You have done a great deal on the public relations side over the past two years. Your team has done some good work."

PLANNING LINES WITH CITIZENS

Project spokesman Weber is delighted to receive such recognition: "We view the dialogue with citizens, associations and local politicians as part of our core business." Mußmann adds, "We want to plan the lines with the citizens, not against them."

The two have seen how well this works in the municipality of Zwiefalten in the district of Reutlingen, a good 50 miles south of Stuttgart, that they want to visit again. They hire a car and set off. Weber and Mußmann have an appointment with the local mayor, Matthias Henne. The two Amprion representatives had first presented the company's plans for the new 380-kilovolt overhead power line to Henne in September 2014: a stretch of just under seven kilometres that is to run through the neighbourhoods of Sonderbuch and Attenhöfen. Back then, at citizens' consultation meetings and in Amprion's infomobile, it quickly became clear that the locals wanted the new line to be built further away from their homes. At a consultation meeting held in the former primary school in Sonderbuch –



Field visit: Jörg Weber and Ulrich Mußmann from Amprion talking with Mayor Matthias Henne (top photo, centre) and Dr Tobias Schneider, Department President at the regional administrative authority in Tübingen (photo bottom left, centre).



*» Amprion's staff were
always very informative.«*

GERHARD REICHELT, CHAIRMAN OF
THE CITIZENS' ACTION GROUP IN RIEDLINGEN

which the current Minister President of the state of Baden-Württemberg, Winfried Kretschmann, once attended – the local residents plotted their own route proposal in Amprion's plans that would circumvent the residential areas. In addition to the basic technical feasibility, the only real condition on Amprion's part for accepting this relocation was that the owners of the land along this new route would have to agree to it.

Great credit in this case goes to Mayor Henne for his mediation work: in the end, it was down to his powers of persuasion that everyone showed willing to compromise and facilitate relocation of the overhead extra-high-voltage power line. He backed the plans, "because they allowed us to achieve something positive for the community. If we succeed in communicating our own responsibility for future generations, too, people who are affected are more likely to be ready to waive their own personal interests in favour of the common good." The result of the extraordinary meeting of the landowners held in the village hall: 100 per cent approval for relocation.

BYPASS FOR RIEDLINGEN

But it's not everywhere that the local residents all pull in the same direction. A half-hour drive away from Zwiefalten lies the town of Riedlingen. This is where the two Amprion men meet up with Gerhard Reichelt, the former manager of the local savings bank and

chairman of the citizens' action group in Riedlingen. He has lived for many years right next to the existing power line – it straddles the garden behind his house. "The residents of the housing estate would like a bypass," says Reichelt. However, unlike in Zwiefalten, the owners of the land potentially affected are not willing to agree. They're afraid of their properties falling in value.

Amprion has submitted an application in Riedlingen for this bypass. "The majority of citizens are for it, and overall it also makes more sense for operational reasons. Expert reports show that the old pylons are simply not suitable for the transmission loads required today," Mußmann explains. All we can do now is wait and see how the regional administrative authority assesses possible objections during the course of the planning approval procedure.

Despite initial conflicting interests, the citizens' action group did not see Amprion as an adversary. As Reichelt describes, "Amprion's staff were always willing to talk to us and were always very informative. They willingly and quickly made all documents and plans available to us." Mußmann and Weber set off on their journey back to Dortmund. They leave the region with a good feeling. "We've done our job and submitted plans that have been very well thought through," says Mußmann, satisfied. "Now it's time for the regional authority to do its job."

QUESTION TIME

Amprion is facing up to the challenge of building new underground cable links as cost-effectively and in as “soil-friendly” a way as possible. Experts from our specialist departments explain what it’s all about.

ILLUSTRATIONS · IRENE SACKMANN



1

WHAT IS THE LEGAL FRAMEWORK GOVERNING UNDERGROUND CABLING?

In December 2015, Germany's legislators reshaped the legal framework for installing underground cables. A clear distinction is now made between direct current and alternating current power lines. From now on, priority is to be given to using underground cable to construct new, major direct current links, which are so essential to securing the nation's power supply. In Amprion's case, this affects the ALEGrO and A North projects. Our Ultrahigh DC power line is an exception to this rule, because for most of the route we can use the existing pylons, which means there's practically no need to build new – neither above nor underground. The AC overhead power line will remain unchanged. However, under certain conditions, subsections of 11 pilot projects are to be laid underground. Amprion is involved in four of these projects: we have already completed one cable section, near Raesfeld in North Rhine-Westphalia, and another is currently under construction. Amprion is presently examining the technical and legal requirements with respect to partial cabling for three more pilot projects.

DR LARS RÖSSING IS RESPONSIBLE FOR LEGAL ISSUES IN RELATION TO LINE CONSTRUCTION.



2

WHY CAN'T ALL NEW AC POWER LINES BE UNDERGROUND?

The crucial factor determining the use of underground cable for AC links are the laws of physics. And these mean that cables behave differently underground compared with conductive ropes in the air. One key aspect is the right level of reactive power: too low a reactive power level results in impermissibly low voltages, while too high a level leads to excessive voltage levels. Compared with overhead power lines, underground cables generate so much reactive power that elaborate correction measures are required. In turn, these measures lead to complicated reciprocal effects. As a result, the maximum length of underground AC cables is limited. We devote a huge amount of our time to such issues, conducting studies and recording the data and knowledge we gain from our pilot projects with 380-kilovolt AC power lines. That's how we find out how overhead power lines and underground cables can best be combined in the transmission grid. For one thing is absolutely crucial to us: there must be no negative effects on the high levels of availability and reliability of our grid.

MARTIN LÖSING IS IN CHARGE OF GRID AND SYSTEMS ANALYSIS IN ASSET MANAGEMENT.



3

WHAT EXPERIENCES HAVE YOU ALREADY GAINED WHILE CABLING AC LINKS?

With its pilot project in Raesfeld/Münsterland, Amprion has done some pioneering work in the densely interconnected grid. Our colleagues have laid a stretch covering a good three kilometres; trial service has been underway since mid-2016 and running very smoothly indeed. We're already integrating the know-how gained into the plans and construction of our cable sections in Borken and Legden. Like Raesfeld, these sections are part of the Diele-Lower Rhine power line, EnLAG Project No. 5. In particular, it's routes that combine sections of overhead power line and underground cable that are posing new technical challenges, because both technologies have their own peculiar and very different electro-technical characteristics. But there's one thing that can't be denied: AC cable links are only suitable for short stretches and are much more expensive than an overhead power line.

DR JAN BRÜGGMANN IS AMPRION'S MAN FOR CABLE TECHNOLOGY AND CONSTRUCTION.



4

HOW WELL IS AMPRION PROGRESSING WITH UNDERGROUND DC LINKS?

Amprion is responsible for two DC links for which underground cabling has been prioritised since 2015. ALEGrO is a cross-border line that is to connect Oberzier in Germany and Lixhe in Belgium from 2020. We have completed the technical planning work and the official approval process has commenced in April 2017. Our second DC project is A North. It is being planned primarily as an underground cable connection and is to be used to transmit wind power from northern Lower Saxony to North Rhine-Westphalia. The experience and know-how we have gained while planning ALEGrO are now being incorporated into the A North project. This also applies to our public relations work: we are informing everyone along the route from a very early stage and will take on board any proposals and information offered regarding potential cable routes even before we trigger the approval process. By doing so, we aim to get A North built as quickly as possible.

PROJECT MANAGER INGO SANDER IS RESPONSIBLE FOR THE ALEGrO UNDERGROUND DC LINE PROJECT.



5

WHAT'S THE DIFFERENCE BETWEEN THE UNDERGROUND CABLES ON LAND AND SUBMARINE CABLES?

The biggest difference between land and submarine cables is the length of the individual cable sections and the number and manufacturing process of the junction sleeves.

Submarine cables are preassembled with junction sleeves in the factory and are loaded on to special cable-laying ships immediately following their manufacture. These ships can lay cables that are many nautical miles long. Consequently, very few connection sleeves are required. By contrast, around 40 times as many sleeves are required per phase for a comparable distance on land. Trucks transport the cables on reels from the factory to the construction site. A heavy-duty truck can carry one reel with a maximum of 1.3 kilometres of cable wrapped around it. On the construction site, the individual cable sections are laid, the connecting sleeves fitted and the sections connected up to form a cable system. This makes laying cables on land much more time-consuming – and also increases the number of potential sources of trouble.

TOBIAS WINKEL PLANS NEW EHV CABLE SYSTEMS FOR AMPRION.



6

WHAT IMPACT DO UNDERGROUND CABLES HAVE ON THE ENVIRONMENT?

Whenever we lay underground cables in open trenches, we make sure that we go easy on the ground, the soil and its hydrology. Independent experts conduct comprehensive environmental surveys for each of our underground cable projects. We have gained valuable information in this respect while working on the Raesfeld project. From the very beginning of our pilot projects with underground cables, we have cooperated closely with the local farmers and followed up the effects of our construction work on the ground. Even before we started laying, experts investigated whether the heat generated in the cables can have a negative impact on harvest yields. These studies have revealed no evidence of this. After the cables have been laid, no buildings, deep-rooting trees or shrubs are allowed to stand on a defined protective strip above and to either side of the underground cable trench. There are no restrictions on animals grazing and fields being tilled.

CHRISTIAN TRIMPE CONCERNS HIMSELF WITH ENVIRONMENTAL PROTECTION ALONG AMPRION'S OVERHEAD AND UNDERGROUND CABLE ROUTES.



»A lot of questions arise when dealing with new power line construction projects. As a communicator, I have to provide people with answers. If we can communicate to our stakeholders why the decision to change course and bring about the energy transition means we have to expand and upgrade our grid, we've done our job well.«

Jonas Knoop is a project spokesman in the Corporate Communications department and joined Amprion at the beginning of 2016.



THE DIALOGUE FACILITATORS

They are the “face” of Amprion in contact with local residents, authorities, clients, service providers and potential talents in the labour market. They go out there and get involved, so that the energy transition will be a success.

PHOTOS · MATTHIAS HASLAUER



» Our relationship with our grid clients gives rise to many fascinating questions. Providing them regularly with information on technical and regulatory issues and with good advice is very important to me. After all, stable customer relationships are always founded on trust.«

Sigrid Hanebutt is a consultant in the field of grid customer management and has been with the company since March 1999.

»As a project coordinator, I get to hear and read a great many pieces of information that I share with our external grid partners. My job also covers coordinating scheduled construction measures with authorities, municipal bodies and citizens. Clearly defined responsibilities and interfaces are the basis for mutual success.«

Markus Mochalski is a consultant for the management of grid projects and has been with Amprion since 1995.





» Identifying talented people and persuading them to join Amprion is one of the best parts of my job. It means I come into contact with different personalities almost every day. But working closely with the various specialist departments in the company is also crucial to successful recruiting.«

Dr Meike Wenzel is a personnel officer and joined Amprion back in March 2011.

» Whenever we build new or make modifications to existing substations, we work hand in hand with some highly capable business partners. This guarantees high-quality standards and helps us meet the ambitious project deadlines.«

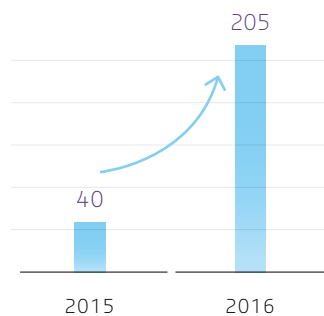
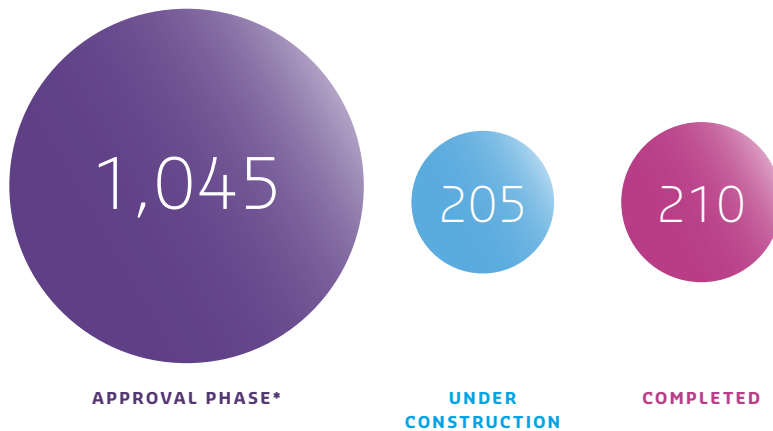
Berthold Pilz is Head of the Plant Engineering Projects department and a employee since 1992.



STATUS QUO 2016

GRID EXPANSION AT AMPRION

(km)



+ 165 KM

that entered the construction phase in 2016. Grid expansion has taken a great step forwards.

As the energy transition progresses, Amprion will continue to upgrade and expand its grid over the coming decade as required. 2016 saw us take a great step forward. We have advanced many of our projects from the preparatory phase to the official approval process. Furthermore, last year we received approval notices for more than 200 kilometres of power line, the majority of which are now already under construction. These include important projects such as the line from the Lower Rhine to the municipality of Doetinchem in the Netherlands and the section of underground cable between Borken and Nordvelen. So far, we have completed 210 kilometres of our grid expansion brief. A good two-thirds of the stretches of power line we have been mandated to build are now in the approval phase, under construction or have already been completed. We will get all remaining sections of line in our remit off the ground during the next few years.

* Source: Evaluation of "EnLAG- und BBPIG-Monitoring" dated 31 December 2016

IMPRINT

ONLINE

Further information can be found at www.amprion.net



PUBLISHER

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CONCEPTION AND DESIGN

3st kommunikation GmbH, Mainz

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(unless otherwise cited in the article)

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Matthias Haslauer [pages 42–43]
Rüdiger Nehmzow [page 21]
Daniel Schumann [pages 28–29]
Getty Images [pages 10–11]

PRINTED BY

Woeste, Essen



NOTE

This is a translation of the German version. In cases of uncertainty or conflict, the German version shall prevail.



Amprion GmbH
Rheinlanddamm 24
44139 Dortmund
Germany

June 2017

2016 was a successful year for Amprion. We have moved forward with the expansion of our transmission grid and our DC projects have also made good progress. More than 200 kilometres of power line are under construction and the same number have also been completed. These projects represent the new start into the energy world of the future – as do our innovation projects. In this way, we are working to fulfil our statutory duty to reliably transmit electricity to the 29 million people who live and work in the region covered by our grid – today and in the future.

KEY TO ICONS USED



Reference to glossary



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Imprint



DR HANS-JÜRGEN BRICK

Chief Commercial Officer and Chief Financial Officer

DR KLAUS KLEINEKORTE

Chief Technical Officer

Dear readers,

Amprion GmbH enjoyed a very successful FY 2016. We have transmitted electricity for the 29 million people who live and work in the area covered by our grid exceedingly reliably and safely. We have also moved a good step forward with the expansion of our transmission grid. On this basis, we have returned positive business results. Our company achieved sales revenues worth 12,650 million euros – some 7 per cent higher than the previous year. A large part of this increase, 10,498 million euros, can be attributed to the handling of the EEG (Renewable Energy Sources Act) balancing mechanism, which had no effect on net income. The 2,152 million euros of revenues from the power grid side of the business likewise exceeded the level in the preceding year. By contrast, the net profit of the company fell to 158 million euros, as had been expected. The main reasons for this were the planned increase in personnel required for our grid expansion projects and the higher costs for system services.

How important it is to keep grid expansion moving at a good pace became very clear in 2016. The share of gross electricity output accounted for by renewable energy sources rose to 30 per cent nationwide – this means the degree of utilisation of our grid has also increased. In December 2016, the situation was particularly tense owing to the supply situation in Belgium and the temporary taking out of service of five nuclear power stations in France. This made Amprion all the more determined to push on with its grid expansion efforts in 2016 and make tangible progress. During last year, the company invested 567 million euros in grid expansion projects – about 20 per cent more than in 2015. Between now and 2026, we plan to invest a total of 5.6 billion euros – 663 million of this sum in 2017 alone.

In order to be able to expand our grid in line with requirements and to operate it reliably and efficiently, we are continuing our efforts to develop the company to be as sustainable as possible. This includes increasing manpower: in 2016, our workforce grew by 92 and now numbers around 1,250. We have also further optimised our planning processes and parallelised processing of our grid expansion projects. These measures also played a part in our obtaining approval notices for 228 kilometres of line in 2016. All in all, we have worked on expansion projects that together cover an overall length of 1,350 kilometres and that have either already been submitted for approval or we are preparing to



submit. On top of this, we have 150 projects in progress in our substations, of which we succeeded in completing 35 in 2016.

Furthermore, our DC projects are also moving along nicely. 2016 saw us successfully launch our public relations activities for the A North project and commence dialogue with the interest groups active in the area between the region around Osterath and Emden. Further milestones in the approval process have also been reached with regard to the Ultranet project. And the same applies to ALEGrO. Together with our Belgian partner ELIA, we have also awarded the contract for the cable system and the converters required for the first interconnector between the two countries.

Dear readers, our DC projects are not only the principal arteries of our future grid; they also highlight the significance of innovations for the new start into the energy world of the future. We ourselves have a multitude of questions in this regard that still need answering: How can we make our grid more capable and flexible? How will the electricity market function in future? How can the costs associated with the energy transition be apportioned fairly?

When it comes to challenges such as these, we want to contribute to finding appropriate solutions and demonstrate our economic responsibility. Consequently, as part of our Strategy 2020, we have taken it upon ourselves to strengthen our innovation capacity in all departments. Last year, we reached a number of important milestones in this area, too: starting with successful trials with our AC cable pilot project in Raesfeld, through the testing of new solid panel pylons, to projects in which we are investigating how we can operate our grid safely and reliably despite the increasing share of renewables. You can find out more in our latest corporate journal.

Our concerted work on these issues is the foundation of our success. Our highly knowledgeable employees are totally committed to the cause and are very willing to dream up and go down new paths. It is precisely for this level of dedication that we would like to thank all of them most sincerely! By pulling together, we will make this new start into an energy world – that is set to transform yet more – a success. And on this basis, we will carry over our commercial success of last year into 2017.



DR HANS-JÜRGEN BRICK
Chief Commercial Officer and
Chief Financial Officer



DR KLAUS KLEINEKORTE
Chief Technical Officer



For more information about Amprion's executive management, go to:
📄 <http://www.amprion.net/en/executive-management>

Report of the Supervisory Board

Ladies and gentlemen,

Amprion GmbH posted yet another successful year of business in 2016. The expansion of the grid has made visible progress. As of the end of the year, 210 kilometres of transmission lines were under construction and 205 kilometres had been completed. The intensive dialogue that Amprion has continued to conduct with all of its stakeholders contributed to this positive situation. Besides grid expansion, we focused above all on questions related to the progress in the integration of renewable energies while simultaneously securing the high security level of the system and to the ways in which the related costs can be distributed so that they are economically sustainable. These topics also impacted the many diverse innovation projects being conducted by Amprion as it contributes to the development of the energy system of the future.

The Supervisory Board was deeply involved in the company's development in financial year 2016. The Board fulfilled the obligations assigned to it by law and shareholders' agreement, devoting especially close attention to its monitoring and advisory duties with respect to the Executive Management. The members received reports from the Managing Directors, both in writing and orally, regarding the course of business transactions, fundamental issues of business policy and the position and development of the company; they discussed in depth significant business incidents with the Management Board and made any decisions that were required. In addition, the chairperson of the Supervisory Board consulted with the Managing Directors outside of the Supervisory Board meetings when important specific events took place and discussed questions of corporate strategy and business policies in preparation for the Board meetings. Furthermore, the Audit Committee fulfilled the tasks assigned to it by the shareholders' agreement, in particular the comprehensive preparation of the adoption of the annual financial statements by the Supervisory Board.

Four Supervisory Board meetings were held during the reporting period. The focus of its consultations was on the detailed reporting from the Managing Directors regarding the company's position, including development of revenues and profits and the company's strategic goals. In addition, the Supervisory Board discussed intensively and adopted the submitted budget for 2017. Furthermore, the long-term investment planning up to 2026 was discussed comprehensively and approved by the Supervisory Board. Moreover, the Supervisory Board considered the regulatory environment in which the Company operates as well as the changes in statutory regulations that have occurred or that are imminent.



The auditor selected by shareholders' resolution of 11 May 2016 and engaged by the company's Supervisory Board for the annual audit, BDO AG Wirtschaftsprüfungsgesellschaft Düsseldorf, audited the annual financial statements and the management report of Amprion GmbH for financial year 2016, including the bookkeeping, and certified the statements with an unqualified auditor's opinion.

The auditor's report, the annual financial statements and the management report were submitted to the Supervisory Board members in good time prior to the Supervisory Board meeting on 11 April 2017 and were comprehensively reviewed during the meeting. The auditor participated in the Supervisory Board's deliberations and reported on the major results of his audit. In addition, he was available to provide any supplementary information. The Supervisory Board agreed with the results of the audit. It also reviewed for its part the annual financial statements and management report prepared by Executive Management. According to the final results of its audit, there were no objections. The Supervisory Board approved the management report and the annual financial statements for financial year 2016; the financial statements have therefore been adopted.

Financial year 2016 saw the following changes in the membership of the Supervisory Board:

Mr Christian Fuhrmann, Supervisory Board member, withdrew from the Board upon the expiration of his term of office per 11 May 2016. Pursuant to the shareholders' resolution of 11 May 2016, Mr Manfred Rupps, Department Head of Capital Investments Real Estate and Alternative Investments of the SV SparkassenVersicherung Holding AG, was elected to the Supervisory Board of Amprion GmbH.

The Supervisory Board wishes to express its thanks and appreciation of the good work done in financial year 2016 to the management and to all employees of Amprion GmbH.

Dortmund, 11 April 2017

PROF. HEINZ-WERNER UFER
Chairman of the Supervisory Board

the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 13.5 million, and the number of people aged 75 and over has increased from 4.5 million to 6.5 million (Office for National Statistics 2002).

There is a growing awareness of the need to address the needs of older people, and the need to ensure that the health care system is able to meet the needs of older people. The Department of Health (2000) has set out a strategy for the health care system, which includes a commitment to improve the health care of older people. The strategy is based on the following principles:

- To ensure that older people have access to the same quality of health care as younger people.
- To ensure that older people are able to live independently for as long as possible.
- To ensure that older people are able to participate in decisions about their health care.
- To ensure that older people are able to live in their own homes for as long as possible.

The strategy is based on the following principles: to ensure that older people have access to the same quality of health care as younger people; to ensure that older people are able to live independently for as long as possible; to ensure that older people are able to participate in decisions about their health care; and to ensure that older people are able to live in their own homes for as long as possible.

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MANAGEMENT REPORT

OF AMPRION GMBH
FOR THE 2016 FINANCIAL YEAR

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Fundamentals of the company

Business activity of the company

Amprion GmbH, based in Dortmund, is one of four transmission system operators (TSOs) in Germany and has about 1,250 employees. In a balancing zone that stretches from Lower Saxony to the Alps, Amprion operates its network at voltage levels of 220 and 380 kV and expands it in accordance with market requirements. Measuring about 11,000 kilometres in length and with 163 substations and **transformer stations**, it is the longest extra-high-voltage network in Germany. It links the power stations with the main centres of consumption and is a vital component of the transmission network in Germany and Europe. Amprion provides its extra-high-voltage network to industrial customers, redistributors, energy traders and generators via currently 1,061 feed-in and tapping points at standard prices in line with the market.

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In addition, Amprion steers and monitors the secure transport of electricity within the extra-high-voltage network in its balancing zone. For this purpose, the system management in Brauweiler/Pulheim ensures that electricity consumption and generation are kept in balance at all times. The system output required (primary control, secondary control and tertiary control) and the necessary electricity for the compensation of grid losses are sourced using transparent tender procedures in line with regulations. The company also coordinates the exchange programmes and the subsequent volume balancing, both for the entire transmission network in Germany and for the northern section of the integrated European grid.

Thanks to its central location within Europe, Amprion's network is a vital hub for the European electricity trade between north and south and between east and west. Amprion provides transmission network capacities to the interconnecting feeder lines to France, the Netherlands and Switzerland by means of market-based auctions.

Amprion's shareholders are M 31 Beteiligungsgesellschaft mbH & Co. Energie KG, a company whose owners largely comprise German institutional financial investors from the insurance industry and pension funds, with 74.9% of the shares, and RWE AG with the remaining 25.1% of the shares.

Financial report

Political and energy regulatory environment

Electricity Market Act

A comprehensive revision in energy market legislation occurred on 29 July 2016 when the Omnibus Act for the Future Development of the Electricity Market went into effect. The Electricity Market Act specified the energy-only market as the future market model. The model includes various reserves to secure the electricity market.

The network reserve serves to manage network bottlenecks and voltage stability and to assure restoration of the power supply if necessary. The framework conditions for this are set forth in the Network Reserve Regulation (Netzreserveverordnung – NetzResV). The EU Commission has approved the new regulations with respect to subsidy law until June 2020.

The capacity reserve is used to compensate for supply and demand imbalances on electricity markets in the German grid control cooperation. The aim is to assure the security of power supply and the system balance by having power stations available for emergency purposes that do not participate in the market and are expected to step in when both technical and market-based measures have been exhausted. The current draft of the Capacity Reserve Regulation provides that storage units or interruptible loads that perform reserve services may also participate in the tender. The first tender for capacity reserves is scheduled for autumn 2018. The EU Commission has not yet approved the regulations for capacity reserves with respect to subsidy law.

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Another reserve is the so-called “security stand-by” for certain brown coal power plants in accordance with Section 13g EnWG (German Energy Industry Act). As specified by law, brown coal power stations have been gradually taken off the market and temporarily shut down since 1 October 2016 in order to achieve the national climate protection target by 2020. Each of them will be maintained for a period of four years as a last, limited backup to secure power supply before being finally decommissioned at the end of this stand-by period. Brown coal power stations with a total capacity of about 1.5 GW are affected in Amprion’s balancing zone. The EU Commission has approved the regulations for security stand by with respect to subsidy law.

The reserve costs can be passed on via network charges by means of a target cost approach without time delays as permanently non-controllable costs. The costs from the capacity reserves and the decommissioning of the brown coal power stations are to be compensated horizontally among the German TSOs.

Pursuant to Section 13k EnWG, the TSOs may install and operate network stability stations with an installed output totalling up to 2 GW for economic and technical reasons. The TSOs determined the demand for the period from 2021 to 2025 by 31 January 2017, and the calculation will be confirmed by the **Federal Network Agency** (FNA; BNetzA) by 31 March 2017. The network stability stations will be used exclusively outside of the electricity market for the purpose of assuring the security and reliability of the transmission network, and their utilisation is expected primarily during the transition period between the completed phase-out of nuclear power in 2021 and the conclusion of the network expansion in 2026. The EU Commission has not yet approved the regulations for network stability stations with respect to subsidy law.

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One major point for the TSOs is the concretisation of the compensation claim accruing to power station operators for redispatching measures. Pursuant to Section 13a (2) EnWG, the actual generation expenditures, the proportionate value depreciation of the stations, lost revenue opportunities and costs to assure operational readiness must be compensated. The compensation regulations are retroactively applicable from 1 January 2013. Nevertheless, the concrete amount of the costs is still unsettled because the legal regulation allows room for interpretation. Negotiations concerning reasonable compensation within the framework of an industry-wide solution are now going on at the level of the German Association of Energy and Water Industries (BDEW) between the power station operators, the FNA and the TSOs.

Moreover, the Electricity Market Act has created a retroactive legal basis per 1 January 2012 regarding the allocation for energy-intensive customers pursuant to Section 19 (2) StromNEV (Electricity Network Fee Regulation Ordinance) that had become necessary pursuant to a decision by the Federal Court of Justice of 12 April 2016. The Court determined in this decision that the EnWG did not provide a legal basis for the allocation. The revised regulation eliminates the legal uncertainty regarding the permissibility of the collection of the allocation in the past.

Act on the Digitalisation of the Energy Transition

The Act on the Digitalisation of the Energy Transition entered into effect on 2 September 2016. It regulates the commercial and technical dimensions of a rollout of intelligent metering systems and the regulation of the operation and outfitting of metering points. The act establishes a new star-shaped communication concept that considers data security and data protection in conjunction with the devolution of tasks from the redistributors to the TSOs. The intended direct balancing of the energy quantities recorded with the aid of intelligent metering systems by the TSOs accelerates billing processes and supports system security.

Renewable Energy Sources Act (EEG 2017)

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The amendment of the EEG 2017 was announced in the Federal Gazette on 18 October 2016 and entered into effect on 1 January 2017. The key new feature is the implementation of a tender procedure for competitive determination of the amount of the compensation claim. The act provides that in future the subsidisation for stations with output greater than 750 kW using the energy sources “onshore wind” and “photovoltaics” and with output greater than 150 kW for biomass facilities will be determined by a tender procedure. The terms and conditions for tender procedures for the energy source “offshore wind” are set forth in the Offshore Wind Energy Act (WindSeeG). These regulations do not have any direct impact on Amprion. It is expected that the build-up in renewable energy stations will be more predictable because of the legally required tender procedure.

Amendment Act to the Combined Heat and Power Act (KWKG) and EEG 2017

The German Bundestag passed the Act Amending the Terms and Conditions of Electricity Generation from Combined Heat and Power and of Self-Sufficiency on 15 December 2016. The act realises many changes in the EEG 2017 and KWKG 2016 that are to a large extent a consequence of demands from the EU Commission related to subsidy law. They concern the EEG allocation for own supply and the introduction of a tender procedure obligation in the KWKG. The regulations for privileged status for the combined heat and power allocation were adapted, whereby the system was reconciled in accordance with the special compensation regulation pursuant to the EEG.

Incentive Regulation Ordinance (ARegV)

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The revision of the ARegV entered into force on 17 September 2016. The proven instrument of investment activity pursuant to Section 23 ARegV for TSOs was retained. However, the ordinance was adapted with regard to the calculation of the reimbursement share for investment measures; in future, they will no longer be standardised, but will be determined project-specifically. The new regulation applies solely to investment measures for which application is submitted after 17 September 2016.

Another change concerns the regulatory account. In future, the transmission system operator will be responsible for management while the regulatory authority will approve the balance calculated annually starting from 2017. This will be taken into account in the revenue cap on an annuity basis over the three calendar years following the year of the calculation. A transition regulation has been established for the balance of the calendar years 2013 to 2016 that are still open. It will be distributed on an annuity basis until the end of the third regulatory period (2023).

Business performance

Grid business

The revenue cap is determined within the framework of the incentive-based regulation and in accordance with the provisions of the EnWG, ARegV and StromNEV. The FNA fixed on 3 July 2014 the revenue cap for the second regulatory period from 2014 to 2018 on the basis of the costs of the year 2011. Pursuant to Section 4 (3) ARegV in conjunction with Section 34 (1) ARegV, Amprion can adjust the revenue cap, and consequently the network charges, on 1 January of each and every calendar year in the event of change in the non-controllable costs. The FNA must be notified of these adjustments. Since the start of the incentive-based regulation, Amprion has recorded increases or decreases in revenue in the regulatory account in accordance with Section 5 ARegV.

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Amprion adjusted its network charges depending on the duration of use and voltage level per 1 January 2016. Particularly in the range of usage hours between 5,000 and 8,760 hours that is relevant to the majority of customers, network charges at the highest voltage level were increased between 9.2% and 12.7%. The increases are a consequence of the following circumstances:

- Rise in the costs for the connection of offshore wind farms passed on by the coastal TSOs
- Higher costs for approved investment activities for the further network expansion pursuant to the energy transition
- Increased costs for reserve power stations

Amprion's customers are industrial companies, distribution networks and power stations connected directly to the extra-high-voltage network. The sales and revenue structure is characterised largely by major distribution network operators, which account for approximately 85% of Amprion's network charges. Some 11% of the network charges originate from the chemicals, steel and aluminium industries. The remaining network charges result from the requirements of the power stations connected to the transmission network.

During the financial year, the withdrawn electrical quantities of directly connected network customers declined by about 7% because of the growing local feed-in in the upstream distribution networks. In view of the energy transition and the related subsidisation of renewable and local energy generation, further declines in quantity are expected in the coming years.

Every two years since 2006, Amprion has conducted customer surveys in collaboration with a market research institution among the directly associated industrial companies, distribution system operators and power stations. The participation rate in past surveys ranged between 65 % and 80 %. The objectives of these regular surveys are to assess the performance spectrum, ascertain image factors and gather information on how the marketing mix might be improved. The standard indicators of customer satisfaction and loyalty were surveyed as well. Customer satisfaction has increased continuously since 2006 and in 2016 reached 73 %, a figure higher than the industry average. Loyalty to Amprion is likewise high at 69 %. The brand potential index, which is the yardstick for brand strength, has improved, and now, at 69 %, is in the upper range of upper middle class. According to the survey's findings, Amprion is characterised primarily by competence, customer orientation, reliability and trustworthiness.

FNA determination of equity interest rates

Page 61 ☰ On 5 October 2016, the **FNA** fixed equity interest rates before taxes for new investments at 6.91 % and for old facilities at 5.12 %; these figures are effective throughout the next regulatory period of five years beginning on 1 January 2019. The equity yield rate for the current regulatory period until 31 December 2018 amounts to 9.05 % for new facilities and 7.14 % for existing facilities. The development of general interest rate levels on capital markets and the assessment of business risk were decisive factors for the FNA's decision. Amprion punctually filed a complaint against the decision with the Düsseldorf Higher Regional Court seeking a court review of the FNA's actions because the FNA, simultaneously with the basic interest rate, also significantly lowered the market risk premium. It was the only regulatory authority in Europe to do so.

EEG implementation

Page 60 ☰ The **EEG** equalisation mechanism operates on the basis of the Renewable Energies Regulation (**EEV**) and the Renewable Energies Implementation Regulation (**EEAV**). The amount of electricity fed in under the EEG outside of direct marketing measures is marketed by the TSOs on the electricity exchange, with the difference between the revenues and expenditures for the EEG feed-in amounts being passed on to energy utility companies via the EEG allocation. The EEG process is income-neutral for the TSOs.

The TSOs published the EEG allocation for 2017 on 15 October 2016. This resulted in an increase of around 8 % in the EEG allocation from 6.35 cents/kWh to 6.88 cents/kWh. The main reasons for this were the forecast for further expansion of renewable energies and the expected decrease in market proceeds from EEG electricity to be marketed. In agreement with the FNA, a liquidity reserve of € 1,477 million (corresponding to 6 % of the shortfall) was included in the EEG allocation.

Interruptible loads

The new Regulation Regarding Agreements on Interruptible Loads (AbLaV) entered into force on 1 October 2016; its term is limited to 1 July 2022. It provides that the TSOs can contract interruptible loads to a maximum of 1.5 GW nationwide and can utilise these loads in critical situations to assure system security. The contract volume has not been fully exhausted as of this time, but essential suitability has been certified by a prequalification process for loads in the amount of 987 MW. In the Amprion balancing zone, 723 MW of interruptible loads has been prequalified. Interruptible loads have been used increasingly for supporting the system's balance and rectifying bottlenecks since the introduction of the load management server. Amprion is the coordinator for interruptible loads and operator of the load management system in Germany. Once the adapted framework terms and conditions have been implemented within the entire operating process chain, the use of interruptible loads is scheduled to begin operation in accordance with a new AbLaV at the end of March 2017.

System services

The control reserve continues to be procured in Germany by the TSOs jointly in accordance with the stipulations of the FNA. Compared to the previous year, the secondary control reserve in 2016 decreased only slightly in volume while tertiary control, on the other hand, saw its volume decline significantly. This is the result of a reduction in the imbalances in the German control block. Prices in the secondary and tertiary control areas continue to show a strong downward trend.

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In overall terms, the cost of procuring lost energy (grid losses) has increased for Amprion. Essentially, this is a consequence of the increased quantities at a stable price level in the area of short-term procurement. Quantities and prices in long-term procurement, on the other hand, remained constant. Procurement had been contracted in 2014 and 2015.

Costs for redispatch activities in financial year 2016 rose sharply owing to numerous redispatch actions, especially in December. A significantly higher utilisation of the Amprion network, due to the extensive and unscheduled shutdowns of nuclear power plants in France and the tense supply situation in Belgium, was the main cause of the redispatch actions.

Reserve power stations

Every year, the FNA publicly announces the grid's reserve needs for the next five years as determined by analyses conducted by the TSOs. The remaining additional needs that cannot be covered by reserves already contractually secured must be covered by expression-of-interest procedures. In its report dated 29 April 2016, the FNA announced a need for reserve power station capacities of 5,400 MW for the winter half-year 2016/2017. Since need was covered by previously committed power stations, no further expression-of-interest procedures were required. National power stations with total output

of 4,505 MW are committed to the network reserve for the winter half-year 2016/2017, of which 429 MW are in Amprion's balancing zone; these reserves were contracted in 2014 and have been called up a number of times. The costs of the network reserved are refinanced fully via network charges.

System management

Although the winter half-year 2015/16 was marked by moderate temperatures, it was nevertheless necessary to call up reserve power stations a number of times, leading to as much as 3,499 MW (of the total 7,495 MW contracted by German TSOs) at peak times. The trigger for these call-ups was the imminent overload of a 220 kV interconnecting feeder on the border with Poland; it was shut down until further notice in June 2016 so that the tense situation on this border has eased for the winter half-year 2016/2017.

Owing to extensive unscheduled shutdowns of nuclear power plants in France in November 2016 and the tense supply situation in Belgium, the utilisation of the Amprion network rose significantly. Numerous redispatch actions were required to assure (n-1)-security. This trend continued at the beginning of financial year 2017 as well.

Technical innovation

Amprion is actively engaged in the transformation of the energy system and develops innovative solutions that enable the realisation of the energy transition while simultaneously opening up business opportunities. As it works to cover the rising demands made on the transmission capability of the network and to ensure its secure and reliable operation in the long term, Amprion integrates innovative technologies into its transmission network. As part of its Strategy 2020, the company has set itself the goal of continuously boosting its innovation strength across all corporate divisions and has developed and implemented an innovation process for this purpose.

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One milestone in network expansion for the energy transition was reached during the financial year 2016 when an initial 380 kV cable connection in combination with an **overhead line** began operation. On 30 June 2016, both 380 kV cable systems were turned on in a test installation in Raesfeld and have been operating without incident. Other operating facilities such as the two cable transfer stations in Löchte and Diestegge were successfully tested for their functionality at the same time.

Amprion is testing the use of innovative solid panel transmission towers in the interconnector project Niederrhein–Doetinchem. They are being used on the section from Millingen to the German–Netherlands border (about 7 kilometres in length) and visually match the transmission towers on the Dutch side. Construction began in 2016, and the operational start-up of the interconnector is scheduled for 2017. Amprion is pursuing two objectives with this pilot project: the acquisition of technical

experience with this new type of construction and a test of the acceptance of this solution among the general public.

Amprion is involved as a partner in European projects and took a leading role in the recently concluded project e-Highway 2050, during which energy scenarios and network architectures for the year 2050 were developed. The project “Massive InteGRATion of power Electronic devices” (MIGRATE) is exploring issues related to the network integration of electronic-coupled generators and power electronic devices. The focus is on the current status and on stability aspects that are currently relevant or will become so in the near future. In addition, it is studying whether a system with 100% electronic-coupled generators can be realised at all and what fundamental concepts for network operation and for network regulation in the transmission network must be created to do so.

Staffing

Amprion continued the scheduled expansion of its workforce throughout the financial year. The number of permanent employees increased by 7.5% over the previous year from 1,112 FTE (full-time equivalents) to 1,195 FTE; this is 1% above the number that was forecasted in the 2015 management report. Based on the assumption of process-related growth in assignments, the staffing needs for 2017 were updated to 1,300 permanent FTE pursuant to a process-related employment plan.

In addition, eight apprentices began their training in commercial and technical occupations. All in all, 33 apprentices are currently receiving their training at Amprion. Eleven apprentices successfully completed their training in 2016. Amprion offered employment to all of the apprentices and all of them accepted. In this way, the company is taking care to ensure that its future staffing needs are covered and that it meets its social obligations towards young people.

The encouragement, advancement and ongoing development of the workforce is a matter of high priority at Amprion. In 2016, for example, there were more than 1,900 participations in internal and external advanced training measures designed to strengthen the occupational and personal competencies of the employees. In addition, the company is applying a procedure for potential assessment so that future management positions will preferably be occupied by its own employees. The potential candidates identified in this way are further developed as executives in needs-based programmes. The assessments take place every two years.

The Amprion workforce is characterised by long-term professional experience and a strong commitment to the company. This is reflected in an average employment period (including predecessor companies) of around 14 years and the low turnover rate of 1%. The average age of the workforce has decreased due to the large number of hirings in recent years and was 42.2 years as of 31 December 2016. The

proportion of women in the workforce has increased continuously and was 18.2% (previous year: 16.9%) at the end of the reporting year. This proportion of women, which is still low compared to other sectors, is attributable to the company's specialised, technical business activities and is related to the low proportion of women who enter degree programmes and vocational training in electrotechnology.

In 2016, Amprion continued with its employee equity participation scheme based on the issuance of *jouissance* rights. The participation rate of around 81% was at the previous year's level. This continues to reflect the staff's high level of confidence in the company.

Industrial safety and health protection

Industrial safety and health protection are important corporate objectives for Amprion. That is why the company has implemented an industrial safety management system based on the standard "Occupational Health and Safety Assessment Series 18001" (OHSAS 18001). All processes with relevance for industrial safety that must be adhered to in connection with statutory and company-level regulatory frameworks are described in binding form for executives and employees in the industrial safety management system. The workplaces should be designed in such a way that the requirements of industrial safety and health protection can be fulfilled by the company's own staff and by the employees of the service companies that work on the premises of Amprion. Industrial safety training programmes for the employees and seminars for safe design of workplaces are conducted before any outside work begins. The accident frequency level during the financial year remained low.

Promoting the health of the workforce is the objective of Amprion's corporate health management. This incorporates a broad spectrum of activities and assistance measures. Among other things, prevention courses, preventive health cures and external welfare consultations are offered to the staff.

Environmental protection

A monitoring audit by the certifying agent in 2016 once again confirmed the conformity of the energy management system with the standard DIN ISO 50001; the system has been certified since 2015. The achievement of defined strategic and operating energy targets remains a programmed objective.

The Technology and Service Centre Primary Technology Transformers division was qualified as a specialist operation in accordance with the German Water Resources Act as part of a quality assurance measure. This legally regulated quality seal confirms that Amprion employs specialists who are qualified and properly equipped in view of environmental aspects as well as for environmentally sensitive installation, maintenance and repair activities.

Financial situation

Earnings

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 | CHANGE |
|----------------------------|--------------------------|--------------------------|--------------|
| Revenues and income | 12,753.5 | 11,974.1 | 779.4 |
| Operating expenses | -12,510.6 | -11,706.3 | -804.3 |
| Operating result | 242.9 | 267.8 | -24.9 |
| Financial result | -22.9 | -24.5 | 1.6 |
| Profit before taxes | 220.0 | 243.3 | -23.3 |
| Tax result | -61.9 | -72.0 | 10.1 |
| Net profit | 158.1 | 171.3 | -13.2 |

Revenues increased by 7% to € 12,650.1 million (previous year: € 11,867.6 million) and are therefore at the level projected in the previous year's management report. The increase essentially relates to the income-neutral EEG equalisation mechanism amounting to € 10,498.2 million (previous year: € 9,967.5 million). This results from higher income from the increased EEG allocation (2016: 6.35 cents/kWh; 2015: 6.17 cents/kWh). Revenues from grid business amount to € 2,151.9 million (previous year: € 1,900.1 million). The increase of € 251.8 million in grid revenues is attributable to higher revenues from the KWKG surcharge and the surcharge pursuant to Section 19 StromNEV. The lower revenues from the offshore-surcharge have a contrary effect. These surcharges correspond to expenditures of the same amount.

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The decline of € 24.9 million in the operating result was essentially caused by higher expenditures for system services and higher expenses for wages and salaries arising from the scheduled workforce increase. The major contrary effect is from credit notes issued by RWE AG related to pension schemes because of the new statutory actuarial interest rate for measurement of pension commitments.


The improvement of € 1.6 million in the financial result was essentially the consequence of lower fees for provision of access to the credit lines pursuant to the newly concluded consortium loan agreement. Expenditures from the compounding of pension provisions ran contrary to this effect.

The tax result includes expenses for current taxes on income as well as deferred taxes. The change is largely attributable to the decline in profit before taxes.

The aforementioned effects led to a decline in the profit for the year by 8% to € 158.1 million. Last year's management report projected a moderate decline in profit.

Financial situation

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 | CHANGE |
|--|--------------------------|--------------------------|--------------|
| Cash flow from operating activities | 298.8 | 141.2 | 157.6 |
| Cash flow from investing activities | -259.8 | -456.4 | 196.6 |
| Cash flow from financing activities | -50.1 | 325.1 | -375.2 |
| Change in cash and cash equivalents | -11.1 | 9.9 | -21.0 |
| Cash and cash equivalents at the end of the period | 905.7 | 916.8 | -11.1 |

Page 60  The cash flow from operating activities continues to be essentially influenced by the EEG equalisation mechanism, which has led to a considerable outflow of cash. This is in contrast to the inflow of cash from the KWKG allocation.

Cash flow from investing activities is characterised by the investments in the transmission network, which increased by 21%. A contrary effect results from the sale of marketable securities (current assets) in the amount of € 300.0 million linked to the coverage of liabilities arising from the EEG equalisation mechanism.

The decrease in cash flow from financing activities is essentially due to the fact that the shareholders did not make any additional contributions to equity during the current financial year in contrast to the contribution of € 400.0 million in 2015.

Cash and cash equivalents are committed to cover future liabilities arising from the EEG equalisation mechanism.

Financing

Investments during the financial year were financed internally utilising the available liquidity. Amprion had concluded a consortium loan agreement to cover operating processes, the interim financing of investments and the cash requirements for the EEG equalisation mechanism, which was set to expire in August 2016. In March 2016, a new agreement with significantly improved terms and conditions was concluded in advance with a bank consortium of five commercial and regional banks. The consortium loan agreement includes a customary financial covenant. Its compliance is audited annually on the closing date 31 December.

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The network credit tranche was increased from €250.0 million to €400.0 million; its term expires in March 2021, with two renewal options of one year each. The interest rate is based on the reference interest rate EURIBOR plus a maturity-based margin. As of the closing date, €31.2 million of the credit line had been utilised. The exercise of an increase option of €200.0 million and the exercise of a renewal option of one year until March 2022 are planned for Q1 2017.

The EEG credit tranche in the consortium loan agreement was significantly reduced from €1,800.0 million to €350.0 million because of the lower financing requirements; its term expires in March 2019, with three renewal options of one year each. The interest rate is based here as well on the reference interest rate EURIBOR plus a maturity-based margin. The credit tranche ensures that the required liquidity related to the EEG equalisation mechanism is available over the term of the loan. The exercise of a renewal option for one year until March 2020 is planned for Q1 2017.

The company concluded a borrower's note loan in financial year 2011 in the amount of €185.0 million with a term expiring in March 2021. In addition, the borrowing of long-term outside capital via the capital market for the financing of investments is planned for the future.

The rating agencies Moody's Investors Service Ltd. and Fitch Ratings Ltd. confirmed the ratings "A3" and "A-" respectively along with a stable outlook. Amprion continues to be firmly anchored in the solid investment grade range. The positive rating contributes to securing access to capital markets for future financing.

Investments

Demands on the transmission network have risen significantly in the past few years. Increases in feed-ins from renewable energy sources and changes in the power station fleet in Germany mean that increased electrical output must be transported over increasingly larger distances. In addition, the significant increase in energy transports throughout the European area, which is due to additional trading resulting from the liberalisation of the European energy market, is a further driver of the need to expand the network.

The legally stipulated deadlines for the decommissioning of the nuclear power stations still in operation determine the necessary pace of network expansion. During the financial year, Amprion has increased investment activities raising transport capacity and stabilising the transmission network further so that system security can be assured. The north-south axes of the transmission network are being steadily expanded to integrate the growing feed-in of renewable energies into the grid and ensure the provision of the required transmission capacities in the long term after all nuclear power stations go offline. The largest investments in financial year 2016 were placed in the projects Ultranet, Dortmund–Frankfurt, Wesel/Niederrhein–Meppen and the new central control stations “HSL2020” in Brauweiler. Amprion has started operation of the partial sections Wesel/Niederrhein–Bredenwinkel and Bredenwinkel–Borken of the project Wesel/Niederrhein–Meppen. In addition, Amprion obtained eight public-law permits for measures related to the Energy Grid Expansion Act (**EnLAG**) and the Act for Planning National Needs (**BBPIG**).

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The realisation of the two interconnector projects to the Netherlands and Belgium continued to progress. The public-law permit for both sections of the Niederrhein–Doetinchem project has been issued so that construction can begin. Amprion has prepared the documents for the official plan approval procedure for the interconnector ALEGrO and submitted them to the appropriate authorities. The procedure has been initiated by the regional administration of Cologne. The company awarded contracts for the planning and construction of the converter as well as the supply of the cables during the financial year. Furthermore, the need for an additional capacity increase at the German-Belgian border was determined during the studies related to the Ten-Year Network Development Plan (TYNDP). Starting from this basis, a concrete project which will be contained in the Network Development Plan (NEP) 2030 was developed over the course of the year. The interconnector projects mentioned here are an important building block for the further development of European market integration.

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Work on the pilot section of **underground cabling** in Raesfeld was completed as scheduled during the financial year. The underground cabling section in Raesfeld is a part of the new Dörpen–Wesel connection. Amprion installed an underground partial 380 kV cabling over a distance of 3.4 kilometres.

Trial operation commenced after the conclusion of the construction and cabling work as well as a successful completion of a voltage test. This trial operation will document the suitability of the 380 kV cable technology for use in the extra-high-voltage network and is already the source of valuable operational experience.

The Ultranet project using extra-high-voltage direct current transmission (HVDC) is in the approval phase. The applications for all five sections were submitted in 2014 and 2015, and the application conferences on the sections were conducted in the financial year. In addition, Amprion submitted the application documents pursuant to Section 8 of the Federal Planning for Transmission Systems for Section A (Riedstadt–Wallstadt) in June 2016. The purchase of a suitable plot of land for the converter and the awarding of the contract for the planning and construction of the converter were carried out in 2015.

The site of the nuclear power plant Isar/Landshut (balancing zone TenneT) was determined as the new southern network connection point of Corridor D (south-east link) in the revised **BBPIG** 2015. As a consequence, Amprion reached an agreement with TenneT for the exchange of the project development responsibility for the southern part of Corridor D with the northern part of A-North. The additional section of A-North means that Amprion will realise a comparable total length of HVDC lines and the same number of converters. Now that the company has sole responsibility for the realisation of A-North, it has the opportunity to bundle approval and communication activities with planned **EnLAG** projects in Lower Saxony. The existing cooperation agreements of Amprion with 50Hertz for Corridor D and of Amprion with TenneT for A-North were each annulled by mutual agreement. The direct current connection A-North from Emden/East to Osterath in combination with the southern project Ultranet forms the West German Direct Current Corridor A from Lower Saxony via North Rhine-Westphalia and Rhineland-Palatinate to Baden-Württemberg. **Underground cabling** is required for A-North by legal statutes. The newly assigned project team is currently at work on the preparation of the application pursuant to Section 6 for the Federal Planning for Transmission Systems. It will be submitted to the **FNA** in Q1 2018. The approximately 300 kilometres of underground cabling are scheduled to commence operation in 2025.

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The total volume of investments in 2016 came to € 567.0 million, about 3 % over the level forecasted in the management report for 2015. Of this amount, € 487.0 million are related to investments in expansion and € 80.0 million to investments in the renovation of the transmission network and other investments. Investments increased by 21 % in comparison with the previous year.

Since 2008, Amprion has submitted a total of 101 investment applications to the FNA. They relate to projects for the period until 2028. Thanks to the applications approved so far, most of the planned investments in expansion over the next few years have been secured.

Assets and liabilities

| ASSETS | | | |
|---------------------|---------------------|---------------------|---------------|
| IN € MILLION | 31 DEC. 2016 | 31 DEC. 2015 | CHANGE |
| Non-current assets | 2,918.8 | 2,516.4 | 402.4 |
| Current assets | 2,071.9 | 2,271.4 | -199.5 |
| | 4,990.7 | 4,787.8 | 202.9 |

| LIABILITIES AND SHAREHOLDERS' EQUITY | | | |
|---|---------------------|---------------------|---------------|
| IN € MILLION | 31 DEC. 2016 | 31 DEC. 2015 | CHANGE |
| Equity | 1,651.4 | 1,576.1 | 75.3 |
| Non-current liabilities | 654.9 | 683.3 | -28.4 |
| Current liabilities | 2,684.4 | 2,528.4 | 156.0 |
| | 4,990.7 | 4,787.8 | 202.9 |

At 58% (previous year: 52%), non-current assets make up the largest portion of the company's assets and are covered up to 79% (previous year: 91%) by equity and long-term debt. The slight increase in the proportion of non-current assets results primarily from the expansion and restructuring investments accompanied by a slight decline in current assets. The equity ratio is 33% (previous year: 33%). In the financial year, € 86.3 million of last year's net profit were allocated to retained earnings.

General statement on the development of business and the financial situation

The Amprion management assesses the course of business and the financial situation as positive. The overall financial situation can be regarded as sound and provides the basis for further investments in the transmission network.

Outlook, opportunities and risk report

Outlook

Grid business

The FNA has set the revenue cap for the second regulatory period from 2014 to 2018 on the cost basis of the year 2011. This initial base level plus the development of the permanently non-controllable costs and the general consumer price index constitute the basis for the 2017 network charges published 19 December 2016. The revenue cap has increased slightly as a consequence of the following changes:

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- Higher planning costs for approved investment activities for further expansion of the network due to the energy transition
- Increased planning costs for reserve power stations pursuant to the Electricity Market Act

The expected decreasing quantities due to the growth of own generation and local feed-in will lead to a sharp increase in network charges of between 17.2% to 19.9% at the extra-high-voltage network level in the spectrum between 5,000 and 8,760 hours of use, which is relevant for the majority of customers.

In accordance with Section 6 (1) ARegV, the FNA will ascertain the initial level for determining the revenue caps for the third regulatory period from 2019 to 2023 by means of a cost examination based on the data of financial year 2016. The data will presumably be submitted to the FNA by 30 June 2017.

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System services

As before, the control reserve will be sourced by Amprion together with the other German TSOs according to the FNA guidelines. In connection with this, it is assumed that increasing quantities and prices will lead to increased expenses for control reserve, especially for the secondary control reserve. The tendering of the long-term component for lost energy has been completed for 2017, whereby prices declined significantly in comparison with financial year 2016. The cost of redispatch activities is expected to increase. In addition, higher expenditures for reserve power stations are expected as a consequence of the Electricity Market Act that entered into effect in financial year 2016.

Investments

The NEP constitutes the basis for Amprion's project planning. The EnLAG and the BBPIG, which is based on the NEP, ensure approximately €3,400 million in expansion investments by Amprion over the coming ten years and secure the legal basis for the investment planning. They confirm as a matter of law that the projects are necessary in terms of the energy industry and that they are urgently required. Moreover, BBPIG projects are subject to an accelerated approval process. In connection with this, it must be noted that only the starting and finishing points of a transmission line are legally specified in

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- Page 60 ☰ the **EnLAG** and **BBPIG**. The transmission line and all of the related further activities have to be secured by investment applications.
- Page 60 ☰ The revision of the **EnWG** changed the preparation of the network development plan to a two-year cycle so that overlaps of successive network development plans can be avoided. The network development plan is going to be published in 2017 and covers the target years 2030 and 2035.
- Page 60 ☰ The revision of the **EEG** will result in far-reaching changes in the expansion paths and the territorial distribution of the renewable energies. These changes impact the fundamental assumptions of the **NEP** and could no longer be given adequate consideration in the NEP 2025. This has prompted legislators to decide that the NEP 2025 procedure will not be continued. The consultation of the second draft will not be carried out, and the **FNA** will not confirm the NEP 2025. The draft prepared by the TSOs on the scenario framework for the coming NEP 2030, Version 2017, was published by the FNA on 18 January 2016 and released for consultation. The FNA approved the scenario framework on 30 June 2016. The first draft of the NEP 2030, Version 2017, was submitted to the FNA on 1 February 2017.
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Preparation and publication of the European TYNDP at ENTSO-E were defined by Regulation (EU) No. 347/2013. The TYNDP 2016 was submitted to the European regulatory authority ACER in December 2016 and represents the basis for the multilateral interconnector planning at Amprion. During the two-stage development procedure for TYNDP 2016 (in which Amprion was intensely involved), the first step was the identification of the required interconnector capacity at inner-European borders for the freest possible European energy trade and an increase in supply security. Subsequently, studies in the six regional groups of ENTSO-E examined the degree to which the required capacities can be secured by projects that have already been concretely planned and whether there is further need for expansion and the development of additional projects. The project assessment took place during the second phase. At this time, the economic benefit of the projects was compared to the cost of the projects with the aid of a procedure developed by the ENTSO-E and accepted by the EU Commission. A major part of this phase concerned the coordination of the projects with the project partners. This procedure made it possible, for example, to identify, develop and assess the project “2nd Interconnector DE-BE”; it will be considered and analysed further on the basis of the TYNDP 2016 in the coming NEP 2030.

The overall volume of investment planned by Amprion up until 2026 consists of investment in expansion, renovation and other investments, and amounts to about €5,600 million, of which €663 million is allocated to 2017.

Revenues and profit or loss

A slight increase in overall revenues is expected in the financial year 2017. Revenues from Amprion's income-neutral EEG-based activities remain at the level of the financial year 2016. Revenues from network business, on the other hand, are expected to increase slightly due to the increase in the revenue cap and higher revenues from the KWKG allocation.

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Against the backdrop of the regulatory environment described above and the tense network situation, the expectation for financial year 2017 is for a moderate downward trend in net income for the year.

Overall statement on future development

The management expects to see a continued positive development in the course of business in financial year 2017 thanks to the prevailing regulatory conditions as well as to the company's stable assets, finance and earnings situation. For the coming regulatory period (2019 to 2023), however, negative impact on the earnings position is to be expected as a consequence of the FNA's determination of the rate of return on equity.

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Opportunities and risk report

Risk management

The objectives of risk management are the avoidance and control of risks which impact the financial result and liquidity or even endanger the existence of the company as well as the reduction of unavoidable risks and the optimisation of the overall portfolio of opportunities and risks.

Amprion's risk management includes extensive organisational measures pertaining to the company's processes and structure with the aim of ensuring that risks are identified, analysed and controlled at an early stage and that they are reported, thereby taking into account the requirements of the German Corporate Sector Supervision and Transparency Act (Gesetz zur Kontrolle und Transparenz im Unternehmensbereich – KonTraG). Risk identification includes the structural recording of possible risks in all operational processes and functional divisions. As part of the risk analysis, the risks identified are assessed in terms of their origin, early warning indicators, risk control and preventive measures, the amount of any loss and the probability of their occurrence. The objective of risk control is to reduce

the potential amount of any loss and the probability of its occurrence or – insofar as this is possible – to avoid risks by not carrying out high-risk activities.

As part of regular risk reporting, the Executive Board and the Supervisory Board are kept informed of the current risk situation. If there are any fundamental changes, decision makers are informed immediately outside of normal risk reporting. Risk management is an integral component of the business, planning and control processes and is reviewed regularly for its functional capability and its effectiveness.

In addition, a risk-oriented approach is used as part of internal audit checks to ensure a comprehensive appraisal of risks. The existing risk portfolios and the resulting areas for action are specified as early as at the preparation stage for auditing schedules and the specific auditing activities.

Essential opportunities and risks

System services

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Market opportunities and risks result from the supplying of the balancing zone. Amprion has in this respect accepted a voluntary self-obligation pursuant to Section 11 (2) **ARegV** approved by the **FNA** that will apply throughout the term of the second regulatory period (2014 to 2018).

Opportunities and risks arise from changes in costs in the procurement of the control reserve due to unforeseen volume effects. The voluntary self-obligation provides for price indexing so that opportunities and risks, which are limited by an incentive regulation, exist for the company's income due to volume effects. Only 25% of the cost savings or increases achieved from unforeseen volume effects will affect Amprion's result up to an absolute upper threshold.

Pursuant to the according voluntary self-obligation, in the event of network losses, a minimal risk or opportunity arises from the price development because the settlement price is fixed. There are only moderate risks or opportunities from the procurement of network losses as a consequence of the time lag of the cost shifting. The tendering of the long-term component for network losses is complete for 2017 and has been partially completed for 2018.

A periodic risk arises from redispatch activities because the additional costs cannot be shifted until after a time delay of two years via the network charges by means of the voluntary self-obligation redispatch.

Financing

As a TSO, Amprion is responsible for the implementation of the EEG equalisation mechanism in its balancing zone. In principle, implementation of the EEG is income-neutral based on the statutory provisions. In the event of developments that differ from the forecast, however, income from the EEG allocation and the actual revenues from sales on the electricity exchange may not be sufficient to cover the volatile remuneration of feed-ins to EEG plant operators. As a result of this, a periodic liquidity risk arises which is countered by the maintenance of a sufficient credit line.

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Credit risks arise if business partners meet their payment obligations either insufficiently or not at all. Credit risks are largely avoided by making appropriate checks on creditworthiness, continuous receivables management and the requirement of collateral security (in justified cases).

Regulation

Regulatory risks arise from changes in European and national laws. Amprion follows and assists in legislative processes in order to use any possible opportunities for financial stability in the regulated grid business and to limit costs to the company.

Charges for the use of the network are subject to regulatory supervision by the FNA. Approvals or decisions by the FNA may have a positive or negative impact on the company's result. The approval practice during cost audits in particular is a key point because the basis of network charges for a regulatory period is fixed here. In decision of the FNA determining the revenue cap for the second regulatory period from 2014 to 2018, the costs applied for by Amprion were largely approved and will therefore form the basis for the company's stable financial development in the future. The calculation of network charges is based on forecasts of sales quantities. In the event of unscheduled quantity deviations resulting from external factors (e.g. weather, economy, local generation), surplus or shortfall revenues occur; they must be recorded on the regulatory account and taken into consideration for future network charges.

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Further risks may arise if the investment measures applied for are only partially accepted by the FNA because these may lead to lower imputed costs and thus to lower revenues from network charges in the future. The company reduces this risk by controlling costs and justifying the costs of investments to the FNA.

Overall statement on risks

During the financial year 2016, there were no identifiable risks that threatened the existence of the company, either individually or in their entirety, or that might significantly impair the assets, financial and earnings position of the company. There are also no such risks foreseeable in the future based on current knowledge.

Corporate governance declaration pursuant to Section 289a (4) HGB (German Commercial Code)

As target figures for the proportion of women to be employed in the company's management, shareholders stipulated a quota of 8.3 % for the Supervisory Board and the Supervisory Board stipulated a quota of 0.0 % for senior management in 2015. For the two management levels below the senior management, senior management stipulated a quota of 6.7 %. The deadline for meeting these targets was determined by the respective bodies as 30 June 2017 in all cases.

Dortmund, 22 March 2017

Management



DR HANS-JÜRGEN BRICK



DR KLAUS KLEINEKORTE

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Balance sheet

OF AMPRION GMBH AS AT 31 DECEMBER 2016

ASSETS

| | NOTES | 31 DEC. 2016 IN € MILLION | 31 DEC. 2015 IN € MILLION |
|--|-------|------------------------------|------------------------------|
| Non-current assets | (1) | | |
| Intangible assets | | 9.4 | 4.9 |
| Tangible assets | | 2,903.3 | 2,483.1 |
| Financial assets | | 6.3 | 6.6 |
| | | 2,919.0 | 2,494.6 |
| Current assets | | | |
| Inventories | (2) | 63.5 | 53.6 |
| Accounts receivable and other assets | (3) | 1,100.5 | 998.5 |
| Securities | | - | 300.0 |
| Cash and cash equivalents | (4) | 905.7 | 916.8 |
| | | 2,069.7 | 2,268.9 |
| Prepaid expenses | | 2.0 | 2.3 |
| Active difference resulting from asset offsetting | | - | 22.0 |
| | | 4,990.7 | 4,787.8 |

LIABILITIES AND SHAREHOLDERS' EQUITY

| | NOTES | 31 DEC. 2016 IN € MILLION | 31 DEC. 2015 IN € MILLION |
|----------------------------|-------|------------------------------|------------------------------|
| Equity | (5) | | |
| Subscribed capital | | 10.0 | 10.0 |
| Jouissance rights capital | | 8.9 | 6.7 |
| Additional paid-in capital | | 1,003.0 | 1,003.0 |
| Retained earnings | | 471.4 | 385.1 |
| Net profit | | 158.1 | 171.3 |
| | | 1,651.4 | 1,576.1 |
| Special items | (7) | 34.2 | 35.9 |
| Provisions | (8) | 432.2 | 514.9 |
| Liabilities | (9) | 2,637.9 | 2,456.8 |
| Deferred income | (10) | 109.8 | 93.0 |
| Deferred tax liabilities | (11) | 125.2 | 111.1 |
| | | 4,990.7 | 4,787.8 |

Income statement

OF AMPRION GMBH FROM 1 JANUARY TO 31 DECEMBER 2016

| | NOTES | 1 JAN. - 31 DEC. 2016 IN € MILLION | 1 JAN. - 31 DEC. 2015 IN € MILLION |
|--|-------|--|--|
| Revenue | (13) | 12,650.1 | 11,867.6 |
| Increase in inventory of unbilled services | | 3.3 | - |
| Other own work capitalised | | 61.5 | 52.1 |
| Other operating income | (14) | 38.6 | 54.4 |
| Cost of materials | (15) | -12,168.3 | -11,375.4 |
| Staff costs | (16) | -120.0 | -125.5 |
| Depreciation | | -128.1 | -124.6 |
| Other operating expenses | (17) | -94.2 | -80.8 |
| Financial result | (18) | -22.9 | -24.5 |
| Profit before taxes | | 220.0 | 243.3 |
| Taxes on income and earnings | (19) | -61.9 | -72.0 |
| Net profit | | 158.1 | 171.3 |

Development of assets

OF AMPRION GMBH FROM 1 JANUARY TO 31 DECEMBER 2016

ACQUISITION AND PRODUCTION COSTS IN € MILLION

| | BALANCE AT 1 JAN. 2016 | ADDITIONS | TRANSFERS | DISPOSALS | BALANCE AT 31 DEC. 2016 |
|--|---------------------------|--------------|-------------|-------------|----------------------------|
| Intangible assets | | | | | |
| Purchased concessions, patent rights and similar rights and assets, and licences in such rights and assets | 27.1 | 6.4 | 0.4 | 0.2 | 33.7 |
| Prepayments | 0.3 | 0.8 | -0.3 | | 0.8 |
| | 27.4 | 7.2 | 0.1 | 0.2 | 34.5 |
| Tangible assets | | | | | |
| Land, land rights and buildings including buildings on third-party land | 387.7 | 61.3 | 37.8 | 7.0 | 479.8 |
| Technical plant and machinery | 6,168.4 | 333.9 | 68.3 | 31.8 | 6,538.8 |
| Other equipment, factory and office equipment | 44.4 | 5.3 | 0.3 | 1.3 | 48.7 |
| Advanced payments and construction in process | 150.1 | 159.3 | -106.5 | 4.8 | 198.1 |
| | 6,750.6 | 559.8 | -0.1 | 44.9 | 7,265.4 |
| Financial assets | | | | | |
| Participations | 5.2 | | | | 5.2 |
| Other loans | 1.4 | | | 0.3 | 1.1 |
| | 6.6 | | | 0.3 | 6.3 |
| | 6,784.6 | 567.0 | | 45.4 | 7,306.2 |

| ACCUMULATED DEPRECIATIONS IN € MILLION | | | | CARRYING AMOUNTS IN € MILLION | | |
|--|---|-------------|----------------------------|-------------------------------|----------------------------|--|
| BALANCE AT 1 JAN. 2016 | DEPRECIATION IN THE REPORTING PERIOD | DISPOSALS | BALANCE AT 31 DEC. 2016 | BALANCE AT 31 DEC. 2016 | BALANCE AT 31 DEC. 2015 | |
| | | | | | | |
| 22.5 | 2.7 | 0.1 | 25.1 | 8.6 | 4.6 | |
| | | | | 0.8 | 0.3 | |
| 22.5 | 2.7 | 0.1 | 25.1 | 9.4 | 4.9 | |
| | | | | | | |
| 173.1 | 5.7 | 2.8 | 176.0 | 303.8 | 214.5 | |
| 4,065.6 | 115.7 | 26.5 | 4,154.8 | 2,384.0 | 2,102.8 | |
| | | | | | | |
| 28.7 | 4.0 | 1.4 | 31.3 | 17.4 | 15.7 | |
| | | | | 198.1 | 150.1 | |
| 4,267.4 | 125.4 | 30.7 | 4,362.1 | 2,903.3 | 2,483.1 | |
| | | | | | | |
| | | | | 5.2 | 5.2 | |
| | | | | 1.1 | 1.4 | |
| | | | | 6.3 | 6.6 | |
| 4,290.0 | 128.1 | 30.8 | 4,387.2 | 2,919.0 | 2,494.6 | |

Notes to the financial statements

OF AMPRION GMBH AS AT 31 DECEMBER 2016

Basis of presentation

The company, based in Dortmund, is entered in the Commercial Register of the District Court of Dortmund under registration number HRB 15940.

The annual financial statements have been prepared in accordance with the provisions of the German Commercial Code (HGB) for a large capital corporation as required by Section 267 (3) HGB and pursuant to the supplementary provisions of the Act Regarding Limited Liability Companies (GmbHG) and the Energy Industry Act (EnWG).

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The company applied the provisions of the Accounting Directive Implementation Act (BilRUG) during the current financial year for the first time. Any consequential effects on recognition, measurements and disclosures will be explained in the corresponding positions of the annual financial statements. The item "Profit after taxes" has been removed from the structure of the income statement because it corresponds to the item "Net profit" in the company's statements. Pursuant to Section 265 (5) HGB, the subtotal "Profit before taxes" was added in the income statement to ensure clarity and transparency.

To ensure clarity of presentation, individual items have been combined in the balance sheet and in the income statement and are explained separately in the notes. The income statement has been prepared according to the nature of expense method. The amounts disclosed in the annual financial statements are stated in millions of euros (€ million) and thousands of euros (€ thousand).

Accounting policies

Non-current assets

Separately acquired intangible assets are initially recognised at acquisition costs and are amortised using the straight-line method over their normal useful lives of two to five years; if their value is likely to be permanently impaired, they are written down.

Tangible assets are measured at acquisition or manufacturing costs less accumulated scheduled straight-line depreciation and any unscheduled write-offs. Manufacturing costs include direct costs and any applicable overhead costs. If the reasons for the unscheduled write-offs cease to exist, appropriate reversals are recorded, but not in excess of the amortised cost. Depreciation pro rata temporis begins in the year of the addition. Scheduled write-offs are based on the lower range of useful life pursuant to Annex 1 to Section 6 (5) StromNEV (Electricity Network Fee Regulation Ordinance). Pursuant to Section 6 (2) EStG (German Income Tax Act), low-value assets whose acquisition costs do not exceed € 150 are recognised as costs in the year of their acquisition. If the acquisition costs exceed € 150, but do not exceed € 410, they are capitalised at the point in time of their addition; at the end of the financial year, they are fully depreciated and recognised as disposals.

Financial assets are recognised at acquisition costs and measured at the lower fair value if there is a presumably permanent loss of value.

Current assets

Raw materials and supplies are recognised at acquisition or manufacturing costs measured by applying moving average prices according to the strict lower of cost or market principle. Inventory risks arising from reduced exploitability are given consideration in the form of appropriate allowances.

Work in progress is measured at manufacturing costs. Direct costs as well as reasonable amounts of overhead costs for material and production are included in these measurements.

The receivables and other assets are recognised at nominal value or acquisition costs. All discernible specific risks and the general credit risk are given consideration in the form of reasonable value allowances.

Securities are measured at costs of acquisition or at the lower fair value.

Cash and cash equivalents are reported at nominal value.

Special items

Special items include advances and contributions in aid of construction and building connection that were received from 1 January 2003 to 31 December 2010, and are reversed in line with the useful lives of the related assets.

Provisions

Provisions for pensions and similar obligations are created on the basis of actuarial calculations, taking into account Klaus Heubeck's 2005 G reference tables and using the projected unit credit method. They are discounted by 4.01 % per year, based on the 10-year-average market interest rate as at 31 December 2016 published by the German central bank with an assumed residual term of 15 years. Other calculation assumptions include a 3.50 % per year increase in wages and salaries and pension increases of 1.00 % and 2.10 % per year.

In the assessment of other provisions, all identifiable risks and contingent liabilities have been taken into account. They are recognised at the amount required for settlement based on reasonable commercial judgement. Provisions with a residual term of more than one year are discounted in accordance with their residual term using the average market interest rate for the previous seven financial years published by the German central bank. Interest accretion on these provisions is calculated using the interest rate at the end of the financial year. The effects of the change in the discounting rate or in the estimation of the residual term are shown in the financial result.

Provisions for service anniversaries are accrued on the basis of an actuarial analysis, taking into account Klaus Heubeck's 2005 G reference tables. They are discounted using the average market interest rate for the previous seven financial years as at 31 December 2016 of 3.23 % per year published by the German central bank. Furthermore, depending on the relevant service anniversary regulations, wage and salary increases of 2.75 % and 3.50 % per year are used as actuarial assumptions.

Provisions for pre-retirement part-time employment are accrued on the basis of actuarial calculations, taking into account Klaus Heubeck's 2005 G reference tables. They are discounted using the average market interest rate for the previous seven financial years as at 31 December 2016 of 2.14 % per year for potential and concluded pre-retirement part-time employment agreements. Furthermore, wage and salary increases of 3.50 % per year are used as actuarial assumptions.

Provisions for pensions and similar obligations are covered in full by assets held in trust as part of a contractual trust arrangement. Credits from the block model pre-retirement part-time employment in accordance with Section 8a of the German Partial Retirement Act (Altersteilzeitgesetz – AltTZG) and credits on long-term working time accounts under Section 7e of the German Social Code Vol. IV (Sozialgesetzbuch – SGB IV) are likewise secured by assets held in trust as part of a contractual trust arrangement. These assets held in trust are recognised at fair value and are offset against the respective underlying obligations in accordance with Section 246 para. 2 (2) HGB. Expenses associated with the interest accretion to provisions are netted against income and expenses from the related assets in the financial result.

Liabilities

Liabilities are generally measured at their settlement amount. Exceptions concern the liabilities to the Pensions Security Association and those arising from early retirement obligations which are stated at present value.

Deferred income

The advances and contributions in aid of construction and building connection accrued up until 31 December 2002 and after 1 January 2011 reported as deferred items are reversed through profit and loss using the straight-line method over a period of 20 years. The income from congestion management is used for maintenance or expansion of cross-border transmission capacities and is, in the same way as the construction grants, recognised in the balance sheet as deferred income.

Deferred tax liabilities

Deferred taxes arise from temporary differences in accounting treatment under commercial and tax law and are calculated using the current applicable tax rate and shown net.

Currency conversion

Transactions in foreign currency are valued at the current exchange rate at the time of their initial posting. Assets and liabilities quoted in foreign currency are converted at the mean spot rate of exchange prevailing on the accounting date.

Notes to the balance sheet

(1) Non-current assets

The structure of the non-current assets summarised in the balance sheet and their development during the financial year 2016 are described on page 36.

The following schedule contains information regarding stockholdings.

| NAME AND HEADQUARTERS OF THE COMPANY — | SHARE OF CAPITAL (%) | EQUITY IN € MILLION* | NET PROFIT IN € MILLION* |
|--|----------------------|----------------------|--------------------------|
| TSCNET Services GmbH, Munich | 7.7 | 2.9 | 0.4 |
| Holding des Gestionnaires de Réseau de Transport d'électricité SAS, Paris/France | 5.0 | 93.7 | 25.5 |
| Joint Allocation Office S.A., Luxembourg/Luxembourg | 5.0 | 4.3 | 0.3 |

* Equity and profit of financial year 2015

(2) Inventories

| IN € MILLION | 31 DEC. 2016 | 31 DEC. 2015 |
|----------------------------|--------------|--------------|
| Raw materials and supplies | 60.2 | 53.6 |
| Work in progress | 3.3 | - |
| | 63.5 | 53.6 |

(3) Accounts receivable and other assets

| IN € MILLION | 31 DEC. 2016 | 31 DEC. 2015 |
|--|--------------|--------------|
| Trade receivables | 1,043.9 | 985.2 |
| Receivables from companies with participation interest | - | * |
| Other assets | 56.6 | 13.3 |
| | 1,100.5 | 998.5 |

* Negligible amount

(4) Cash and cash equivalents

Cash and cash equivalents consist largely of bank deposits.

(5) Equity

The company's authorised capital has been paid in full; 74.9% is held by M 31 Beteiligungsgesellschaft mbH & Co. Energie KG, Düsseldorf, and 25.1% by RWE AG, Essen.

The jouissance rights, which are not securitised, are held by the company's employees and are not transferable. They can be redeemed after a minimum holding period of five years. The jouissance rights entitle to a limited interest claim on the nominal amount which is prioritised over the shareholders' interests. The amount of the interest yield is dependent on the company's profit. They do not entitle to any participation in returns from liquidation of the company. The yield on the jouissance rights capital in the financial period amounted to €0.5 million. In total, jouissance rights in the following denominations have been issued.

| NOMINAL AMOUNT | 31 DEC. 2016 |
|----------------|--------------|
| € 180 | 44,229 |
| € 360 | 16 |
| € 720 | 303 |
| € 1,220 | 69 |
| € 1,720 | 379 |
| | 44,996 |

The retained earnings consist of the item "other retained earnings" pursuant to Section 266 (3) III, no. 4 HGB.

By resolution of the Supervisory Board on 12 April 2016, €85.0 million of the net profit of €171.3 million for the 2015 financial year was distributed to the owners. The remainder of €86.3 million was transferred to other retained earnings.

(6) Payout block

The total amount of non-distributable profits in accordance with Section 268 (8) HGB of €6.3 million results from the €9.1 million fair value measurement of covering assets in accordance with Section 246 para. 2 (2) HGB less the related deferred tax liabilities of €2.8 million. The non-distributable amount

of € 24.8 million in accordance with Section 253 para. 6 HGB arises from discounting the provisions for pension obligations using the 10-year-average market interest rate instead of the previous 7-year average.

The freely disposable reserves of € 1,474.4 million exceed the non-distributable amounts of € 31.1 million.

(7) Special items

Advances and contributions in aid of construction and building connection received from 1 January 2003 to 31 December 2010 are recognised under special items for investment grants associated with fixed assets.

(8) Provisions

| IN € MILLION | 31 DEC. 2016 | 31 DEC. 2015 |
|------------------|--------------|--------------|
| Tax provisions | 40.5 | 44.0 |
| Other provisions | 391.7 | 470.9 |
| | 432.2 | 514.9 |

Due to the offsetting rule pursuant to Section 246 para. 2 (2) HGB, the provisions for pensions and similar obligations reported under other provisions are netted against plan assets.

| IN € MILLION | HISTORICAL COST | FAIR VALUE | SETTLEMENT AMOUNT |
|---|--------------------|------------|----------------------|
| Netted assets | | | |
| Securities | 120.7 | 129.8 | |
| Other assets | 2.4 | 2.4 | |
| | 123.1 | 132.2 | |
| Netted liabilities | | | |
| Provisions for pensions and similar obligations | | | 132.2 |
| | | | 132.2 |
| Difference from offsetting | | | - |

The fair value corresponds to the market value as at 31 December 2016. The corresponding offsetting of expenses and income is disclosed in the notes to the financial result.

Tax provisions relate to tax periods not yet irrevocably closed.

Other provisions are accrued essentially for obligations for the overhaul of pylons, claims arising from the previous version of the KWKG (Combined Heat and Power Act), and personnel-related as well as regulatory obligations.

In accordance to the consolidation requirement pursuant to Section 246 (2) second sentence HGB, the provisions for pre-retirement part-time employment and long-term working hours accounts disclosed under other provisions are offset against the plan assets.

| IN € MILLION | HISTORICAL COST | FAIR VALUE | SETTLEMENT AMOUNT |
|--|--------------------|------------|----------------------|
| Netted assets | | | |
| Other assets | 11.0 | 11.0 | |
| | 11.0 | 11.0 | |
| Netted liabilities | | | |
| Provisions for pre-retirement part-time employment and long-term working time accounts | | | 35.1 |
| | | | 35.1 |
| Difference from offsetting | | | 24.1 |

The fair value corresponds to the market value as at 31 December 2016. The corresponding offsetting of expenses and income is disclosed in the notes to the financial result.

(9) Liabilities

| IN € MILLION | 31 DEC. | OF WHICH: | OF WHICH: | OF WHICH: | 31 DEC. | OF WHICH: | OF WHICH: | OF WHICH: |
|--|---------|------------------------------|------------------------------|-------------------------------|---------|------------------------------|------------------------------|-------------------------------|
| | 2016 | RESIDUAL TERM ≤ 1 YEAR | RESIDUAL TERM > 1 YEAR | RESIDUAL TERM > 5 YEARS | 2015 | RESIDUAL TERM ≤ 1 YEAR | RESIDUAL TERM > 1 YEAR | RESIDUAL TERM > 5 YEARS |
| Liabilities to credit institutions | 222.4 | 37.4 | 185.0 | - | 191.1 | 6.1 | 185.0 | 185.0 |
| Prepayments received | 17.7 | 8.2 | 9.5 | 1.8 | 15.5 | 9.4 | 6.1 | 1.8 |
| Trade payables | 2,168.0 | 2,168.0 | - | - | 2,067.5 | 2,067.5 | - | - |
| Liabilities to companies with participation interest | * | * | - | - | 0.1 | 0.1 | - | - |
| Other liabilities | 229.8 | 146.5 | 83.3 | - | 182.6 | 93.1 | 89.5 | 0.1 |
| - of which from taxes | 9.5 | 9.5 | - | - | 13.5 | 13.5 | - | - |
| - of which relating to social security | 0.6 | 0.2 | 0.4 | - | 0.7 | 0.3 | 0.4 | 0.1 |
| | 2,637.9 | 2,360.1 | 277.8 | 1.8 | 2,456.8 | 2,176.2 | 280.6 | 186.9 |

* Negligible amount

Liabilities to credit institutions largely concern a long-term promissory note totalling € 185.0 million.

Other liabilities primarily comprise liabilities for regulatory obligations.

(10) Deferred income

Deferred income includes € 30.1 million (previous year: € 33.6 million) in advances and contributions in aid of construction and building connection received up to 31 December 2002 and from 1 January 2011; advances from congestion management for maintenance or investments in the expansion of cross-border transmission capacities amounting to € 44.0 million (previous year: € 18.8 million) as well as various other advances for income in subsequent years amounting to € 35.7 million (previous year: € 40.6 million).

(11) Deferred tax liabilities

| IN € MILLION | 31 DEC. 2015 | CHANGE | 31 DEC. 2016 |
|------------------------------|--------------|--------|--------------|
| Deferred tax assets | 46.6 | 14.5 | 61.1 |
| Deferred tax liabilities | 157.7 | 28.6 | 186.3 |
| Liability gap deferred taxes | 111.1 | 14.1 | 125.2 |

The deferred tax liabilities arise essentially from valuation differences with regard to land and buildings as well as technical plant and machinery. These liabilities exceed the deferred tax assets, which stem mainly from differences in the valuation of provisions for pensions and similar obligations, other provisions and deferred income. The calculation was based on a tax rate of 31.33% (previous year: 31.24%).

(12) Guarantees and other financial obligations

The guarantees consist exclusively of liabilities from guarantee contracts totalling € 151.1 million (previous year: € 158.8 million), with € 147.7 million of this amount (previous year: € 155.9 million) relating to the joint liability for pension obligations stated in the partner RWE AG's accounts. Amprion is responsible for the economic burdens and relief.

Guarantees are provided only after a thorough review of the related risks and are restricted to the company's scope of business activities. Based on all indications available up until the preparation of the annual financial statements, it is assumed that the main debtors will be able to fulfil the obligations underlying the guarantees and that the guarantees will therefore not be called upon.

The aggregate total of other financial liabilities is € 425.2 million and relates to the following circumstances:

Purchase obligations for electricity procurement for the market-oriented balancing-out of grid losses in the amount of € 84.7 million have been entered for 2017 and 2018.

Order commitments in the amount of € 313.3 million related to submitted investment and maintenance orders and to framework agreements regarding purchase obligations.

Non-discounted financial obligations of € 15.2 million (thereof < 1 year: € 8.6 million) are related primarily to long-term property leases.


A payment obligation in the amount of € 11.9 million results from contracts for the purchase of land that will be legally and commercially conveyed after 31 December 2016.

Due to the transfer of certain pension scheme liabilities to RWE Pensionsfonds AG which took place in previous years, the company – in its capacity as employer – has a legally mandated funding obligation in the event of a possible shortfall in the pension fund in the future. This financial liability is currently not quantifiable.

Notes to the income statement

(13) Revenues

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 |
|--------------|--------------------------|--------------------------|
| Electricity | 12,613.2 | 11,849.1 |
| Other | 36.9 | 18.5 |
| | 12,650.1 | 11,867.6 |

Page 60  Electricity revenues essentially include revenues from the passing on of EEG expenses, network charges and income-neutral allocations. They are generated mainly within Germany.

The revenues pursuant to Section 277 (1) HGB as affected by the BilRUG are not comparable with the revenues of the previous year. The revenues of the previous year in accordance with the new regulations under BilRUG amount to € 11,878.6 million. The change is essentially related to income from leases that was previously disclosed under other operating income.

(14) Other operating income

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 |
|---|--------------------------|--------------------------|
| Reversal of provisions | 25.9 | 14.7 |
| Profits from disposal of non-current assets | 1.2 | 4.7 |
| Miscellaneous | 11.5 | 35.0 |
| | 38.6 | 54.4 |

Other operating income includes income related to other periods in the amount of €34.6 million (previous year: €38.5 million). Income of €2.5 thousand (previous year: €7.2 thousand) resulted from currency conversion.

In the previous year, a total of €11.0 million was reported under miscellaneous other operating income that in the current financial period is recognised as revenues because of the first-time application of the BilRUG. The amount is essentially related to income from leases.

(15) Cost of materials

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 |
|---|--------------------------|--------------------------|
| Cost of raw materials, supplies and purchased goods | -11,598.1 | -10,774.6 |
| Cost of purchased services | -570.2 | -600.8 |
| | -12,168.3 | -11,375.4 |

The cost of materials essentially consist of charges from EEG feed-ins and expenses for system services as well as income-neutral allocations.

(16) Staff costs

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 |
|---|--------------------------|--------------------------|
| Wages and salaries | -102.1 | -94.6 |
| Costs of social security, pensions and other benefits | -17.9 | -30.9 |
| - of which relating to pension | -2.7 | -16.9 |
| | -120.0 | -125.5 |

| | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 |
|---|--------------------------|--------------------------|
| Executive employees | 30 | 30 |
| Non-tariff employees | 235 | 214 |
| Employees covered by collective wage agreements | 934 | 870 |
| | 1,199 | 1,114 |

The figures stated above are related to the average employee equivalents employed during the financial year. Part-time employees are taken into account in proportion to their working hours.

(17) Other operating expenses

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 |
|---|--------------------------|--------------------------|
| Services | -34.1 | -32.2 |
| Losses from disposal of non-current assets | -9.1 | -5.5 |
| Impairments or losses from disposal of current assets | -0.3 | -0.6 |
| Miscellaneous | -50.7 | -42.5 |
| | -94.2 | -80.8 |

Other operating expenses include expenses related to other periods in the amount of €9.4 million (previous year: €6.1 million) and other taxes in the amount of €2.2 million (previous year: €2.1 million). Losses from currency conversion amounted to €1.6 thousand (previous year: €4.7 thousand).

Expenses for services relate largely to data processing and real estate management.

Miscellaneous other operating expenses essentially include expenses for fees and consulting services as well as for pre-retirement part-time employment obligations.

(18) Financial result

| IN € MILLION | 1 JAN. - 31 DEC. 2016 | 1 JAN. - 31 DEC. 2015 |
|--|--------------------------|--------------------------|
| Income from participations | 0.5 | - |
| Earnings from other securities and loans of financial assets | * | * |
| Other interest and similar income | 8.4 | 4.3 |
| Interest and similar expenses | -31.8 | -28.8 |
| - of which interest accretion | -16.4 | -6.6 |
| - of which remuneration for jouissance rights | -0.5 | -0.3 |
| | -22.9 | -24.5 |

* Negligible amount

Expenses and earnings from plan assets were netted against expenditures from interest accretion in accordance with Section 246 para. 2 (2) HGB. The resulting net amount is included in the item "Interest and similar expenses".

| | IN € MILLION |
|-----------------------------------|--------------|
| Netted income | |
| Other operating income | 2.3 |
| Other interest and similar income | * |
| | 2.3 |
| Netted expenses | |
| Interest and similar expenses | -13.2 |
| | -13.2 |
| Difference from offsetting | -10.9 |

* Negligible amount

(19) Taxes on income and earnings

Expenses arising from taxes on income and earnings relating to the the current financial year amount to €56.0 million; expenses for deferred taxes amount to €24.8 million. Tax income from previous years has an opposite effect.

Additional information

Directors and officers

The option pursuant to Section 286 (4) HGB was exercised and no disclosure of the total remuneration paid to senior management in the financial period pursuant to Section 285 no. 9a HGB was made.

Members of the Supervisory Board received remuneration in the amount of € 281.7 thousand during the financial year.

The members of the Supervisory Board are listed below:

- **Professor Heinz-Werner Ufer**
Lecturer at the Chair of Management Accounting and Control of the Technical University of Dortmund, Chairman
- **Dr Andreas Kretschmer**
Managing director of Ärzteversorgung Westfalen-Lippe
1st Deputy Chairman
- **Josef Frankemölle***
Chairman of the General Works Council of Amprion GmbH and Chairman of the Works Council of Amprion GmbH at the Dortmund site
2nd Deputy Chairman
- **Frank Amberg**
Head of Private Equity & Infrastructure of MEAG MUNICH ERGO AssetManagement GmbH
- **Detlef Börger-Reichert***
Deputy Chairman of the Works Council of Amprion GmbH at the Dortmund site
- **Christian Fuhrmann**
Member of the Management Board of Evangelische Zusatzversorgungskasse, Finance Director
• until 11 May 2016

* Employees' representatives

- **Malte Glasneck***
Chairman of the Works Council of Amprion GmbH at the Hoheneck site
- **Natalie Kornowski***
Chair of the Works Council of Amprion GmbH at the Brauweiler site
- **Dr Thomas Mann**
CEO of Ampega Investment GmbH
- **Christoph Manser**
Head of Infrastructure Investments of Swiss Life Asset Management AG
- **Fred Riedel**
Auditor, tax advisor
- **Manfred Rupp**
Head of Main Department Capital Investments Real Estate and Alternative Investments of
SV SparkassenVersicherung Holding AG
• since 11 May 2016
- **Uwe Tigges**
Member of the Management Board of RWE AG, HR Division

* Employees' representatives

The members of the senior management are listed below:

- **Dr Hans-Jürgen Brick**
Chief Commercial Officer and Chief Financial Officer
- **Dr Klaus Kleinekorte**
Chief Technical Officer

Auditor's fee

The total auditor's fee breaks down as follows:

| | IN € THOUSAND | OF WHICH FOR PREVIOUS YEARS |
|--------------------------|---------------|-----------------------------------|
| Auditing services | 154.2 | - |
| Other assurance services | 272.7 | 1.3 |
| Other services | 1.5 | - |
| | 428.4 | 1.3 |

Appropriation of net profit

The net profit for the financial year amounts to € 158.1 million. Pursuant to Section 16 (1) of the company's Articles of Association, senior management proposes to the Supervisory Board a distribution of € 100.0 million. In addition, senior management proposes the allocation of the surplus amount of € 58.1 million to other retained earnings according to Section 266 (3) III. no. 4 HGB for the purpose of creating appropriate reserves for future investments.

Events after the end of the reporting period

No significant events occurred during the period between the end of the reporting period and the preparation of the company's annual financial statements.

Information pursuant to EnWG

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The company's business activities are related exclusively to the area "transport of electricity". Consequently, the activity report required pursuant to Section 6b (3) EnWG is equivalent to the financial statements.

Dortmund, 22 March 2017

Management



DR HANS-JÜRGEN BRICK



DR KLAUS KLEINEKORTE

Independent auditors' report


We have audited the annual financial statements, comprising of the balance sheet, the income statement and the notes to the financial statements, together with the bookkeeping system and the management report of Amprion GmbH, Dortmund, for the business year from 1 January 2016 to 31 December 2016. In accordance with Section 6b, Paragraph 5 of the Energy Industry Act (EnWG), the audit also involved verifying the fulfilment of the accounting duties pursuant to Section 6b, Paragraph 3 of the EnWG, which stipulates that separate accounts be maintained and separate financial statements be prepared for activities defined in Section 6b, Paragraph 3 of the EnWG. The maintenance of the books and records and the preparation of the annual financial statements and the management report in accordance with German commercial law as well as compliance with the obligations specified in Section 6b (3) EnWG are the responsibility of the Company's management. Our responsibility is to express an opinion on the annual financial statements, together with the bookkeeping system, and management report as well as on the fulfilment of the accounting duties pursuant to Section 6b, Paragraph 3 of the EnWG based on our audit.

☰ Page 60

We conducted our audit of the annual financial statements in accordance with Section 317 of the German Commercial Code and German generally accepted standards for the audit of financial statements promulgated by the Institut der Wirtschaftsprüfer [Institute of Public Auditors in Germany] (IDW). Those standards require that we plan and perform the audit such that misstatements materially affecting the presentation of the net assets, financial position and results of operations in the annual financial statements in accordance with German principles of proper accounting and in the management report are detected with reasonable certainty and that the fulfilment of the accounting duties pursuant to Section 6b, Paragraph 3 of the EnWG can be verified with reasonable certainty in all material respects. Knowledge of the business activities and the economic and legal environment of the Company and expectations as to possible misstatements are taken into account in the determination of audit procedures. The effectiveness of the accounting-related internal control system and the evidence supporting the disclosures in the books and records, the annual financial statements and the management report as well as the fulfilment of the accounting duties pursuant to Section 6b, Paragraph 3 of the EnWG are examined primarily on a test basis within the framework of the audit. The audit includes assessing the accounting principles used and significant estimates made by the management, as well as evaluating the overall presentation of the annual financial statements and management report, and assessing whether the valuations and the allocations of the accounts pursuant to Section 6b, Paragraph 3 of the EnWG are appropriate and clear and whether the principle of continuity has been adhered to. We believe that our audit provides a reasonable basis for our opinion.

Our audit has not led to any reservations.

In our opinion, based on the findings of our audit, the annual financial statements comply with the legal requirements and give a true and fair view of the net assets, financial position and result of operations of the Company in accordance with German principles of proper accounting. The management report is consistent with the annual financial statements, complies with legal requirements, as a whole provides a suitable view of the company's position and correctly presents the opportunities and risks of future development.

Page 60  The audit of the fulfilment of the accounting duties pursuant to Section 6b, Paragraph 3 of the **EnWG**, which stipulates that separate accounts be maintained and separate financial statements be prepared for activities defined in Section 6b, Paragraph 3 of the EnWG, has not led to any reservations.

Düsseldorf, 22 March 2017

BDO AG
Wirtschaftsprüfungsgesellschaft

signed Eckmann
Wirtschaftsprüfer
(German Public Auditor)

signed Wiening
Wirtschaftsprüfer
(German Public Auditor)

Glossary

ARegV

The Ordinance on Incentive Regulation (Anreizregulierung – ARegV) is an official instrument for the regulation of monopolistic markets. As networks are seen as natural monopolies, in theory network operators do not have any incentive to maintain their efficiency and thus keep the costs of their services low. The Federal Network Agency therefore sets a revenue cap for network operators via the Incentive Regulation which is stipulated on the basis of the efficiency ratings of the most favourable network operator. Within this framework, network operators are allowed some leeway, for example for investments in the network. The difference between the revenue cap and actual revenues is placed in a regulatory account by the Federal Network Agency. The revenue cap is implemented through the transmission charges. If revenues exceed the cap by more than 5 %, the transmission charges must be adjusted.

EEV

The Renewable Energies Regulation (Erneuerbare-Energien-Verordnung) regulates the marketing of electricity generated from renewable sources. This electricity must be sold at the level of the transmission network operator and must no longer be sold by energy utilities which supply end customers. In addition, the EEV contains provisions on calculating the EEG allocation.

BBPlG

The Federal Requirement Plan Act (Bundesbedarfsplangesetz, BBPlG) contains 47 of the grid expansion projects certified as necessary by the Federal Network Agency which must be implemented by the transmission system operators. They are considered to be necessary for the energy industry and are urgently required. The Federal Network Agency normally carries out federal planning for these projects.

www.netzausbau.net

EEG

The Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG) regulates the preferential feed-in of electricity from renewable sources, such as wind, sun, water or biomass, into the German electricity grid. This is intended to allow the operation of regenerative generation facilities on a financially sustainable basis. According to EEG, network operators are obliged to accept electricity from these facilities and market it in the spot market on the electricity exchange. The law also lays down fixed rates of remuneration for electricity from renewable sources. The difference between the remuneration and the price achieved in the spot market is balanced out via the EEG allocation.

EnLAG

The Power Grid Expansion Act (Energieleitungsausbaugesetz, EnLAG) regulates the accelerated expansion of power lines in the extra-high-voltage transmission network and the introduction of technologies such as “high-voltage direct current transmission”. Attached to the law as an appendix is a Consumption Plan which contains the planned construction projects for the expansion of the transmission networks.

EnWG

The Energy Industry Act (Energiewirtschaftsgesetz, EnWG) contains fundamental regulations on the law on power-line-based energies. EnWG has the goal, among others, of ensuring a “best possible secure, affordable, consumer-friendly, efficient and environmentally sustainable” energy supply to the general public. This includes safeguarding effective and transparent competition on the energy market. The law also contains regulations on the supervision of the network operations by the regulatory authorities.

Federal Network Agency

The Federal Network Agency (Bundesnetzagentur, BNetzA) is a regulatory body that supervises, maintains and promotes competition in the network markets (electricity, gas, railway tracks). Once a year, the Federal Network Agency reviews and approves the Power Grid Development Plan and its basis as produced by transmission system operators and the scenario parameters for the development of electricity generation for the next ten years.

NEP

The Power Grid Development Plan (Netzentwicklungsplan, NEP) sets out the expansion projects in the German transmission network in the following ten years. The Power Grid Development Plans are developed by the four transmission system operators on the basis of assumptions about the development of electricity generation and consumption, the scenario parameters. The plan was created in 2012 for the first time and as of 2016 is to be developed further every second year.

Overhead power line

Overhead power lines – also known as overhead transmission lines – are electrical transmission lines where the conductor ropes – unlike underground cables – are insulated by the surrounding air. For the foreseeable future, overhead power lines will continue to be the most economical form of power transmission, particularly over long distances.

Transformer station

This is a junction in the electricity grid. Several high-voltage and extra-high-voltage transmission lines converge at a transformer station. In these facilities, individual electricity circuits can be selectively switched on and off. It is also possible to direct the electricity via the transformers – voltage converters – to be distributed further on grids with lower voltage.

Underground cables

The use of underground cables is widespread among lines for supplying towns and in regional electricity networks. On the other hand, in sections with 380 kilovolts, underground cables are unusual. Pilot sections with underground cables are provided for in EnLAG, for example, when a line is located less than 400 metres from a residential area. Cabled sections are essentially more cost-intensive than overhead power lines. The additional costs are passed on to the consumer through network use charges.

IMPRINT

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CONCEPTION AND DESIGN

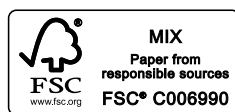
3st kommunikation GmbH

PHOTOS

Rüdiger Nehmzow [pages 4–5]
Marcus Pietrek [page 7]

PRINTING

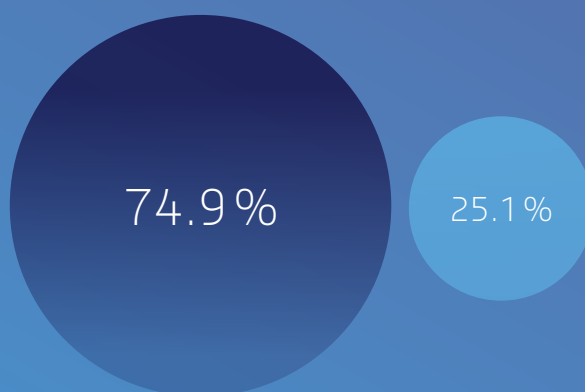
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NOTE

This is a translation of the German version. In cases of uncertainty or conflict, the German version shall prevail.

SHAREHOLDER STRUCTURE



■ M31 Beteiligungsgesellschaft mbH & Co. Energie KG* ■ RWE AG

* M31 Beteiligungsgesellschaft mbH & Co. Energie KG is a consortium of German institutional investors from the areas of insurance, pension funds and pension plans, including MEAG MUNICH ERGO, Swiss Life and Talanx as well as medical pension funds.

KEY FIGURES 2016

€ 10,498 MILLION € 2,152 MILLION

in income generated by Amprion from the revenue-neutral management of the EEG equalisation mechanism.

generated in revenue from the network business.

€ 567 MILLION

invested by Amprion in the modernisation and expansion of its grid.

€ 158 MILLION

net profit made by Amprion.

CONNECTED TO EUROPE

The Amprion grid is located in the heart of Europe and connected to the grids in the Netherlands, Luxembourg, France, Austria and Switzerland through cross-border interconnectors. Amprion is working towards making the European electricity network even more secure and efficient through numerous cooperations and projects.

COOPERATION WITH EUROPEAN PARTNERS

Amprion works intensively in many areas with other European transmission system operators. The topics of system security, network planning and development of transmission technology are the main focus.

SECURITY SERVICE CENTRE (SSC)

In the SSC in Rommerskirchen near Cologne, there is a joint team of experts from Amprion, TenneT Netherlands and Germany supporting the security management and the extra-high-voltage network in Germany and the Netherlands.



JAO

Together with 19 European transmission system operators, Amprion has a holding in the Luxembourg company JAO (Joint Allocation Office). The company acts as a central auction platform and contact point for the provision of transmission capacities for electricity trading in the European Union.

ENTSO-E

As part of the “European Network of Transmission System Operators for Electricity” (ENTSO-E), Amprion is continuing to develop the European electricity network together with 40 transmission system operators. The key challenges are promotion of the EU internal market for electricity, network expansion and developing rules for network operation.

Amprion

TSC SECURITY COOPERATION (TSC)

Together with 12 European transmission system operators, Amprion is involved in the security cooperation TSCNET Services. TSC supports the transmission system operators in the coordination and planning of network operations, the forecasting of network bottlenecks and the calculation of available transmission capacity.

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June 2017

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