

**VOITH**

MAGAZINE FOR HYDRO POWER TECHNOLOGY

# HyPower

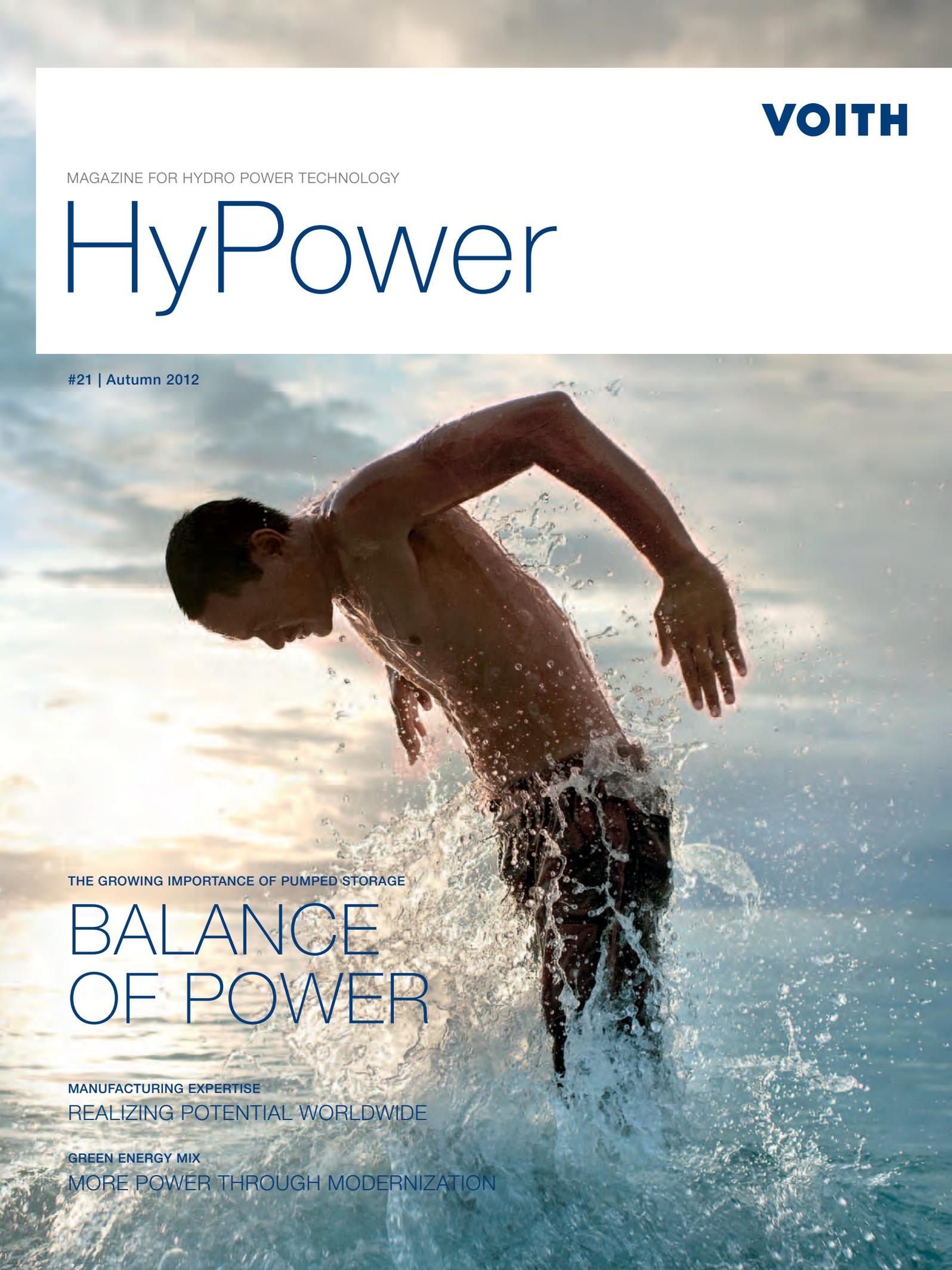
#21 | Autumn 2012

THE GROWING IMPORTANCE OF PUMPED STORAGE

## BALANCE OF POWER

MANUFACTURING EXPERTISE  
REALIZING POTENTIAL WORLDWIDE

GREEN ENERGY MIX  
MORE POWER THROUGH MODERNIZATION



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Alexanderstr. 11  
89522 Heidenheim, Germany  
[www.voith.com](http://www.voith.com)

Editor: Ute Böhringer-Mai  
Editorial coordination: Vesna Stirnadel  
Tel: +49 7321 37 0  
Fax: +49 7321 37-7828  
Email: [info.voithhydro@voith.com](mailto:info.voithhydro@voith.com)

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## TEAMING UP FOR A SUSTAINABLE FUTURE



**Tremendous amounts of electricity** are needed to power economic growth and development around the world. Delivering that energy in a way that is both reliable and sustainable is a task that cannot be accomplished in isolation. It requires highly productive teamwork across borders.

Within Voith Hydro, international cooperation is a core principle. Successfully managing the full range of products and services in order to provide global excellence requires intensive, intercultural teamwork. In this issue of HyPower you will find out more about how working hand-in-hand makes it possible to ensure consistency and provide local expertise in a global context – from Brazil to China and beyond.

Above all, however, effective cooperation means listening to and working with our valued customers and partners. Through phases of hydro power site planning, construction, operation, services or modernization, we view plant operators and other stakeholders involved as long-term partners with whom we share a common future – a future in which hydro power will be indispensable because of its essential contribution to limiting global warming and to reaching ambitious climate-protection goals.

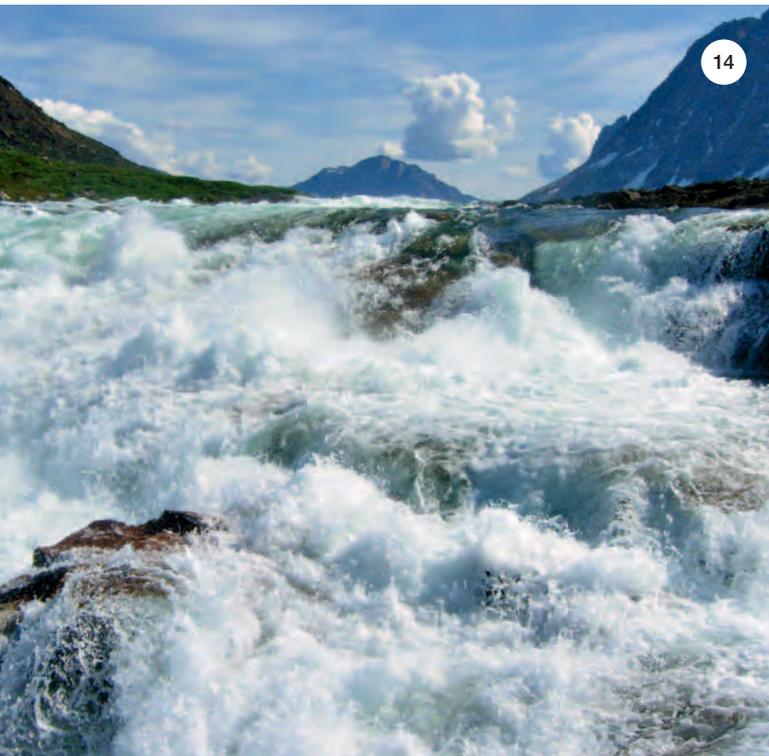
Looking beyond hydro power, we see a strong need for cooperation within the renewable energy mix. One example is pumped storage, which can contribute significantly to the further growth of wind and solar power plants by acting as a “battery,” thus providing necessary grid stability.

In this issue, we hope that you will gain valuable insight into how cooperation is delivering benefits around the world. Enjoy the read!

Yours sincerely,

A handwritten signature in blue ink that reads "Ute Böhringer-Mai". The signature is fluid and cursive, written on a light-colored background.

Ute Böhringer-Mai  
Head of Communications



Discover more about the world of Voith in its other insightful publications.

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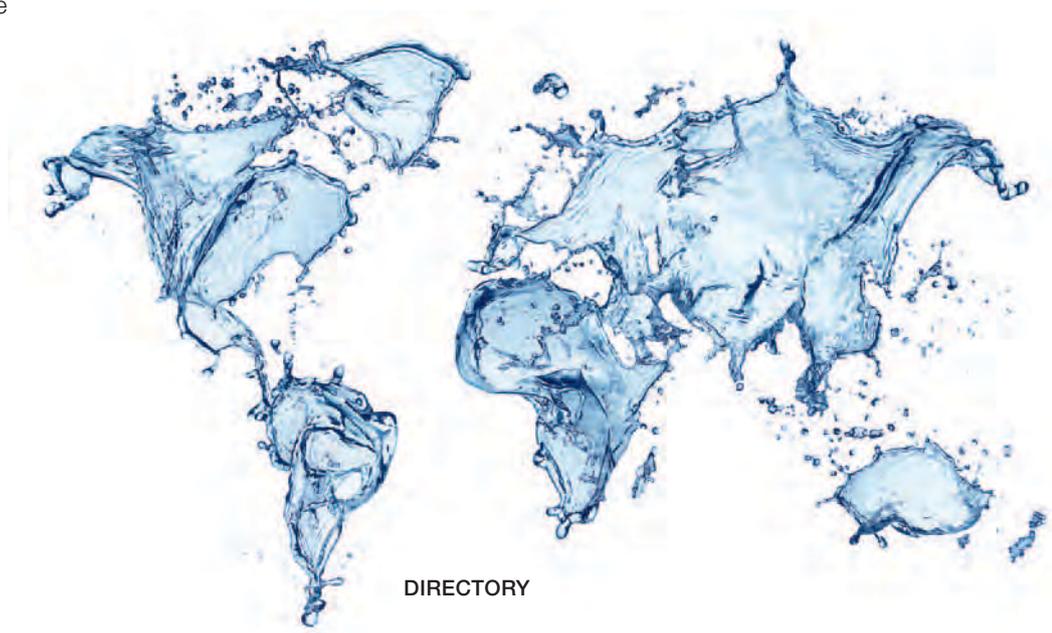
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## BREAKING NEW GROUND IN MODERNIZATION

**BRAZIL** Voith Hydro Brazil recently signed a contract with AES Tietê for the modernization of Água Vermelha (also called José Ermírio de Moraes), located on the Grande River, on the border between the states of São Paulo and Minas Gerais. The order value for the company totals around €80 million. The Água Vermelha plant houses six large-scale generating units amounting to a total rated capacity of 1,396 MW. Voith's

modernization work will comprise an overhaul of the turbines and gates, and the repair of the generators, as well as all other associated electromechanical systems. Many of them will be completely renewed. The contract for Água Vermelha represents one of the largest modernization contracts ever tendered in Brazil, and it is the largest ever to be undertaken by a single company. //

## BEST-IN-CLASS IN BRAZIL

**BRAZIL** As recognition for its continued excellence, Voith Hydro Brazil recently picked up two important awards. The company was chosen as market leader in Brazil's capital-goods sector by *Exame* magazine, one of the country's most important business media publications. A total of 3,500 companies were assessed for the report's 18 business sectors, placing Voith Hydro firmly among Brazil's leading performers. It is "an acknowledgement of our commitment to Brazil," says Osvaldo San Martin, President and CEO of Voith Hydro Brazil.

In the inaugural edition of the *Época NEGÓCIOS 360°* yearbook, Voith Hydro Brazil picked up another award, this time as best company in the mechanical and metalworking category. In addition to financial results, the ranking



was made according to factors such as corporate governance, social and environmental responsibility, and vision for the future. "Our management model and results have made us stand out in the market," sums up a delighted San Martin. //



## MILESTONE REACHED

**UNITED STATES** 2012 represents the 135th anniversary of hydro power in York, Pennsylvania, home of Voith's North American headquarters. A celebration was held at the Voith facility, with employees and their families, customers and special guests, including Governor Tom Corbett (pictured above) and Todd Platts, a local congressman, all of whom who came to congratulate and recognize 135 years of hydro power "made in America." They focused on the importance of the hydro power industry for the region, with Corbett explaining that "it isn't just powering our homes and businesses, it's also powering our economy, our recovery and our prosperity, too."

It was back in 1877 that Stephen Morgan Smith originally began designing and manufacturing hydraulic turbines in the area. Members of the Voith family would travel over from Germany by steamship to visit the facility, before Voith eventually acquired the location in 1986. At the end of the 19th century 20 people worked at the facility, but it now employs more than 500, and supplies a full range of hydro power equipment and services to the United States and beyond. "Voith will continue to provide the equipment that generates the renewable energy to power America and drives economic growth for its people," said the Voith Hydro President and CEO, Kevin Frank. //

## STRENGTHENING BONDS

**GERMANY** Governor Mo Fuchun led a recent visit to Voith Hydro headquarters in Heidenheim by the Minhang District government, part of the Chinese metropolis of Shanghai. During the visit, Voith Hydro CEO Dr. Roland Münch introduced the company's history, technology and future development plans in China. Mo expressed his thanks to the contributions that Voith Hydro Shanghai has made to the economic development of Minhang. "Minhang District government has always been committed to providing a business-friendly environment. We will continue to do our best to support the development of Voith in Minhang." //



The Chinese delegation together with Voith Hydro management in Heidenheim.

# DEVELOPING FUTURE PROSPECTS

Within the set of renewables, only hydropower can provide the stability needed to supply modern industries with constant electricity. However, the structures required must be further developed. Voith Hydro CEO **Dr. Roland Münch** on the future prospects for hydro.

“In Brazil, where our focus has been on new projects, we are now pursuing more and more work in modernization.”

## **The financial year just closing was another successful hydro year for Voith. What were your personal highlights?**

After a weaker order intake for us in Asia, we have revived the potential in this region. Voith Hydro was able to obtain new, large-scale projects in both India and China. In Brazil, where our focus has been on new projects for many years, we are now pursuing more and more modernization work. After decades of operation, many power companies are now upgrading their fleets – a similar trend to the one we saw in the United States 20 years ago. Talking about Europe we were particularly successful in the Eastern European market and in Russia. Providing reliable and sufficient renewable power solutions is a key topic.

## **What developments have you seen recently in the market?**

While we are working on a number of very large, complex projects in our workshops, we are simultaneously seeing an increased trend toward decentralized solutions. This is especially evident in the small hydro segment, where more and more private operators and investors are seizing the initiative.

## **What do you think this means for the future of the industry?**

For me it's very clear that hydro power – being a proven, mature technology – continues to play an important part in the future renewable energy mix. It has a lot of untapped potential. Take small hydro for example: Voith Hydro specifically addressed this field and comes up with ecologically friendly solutions and new innovations that can be used to tap new potential; potential that needs new technically feasible and cost-effective solutions like very low head locations. As a result, areas that may not have been economically viable in the past have become attractive for power generation. In Central Europe alone we could generate a total of 600 MW of climate-friendly power with this type of small hydro power plant.

## **What is driving the search for innovation in a mature technology like hydro power?**

It's a matter of slowing global warming. Climate change is one of the most pressing problems of our time. If we want to decrease CO<sub>2</sub> emissions, the percentage of power supplied from renewable sources has to increase dramatically. To

“Government policies need to promote renewable energy sources in a way that allows hydro power to maximize its contribution to supply reliability.”



make that happen, we have to look at all possible solutions, which is where hydro power can demonstrate its versatility. Currently, less than 15 percent of all dams around the world are used for power generation – a sign of just how huge the potential is from upgrading existing dams and locks alone. The impact on the environment would be relatively low. We’re working on the future prospects of hydro power and that’s why we keep enhancing the technology, even though it is already very well engineered.

**Can comparatively small solutions satisfy the world’s need for energy? The International Energy Agency estimates that demand will increase by around 50 percent by 2030.**

Precisely because of its versatility, hydro power is an essential part of the energy mix needed for this growing demand. It is base-loadable and can also produce operating reserve for load- or demand-related peaks. Additionally, hydro power can be integrated in centralized as well as in decentralized power supply structures. Part of the world’s demand for energy is driven by numerous regions that are intently pursuing development. For many countries, electrification has been the first step to continued economic and social development. Hydro power is the most proven and important of the renewable en-

ergy sources that are currently available. There’s no question that it will play a significant role in covering this increasing global energy demand.

**Given these favorable prospects for hydro power, what are the challenges facing power plant operators?**

There are certainly structural considerations that must still be overcome. Approval processes for hydro power plants – and I don’t just mean large-scale infrastructures – remain very complex and take far too long. In addition, government policies need to promote renewable energy sources in a way that allows hydro power to maximize its contribution to supply reliability. In comparison with other energy sectors, the hydro industry receives less support and faces more hurdles. Hydro power is the only way to provide stability alongside the fluctuating power supply from other renewable sources; pumped storage is the only technology with which we can store energy in a cost-effective manner on an industrial scale. However, the commercial models available to utility companies on the market are not sufficiently developed to meet this critical function. This issue calls for government policies and the creation of structures that will make the power supply reliable. //



The picturesque scenery along the Glomma River holds one of Norway's most important power sources.

# VITAL SOURCE

Crucial to Norway's power supply, the **Glomma River delivers more than stunning beauty** and forms the backbone to Voith Hydro's full spectrum of local services.



The Glomma River is the longest in Norway and has long been an important source of hydro power and a means of transport.

The plunging waterfalls and turbulent rapids of the Glomma River as it rushes down mountains and through forests are the spectacular backdrop to Voith Hydro's operations in Norway.

Harnessing the power of the Glomma River is vital to the region's energy needs: almost all of Norway's electricity is generated by hydro power plants, and many of these plants are located along the river's almost 600-kilometer journey to the sea.

At over 30,000 MW, Norway is the sixth-biggest market in the world in terms of hydro power capacity. In such a mature marketplace the modernization of existing systems is crucial. "It is



Efficiency gains can make modernization worthwhile more than once in a plant's lifetime.

our main focus," explains Dr. Gerhard Blaschitz, Managing Director of Voith Hydro in Norway. "The majority of plants here are 50 years old."

Some are even older: the company's relationship with the longest river in Scandinavia began nearly a century ago when it supplied three turbines to the original Rånåsfoss plant on the Glomma in the early 1920s. This sort of commitment means a great deal to Akershus Energi, which runs Rånåsfoss and came back to Voith when it decided to build a completely new plant on the site.

Voith is now delivering six complete new vertical propeller turbines, generators, power house crane, switchgear and control systems, which will be the heart-beat of the new Rånåsfoss III. "This is a continuation of a unique relationship that's lasted 90 years," laughs Bjørn Dag Gundersen, information director at Akershus. "It's been a good relationship – that's why we re-hired them!"

**At Rånåsfoss II**, on the other side of the Glomma, Voith modernized the control system and switchgear equipment for a Kaplan unit earlier this year. "To build a new power plant is very expensive, so it is very important that they last as long as possible," points out Gundersen.

"Modernization can extend a plant's lifetime by up to 50 years and can be done not once, but several times," says Blaschitz. It's a service that Jan Øystein Rafoss at E-Co Energi also appreciates. His company manages one of the biggest plants on the Glomma, at 215 MW. "New turbine runners with better design, new transformers and control systems that optimize the running of the turbines can increase efficiency."

Between 1999 and 2003, Voith delivered new turbine governors to Solbergfoss I, as well as flow controllers for all machines and gates, while in 2009 it supplied and installed new control systems, updated switchgear equipment

and provided a new turbine governor for Solbergfoss II.

**Having a world leader** in full-line hydro power solutions handling such work is crucial, Rafoss believes. "It gives me a feeling of security – I know I will receive solid, technical solutions and that I always have the necessary help when needed."

Blaschitz is gratified to hear it. "Voith's scope and expertise means customers get their solution from one company, which is taking full responsibility," the Austrian says. In Norway's liberalized energy market, electricity from hydro power operations on the Glomma could be used almost anywhere, and he is convinced that ongoing modernization can help increase capabilities. "There is some potential for creating additional capacity – we can find room for improvement," he concludes. "We can do more." //

# SUPPLYING DEMAND

Three recent projects highlight Voith Hydro's expertise as **a turnkey supplier** of a comprehensive range of services.

With its twofold roots – based on the long-term expertise of both Voith and Siemens – Voith Hydro can look back on over 100 years of know-how and experience in the turbine and generator business. In view of this DNA, the company has positioned itself as a true full-line supplier for hydro power plants since the joint-venture a little over a decade ago.

Three recent projects – two in Turkey and one in Guatemala – tell the story of Voith Hydro as a water-to-wire provider of small and large hydro power plants on two continents. They also show the company's ability to custom-engineer equipment for individual plants and its skill in managing large-scale projects with thousands of details. That expertise can be useful for handling the surprise challenges that can arise, such as having a construction road in the Guatemalan jungle blocked for months at a time.

As the general contractor for the three projects, Voith Hydro took over the job of coordinating and managing suppliers and vendors that provided non-core parts; meanwhile, Voith kept its focus on engineering and those components which are based on the firm's knowledge.

"Twenty years ago, it was common practice for energy companies to buy systems from different suppliers and take responsibility themselves for compatibility and functioning," clarifies

Murat Cetinkaya, project manager at the Akköprü plant located in southwest Anatolia, Turkey. "But that requires much expertise and coordination. Now, many energy companies seek turnkey suppliers."

The Akköprü project, started in 2002, was among the company's first turnkey projects. The plant there now supplies vacation regions like Antalya and Marmaris with 120 MW of power. Voith Hydro was completely responsible for engineering the power plant, including mechanical, electrical and automation systems. It also oversaw the assembly and commissioning.

"We handed our client a full electricity-producing power plant," comments Cetinkaya. "By using us as a turnkey partner, the power company met its production goals faster and spared itself the job of coordinating a dozen contractors. One contract with one sub-supplier simplified everything."

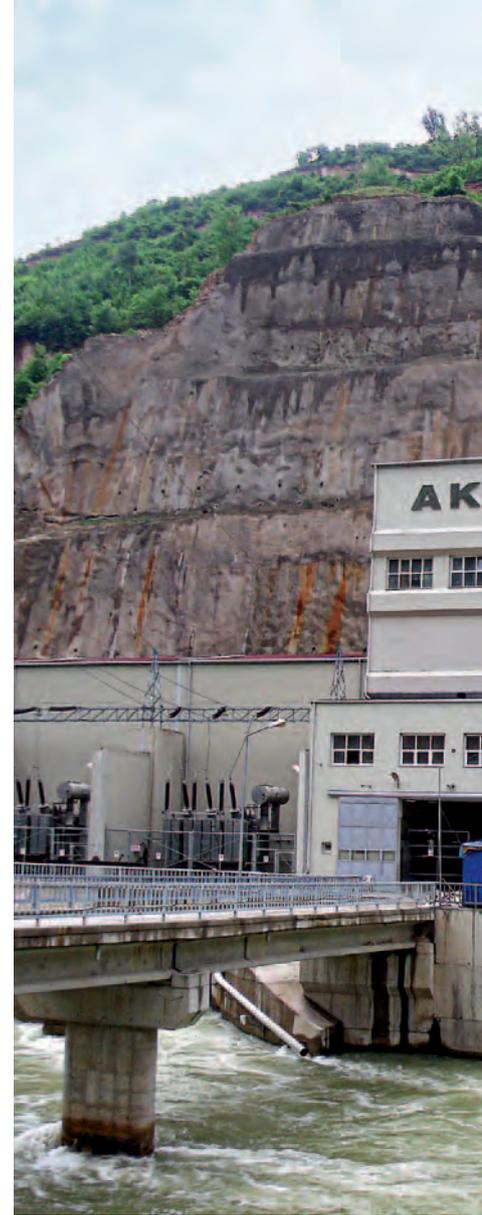
Turkey's Ministry of Energy and Natural Resources decided to build the Akköprü dam and hydroelectric power plant in order to protect from flooding, provide irrigation and produce renewable energy.

The country's water authority, DSI, entrusted the Austrian Division of Voith Hydro, Voith Hydro St. Pölten, with the job of supplying the power plant. It included delivering two Francis turbines, each with 59.3 MW, governors, two generators, excitation systems, the protec-

tion system, main butterfly valves, the automation system, main transformers, controlling units and the switch yard.

**Turnkey services** with custom engineering were also the focus of another project performed by Voith Hydro in Turkey. Some 1,400 kilometers to the northeast of the Akköprü site, near Turkey's Black Sea coast, Voith has installed the Akköy I and Akköy II plants for Akköy Enerji, a private Turkish investor.

The Akköy II order for a 234 MW plant encompassed all of the required electromechanical equipment. This included two Pelton turbines using a 1,220-meter water head – which makes the project the highest-head Pelton application in Turkey.





Akköy Enerji's plant is the highest-head Pelton application in Turkey.



Jungle power: with an overall capacity of 86 MW, the hydro power plant in Palo Viejo will avert 280,000 tons of CO<sub>2</sub> emissions per year.

“The combination of a high head and high rotation speed makes the design sophisticated, especially for the rotating parts like the generator rotor and the bearings. In addition, the high efficiency of the turbine was an exciting challenge for our hydraulic engineers,” explains Harald Fohleitner, the Voith project manager.

The order came after that for the 103 MW Akköy I plant, which has three Francis turbines and was handed over in 2008. Voith was named the head of the Akköy II consortium in September 2008, and Akköy II was handed over to the customer in mid-2012.

**In Central America,** project management skills complemented the engineer-

ing expertise needed for Voith Hydro's work in Palo Viejo, Guatemala. At a site nestled some 300 kilometers into the Guatemalan jungle, Enel America Latina S.A. decided to build a hydroelectricity plant with two vertical Francis turbines and generators that produce a maximum of 86 MW of power.

The Italian company contracted with Voith Hydro São Paulo, Brazil, for a turnkey project at the Palo Viejo site. In addition to project management, engineering, transportation, erection, commissioning and training, Voith Hydro also delivered two 370-meter head power units, two spherical valves, two step-up transformers, the automation system and further electrical and mechanical ancillary equipment.

The main challenges facing this project were the tight timeline and transportation of materials to the construction site on a road that had to be especially built for that purpose, says Leonardo Colombini, the Voith project manager.

“We exceeded customer expectations regarding the operation runability of the plant,” comments Colombini.

The Palo Viejo plant was handed over to the customer in May 2012. “As a whole, the project allowed Voith to show our engineering reliability and our creativity in project management,” Colombini concludes. //

## SUCCESSFUL PARTNERSHIPS



1 Located on Greenland's west coast, Sisimiut has a thriving fishing industry and is a growing industrial center.

2 The demanding terrain made equipment delivery particularly challenging.

3 Extreme weather conditions limited access to the town and meant the power plant project had to run according to a tight schedule.



2

3



# WHERE THE WEATHER SETS THE RULES

From **freezing temperatures to swarms of mosquitoes** – the Arctic challenged a construction team made up of workers from 13 countries.

Some 100 km north of the polar circle, on a fjord on Greenland’s western coast, a new hydro power plant is bringing electricity to the town of Sisimiut, one of Greenland’s fastest-growing communities.

Constructing the plant there was no easy feat: the site has no road access, and ice blocks sea transport from late November to the beginning of June.

Istak, a construction company that works closely with Kössler, the Voith Hydro subsidiary in Austria specialized in small power plants, managed the construction of the plant, which began in 2007. During the three-year project, Guðmundur Þórðarson, Istak’s project manager on site, not only faced -35°C temperatures and logistical challenges, but also swarms of mosquitoes so bad you could hardly go outside, emergency medical evacuations and a fire that broke out at 5:00 a.m. “It didn’t take us long to figure out that we not only had to

build the plant in this difficult location, but we also had to be our own doctors, social workers and firefighters,” reports Þórðarson.

Nukissiorfiit, a government-owned energy company in Greenland, asked Istak and a consortium of its partners to build the hydroelectric plant underground to protect it from the harsh climate. The plant was needed as a replacement for diesel-powered generators that were nearing the end of their life cycles. Denmark, which administers Greenland, has embraced renewable energy in cooperation with the island’s government and was therefore keen to avoid putting in more generators that run on fossil fuels. The new hydro power plant – which saves 6.5 million liters of diesel a year – can produce 58 GWh of electricity a year.

Kössler supplied key technology for the hydro power plant, including two 7.5 MW Francis turbines and genera-

tors, the main inlet valves, the hydraulic power unit, cooling system, turbine control systems and spare parts, says Karl Henninger, who works in sales at Kössler and was involved in the project. Kössler designed the equipment to meet special requirements for the regulated units and the control system, since the plant needed to handle variable loads in short times to guarantee a stable, isolated grid. The Austrian company also delivered parts that were packed seaworthy to Aalborg, Denmark; from there, Istak took over the task of moving equipment to Greenland.

**For Þórðarson**, managing the project was a constant battle with the calendar. “We had a tight schedule due to the climate. Many of our decisions were driven by weather.”

In June of 2007, Þórðarson’s team received its first shipment of construction equipment, including excavators and containers. About a year later, the first Kössler equipment arrived – steel pipes for the waterway from the turbine. “We had a landing craft barge that transported items from Sisimiut’s harbor to the site. It was the kind of barge you could use for armory,” he recounts.

The spirals of the Francis turbines were set for delivery in October 2008. However, extreme weather conditions made things difficult by covering the spirals with snow during transport into the cavern. ▶

“It didn’t take us long to figure out that we not only had to build the plant in this difficult location, but we also had to be our own doctors, social workers and firefighters.”

Site manager Guðmundur Þórðarson.



1 A view inside the powerhouse of Sisimiut with its two generating units.

2 One of the two 7.5 MW Francis turbines is taken into the access tunnel.

3 The project team prepared for two years to receive the turbines and generators.

▷ In 2009, the two Kössler-provided generators, manufactured by LDW in Bremen, arrived, each weighing 30 tons. “We had been working there for two years, preparing everything for the turbines and generators,” says Þórðarson. “The generators were put on a trailer in Sisimiut using harbor equipment. Workers moved the trailer onto the landing craft barge and sailed to the construction site at the so-called ‘Second Fjord,’ or ‘Kangerluarsuk Ungalleq,’ where the trailer was rolled off the barge and into the powerhouse. We used the overhead crane in the powerhouse to lift the generators from the trailer and lower them down to their final position,” the Iclander says.

A team of up to 120 people from 13 countries worked on the construction at peak times. It was a project that tested the team’s management flexibility and ingenuity, says Þórðarson. “You can’t just pick up the phone and call for service. If you have a problem, you’ve got to fix it. You’ve got to have spare parts on hand and solutions for problems.”

The work also tested Þórðarson and his team in ways they hadn’t expected, like being asked to organize an urgent sea ambulance transport for a local resident who fell sick, or fighting the blaze of a fire that engulfed the camp’s diesel generator in the early hours of the morning. Despite the various setbacks, the site manager and his team commissioned all the equipment and provided the residents with the power they needed for the winter of 2009 – six months ahead of the planned completion date.

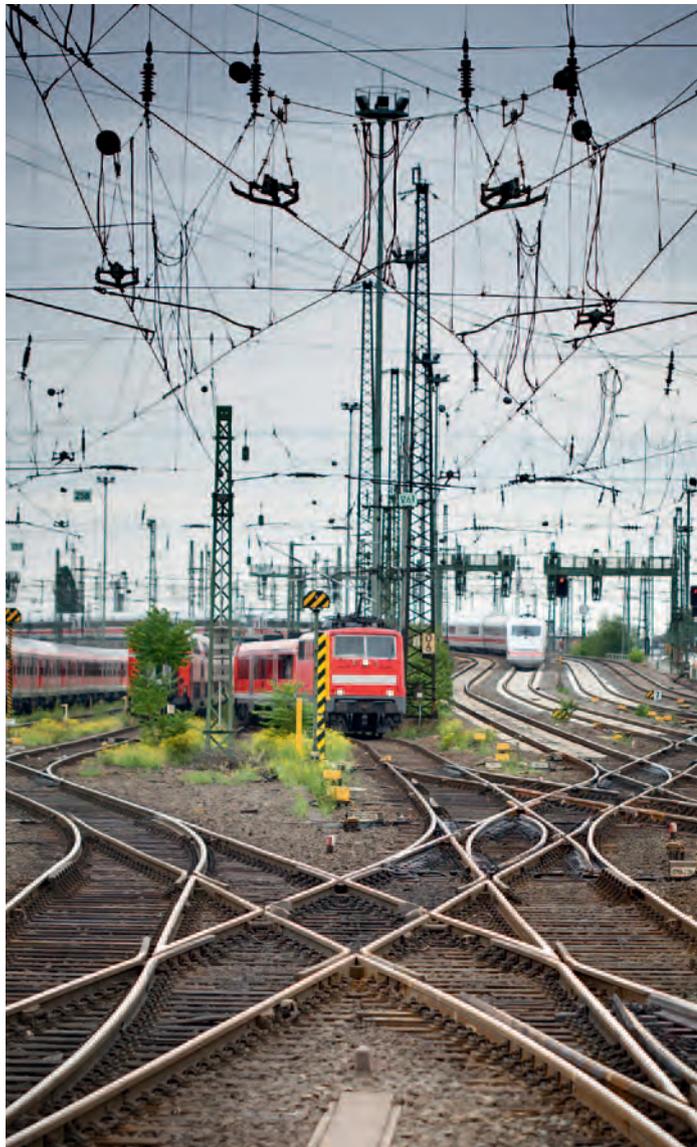
Such was the success of the project that shortly after the Sisimiut plant was in operation, Istak contracted with Kössler again to build the Ilulissat plant, further north on Greenland’s western coast. It is to be taken into operation in part in late 2012. //

“You can’t just pick up the phone and call for service. If you have a problem, you’ve got to fix it.”

Guðmundur Þórðarson.

# MOVING THE MASSES

Hydro power is a **vital contributor to a special network** that generates electricity for Germany’s rail system.



Deutsche Bahn is the single largest consumer of electricity in Germany and requires its own special network.

The next time you’re about to get on a long-distance train, look up. The chances are that your train is powered by electricity supplied by overhead lines, but the story of how the electricity got there in the first place is not a simple one. And trains need a lot of power.

Deutsche Bahn is the single largest consumer of electricity in Germany – in 2009, 10.9 terawatt-hours – but this power does not come from the same system that runs our TVs and lights our homes. For a number of technical and historical reasons, the German rail system uses a lower frequency of electricity than the normal consumer network: 16.7 Hz, instead of 50 Hz. This means that the rail system needs its own network, with its own generating power stations as well as its own cable and transformer system, and just like its big brother, the pressure is on this network to embrace green energy.

**Increasing the proportion** of renewable electricity in a network is not quite as simple as building new wind, hydro and solar facilities, however. Unlike coal or nuclear, which can deliver energy consistently and around the clock, the power from wind and solar facilities is intermittent and highly dependent on the elements. An additional challenge in the special rail network is the extremely varied and unpredictable consumption profile.

In order to level off this fluctuation and make sure that unused energy doesn’t go to waste, the network has a tried and trusted solution: pumped-storage hydroelectricity plants. Originally built to balance the different demands of the system at different times of day, stations like this can react instantly to the constantly changing demands of the network, to deliver energy when it’s needed and store it when it isn’t. The pumped-storage hydroelectric station at Langenprozelten, in the south of Germany, is the only facility of its kind in the country’s rail electricity network, and it makes up a significant proportion of the network’s total capacity. In the 1970s, Voith equipped the plant with two pump-turbine units. Today it is the responsibility of Voith Hydro in Heidenheim to offer best services in order to keep the station running at full capacity and optimum efficiency with regular inspections and maintenance, so it can make sure that the trains have the electricity they need, when they need it, to take us where we want to go. //



# GLOBAL COOPERATION: THE PEOPLE FACTOR

At Voith Hydro's manufacturing operations, international cooperation is much more than just a corporate concept – it's an integral part of how people do their jobs every day, as the examples of China and Brazil illustrate.

The career of Helio Moino, Vice-President for Inter-Company Business Cooperation (ICC) and Head of the Electrical Workshop in Shanghai, demonstrates just how Voith is driven by global knowledge-sharing. “The company set up manufacturing activities in Brazil in 1964 and built everything up from zero, with German experts bringing their knowledge to the locals. The process took several years and then the first generation of Brazilian managers, of which I was one, began to take over.”

Moino was Head of Manufacturing for Voith Hydro Brazil from 1994 to 2003, before going to China to train local managers so that they could take charge. “It’s the same cycle all over again, but this time I am the one transferring knowledge,” he says proudly.

“Voith Hydro Brazil is an exporter of expertise for other Voith Hydro operating units. We provide knowledge-transfer and assistance in developing new processes,” explains Carlos Macedo, Head of Foundry in São Paulo and Head of Health, Safety and Environment.

Huang Zhengguang, Manager of the Mechanical Workshop at Voith Hydro Shanghai, believes that Voith’s emphasis on international knowledge-sharing is one of the reasons for the company’s success in China. He says, “The Chinese hydro power market is getting more and more competitive, but Voith Hydro Shanghai, which models itself on other Voith operating units, continues to stand out for its quality. To further improve our costs and delivery times, I will soon be going to São Paulo for more training in boosting operational efficiency.”

**Just as Voith Hydro Brazil** started from scratch to become a benchmark in global manufacturing, Voith Hydro Shanghai is not only involved in many of China’s most ambitious hydro power projects, but also exports a certain extent of its production. Voith Hydro Brazil continues to provide support: a team from São Paulo recently traveled to Shanghai to train welders, and the plant has seen a marked rise in welding quality as a result.

Sharing knowledge internationally has obvious benefits but requires an open mind. Dr. Udo Wunsch, Head of Voith Hydro Holding’s international production division, explains the routine of knowledge-sharing: “All Heads of Manufacturing worldwide meet on a regular basis to discuss recent experience from their projects. Between these meetings they form a network and permanently discuss upcoming questions and issues bridging the geographical distance. On an operational level all special-matter experts are cross-linked and



“It’s the same cycle all over again, but this time I am the one transferring knowledge.”

Brazilian Helio Moino on passing on the expertise he learned from German colleagues to managers in China.



can address particular technological questions directly to the according specialist.”

**Edson Rofino** is Manager of Voith Hydro’s Electrical Workshop in São Paulo. He worked for two years at Voith Hydro Shanghai and is in regular contact with the unit there, and knows about the effectiveness of keeping in touch that way: “As you exchange ideas with your colleagues in other countries, you realize there may be more than one way to arrive at the same goal. The São Paulo and Shanghai workshops share experiences and support each other. We have the same equipment and processes and follow the same guidelines set by the Voith Hydro Engineering Center (VHEC) in Heidenheim. We work as a successful team, and the VHEC is the bridge.”

Combining industry-leading expertise with local knowledge has helped to give Voith Hydro a competitive edge in many markets, says Gert Roetter, nowadays Head of Manufacturing in São Paulo. He started his career in Brazil and later was with Voith Hydro in Germany before moving to his current posi-

tion. The approach certainly works. Voith Hydro Brazil was named the country’s best company in the capital-goods sector this year.

Fostering international cooperation has become part of Voith’s corporate culture. Voith is focused on promoting global exchanges, not just between Germany and other markets, but also among all Voith operations located around the world.

**Maintaining the same** high standards in all its plants while simultaneously building up its worldwide network is a core principle. “Already some time ago we have started to harmonize the processes, organization, equipment and infrastructure of all our factories,” says Dr. Udo Wunsch. “My team and I travel regularly to each of the workshops, thus granting the cross-link on a corporate level.”

Another aspect is education. It has been crucial to the success of Voith Hydro’s operation in Manaus, set up in 2010 to serve northern Brazil’s huge hydro projects. General Manager Leonardo Nuzzi, explains that the Manaus labor market is quite different from that of São Paulo 3,900 kilometers away. ▷

An open mindset and willingness to learn from colleagues around the world, regardless of age or gender, is giving Voith Hydro a competitive advantage.



“As you exchange ideas ... you realize there may be more than one way to arrive at the same goal.”

Edson Rofino, Manager of Voith Hydro's Electrical Workshop in São Paulo, who spent two years in China

Bringing women into a male-dominated environment has already proven successful both in Brazilian and in Chinese heavy industry.

▷ Trainers from São Paulo do more than teach new skills, he says: “We are instilling new attitudes.”

In its drive to build up a cohesive network of skilled, highly motivated people working in very different places, Voith makes sure that its managers get plenty of chances for face-to-face interactions with their global counterparts. Heads of Voith Hydro workshops around the world meet twice a year, and many managers regularly visit plants in other countries.

Débora Trevisan, Voith Hydro's Human-Resources Director for Latin America, believes that flexible, international cooperation fosters a competitive advantage. She points to the decision to employ female precision-welders at the company's plants in Brazil as one example of the benefits of being open to new ideas: “Bringing women into a male-dominated environment, especially one filled with noise and extreme heat and smoke like a foundry, was not an obvious choice, but women are good at precision work and concentrating on the task at hand.” After the successful experiment in São Paulo, female welders are

now working for Voith Hydro in Manaus and a female instructor trains welders at Voith Hydro Shanghai.

Voith's emphasis on global knowledge-exchange is a win-win for everyone involved. “Close cooperation among people in different markets allows us to learn right away about innovations throughout the Voith network and adapt them to our own circumstances,” Moino says. The São Paulo operation was the benchmark when Voith set up the plant in Shanghai, but after a while the responsables from Brazil realized that the Chinese had many good ideas about how to do things. As they used the Brazilian ideas in China, the Brazilian colleagues started using some of theirs in their own workshops. They learned from each other, and the whole company benefited. Expertise has no borders. //



Cooperation is less about being right and more about being open to new perspectives.

## MUTUAL BENEFIT

Robert Moran, **professor emeritus of international management** at the US Thunderbird School of Global Management, discusses successful global cooperation.

### What is the key to successful international teamwork?

Partnerships or cooperations work when both sides work to create a future together. They fail when one side or both are attempting to “win” and impose their perspective on the other side. Entering an international cooperation with a global mindset is key. It means understanding that there are different perspectives and that both sides want to make and create a partnership that will work for them. It also means understanding that not everyone is the same, working to understand differences and being prepared to move forward to a mutually beneficial future.



### What skills are required?

It takes a range of skills in order to prevent this from happening. In building these partnerships, it is so important to take care in selecting the key team members who will be managing this partnership or negotiating a partnership. These key people have to have a curiosity about – and a willingness to genuinely listen to – the other perspective. They must recognize that however careful the preparation might be, new things may come out that will alter their perspective. These characteristics sound soft and fluffy but they are in fact important qualities. Often, very smart, technically sophisticated individuals, when they are under pressure and stress, fall back on behaviors that don't work.

**Professor emeritus** at the United States Thunderbird School of Global Management, Moran has studied the creation and outcome of large-scale global projects as an academic and in industry for over 40 years.

### How easy is that to do?

The primary challenge is that many people don't have a very global mindset – when negotiation gets stressful and things don't go to plan I've often seen a tendency to become entrenched in the “we are right” belief as opposed to looking at different perspectives and looking at ways to find a solution.

### How important is diversity?

Ultimately, I think it's very important. It's where different ideas come from.

# RIVER OF OPPORTUNITIES

Converting some of the country's dams to **generate electricity** is helping the United States realize its huge hydro power potential.





**Hydro power is available** in all parts of the United States, and it is already providing some 30 million American households with clean and affordable energy. Still, the full potential of American hydro power remains largely untapped.

There are approximately 80,000 dams in the U.S. that do not produce power. A study by the National Hydropower Association (NHA) found that with the right policies in place, the United States, by maximizing these non-powered dams and existing hydropower infrastructure could add up to 60,000 MW to the nation's grid.

Four new projects on the Ohio River represent the latest effort to realize this potential. For these, American Municipal Power chose Voith Hydro to supply four new hydroelectric plants at existing locks in Willow Island, West Virginia, Cannelton, Indiana, and Meldahl (51 percent owned by the city of Hamilton) and Smithland, both in Kentucky.

Once completed, in 2014-15, the plants will have a total expected capacity of 313 MW. Each project will additionally employ 200-400 people during the construction stage – a welcome figure in these areas, where unemployment rates are above the national average.

According to Hugo Carle, a project manager for Voith Hydro on the Ohio River projects, using existing dams to generate climate-friendly energy seems natural. “Hydro power has its obvious benefits,” Carle says, “but the biggest is that we can avoid an impact on the environment.”

He explains that it is incredibly rewarding to be involved in projects that make a difference, then adds, “Not only for the company you work for, but also for the local community and the environment.” There is room for optimism, as the political climate is currently changing in the industry's favor: Earlier this year, the US House of Representatives passed the Hydro-power Regulatory Efficiency Act, following the passing of the Hydropower Improvement Act by a US Senate Committee last year. Both acts work to significantly ease and speed up the regulatory processes for hydro-power projects.

To Carle, this means that he could be looking at more projects. “Hydro power has a bright future,” he says. “There's all this potential out there, and legislation is coming, too. It's all really coming together these days.” //

1 Smithland lock and dam, Kentucky

2 Cannelton, Indiana

3 Willow Island, West Virginia

4 Meldahl, Kentucky

# UNTAPPED POTENTIAL

A rapidly growing population and rising levels of affluence mean **India's energy demand is set to rise**. Hydro power has a vital role to play.

Already the world's second-most-populous country, it is estimated that in 2020, 1.3 billion will live in India. Coupled with a rise in per capita income of over 8 percent annually over the next decade, which the country aspires to, the government is anticipating the amount of energy needed to meet this demand will more than double, to 512 GW.

Hydro power is well placed to increase its share in India's total electricity generating mix (currently around 20 percent), says Sumeet Mazumdar, Vice President Projects and Field Services, for Voith Hydro in India, and explains: "Our hydro potential is largely untapped and presents a huge opportunity." He adds that in a country that is concerned about security and energy independence, the fact that "the rivers flow all year and the energy they produce is locally generated and owned," gives hydro power a natural advantage.

**Indians are renowned** for their traditional closeness to the land, but with development and urbanization, electricity is increasingly defining the lifestyles of the country's growing urban population, from their reliance on it when commuting to work through to how they spend their leisure time. "Indians are increasingly using mass transport systems to take them to their city-center offices. Footfall is very high in

the Delhi-Metro, and its size still is growing," Mazumdar says. The explosion in city-center retail and residential development over the past decade has coincided with a growth in expendable income. "The middle class is rising and aspiring to own a car, an apartment and electrical gadgets earlier than the previous generation," explains Mazumdar. "In an increasingly open society aspirations are bound to rise."

In these households, computers, air-conditioning units, refrigerators, televisions, kitchen appliances and personal communication devices will be commonplace. "Living standards will continue to rise, and electricity demand will go up exponentially as a result."

**Such a scenario poses a challenge** for this ambitious country: without significant investment in energy infrastructure, it will be impossible for India to achieve its economic growth targets to secure a better life for its citizens.

The two-day electricity blackout that hit the national grid in the summer offered a worrying glimpse of the future if India doesn't address its energy gap. The government's current (12th) plan period is to ensure that the electricity demand-and-supply situation remains well balanced. Mazumdar adds: "Indians are very tolerant, but young people have much higher expectations and the government will have to keep pace." //



1



2



3



4

1 India's population is booming, and the younger generation is more technologically savvy.

2 Demand is climbing across the board as the middle class grows and living standards rise.

3 Urbanization: India's rural population is increasingly moving – or commuting – to the country's vibrant megacities.

4 With increasing urbanization, consumers rely increasingly on public transportation and electricity. Hydro power is well positioned to help meet India's energy needs.

Ontario Power  
Generation's  
Des Joachims  
Station



## SAME FOOTPRINT, MORE OUTPUT

Without adding to the environmental burden, two operators are gaining the ability to **get more out of existing plants** by updating to leading-edge technology.

**Hydroelectric generation** has been a significant part of the global energy mix for over 100 years. While the principles of hydro power have not changed since the first generators were built, new technology and design allow modern plants to be far more efficient than their predecessors.

As well as building new hydro power plants, Voith has been active in upgrading, modernizing and replacing generator components in existing hydro facilities. Such investments yield both financial and environmental benefits.

**The Des Joachims Station** on the Ottawa River in Ontario, Canada, dates back to 1950. Voith was recently awarded the contract to upgrade and modernize the stators and rotors in three of their eight 45 MVA generators. As John Peden, Vice President Sales and Marketing in Voith Hydro Mississauga, says, "The basic advantage in upgrading is financial return. These units can be up-rated to higher outputs with greater efficiency and reliability for significantly less cost than replacing them, and with little or no need for environmental impact around the river." Voith Hydro Mississauga, Canada, has completed more than 450 hydro modernization projects since the mid-1970s and has a wealth of experience in the field.



The Ohio Falls Hydro Station is gaining a significant capacity boost.

**Even older is the Ohio Falls Hydro Station** on the Ohio River near Louisville, Kentucky, which opened in 1926. It is built into a dam that the Army Corps of Engineers uses to help control the river level and monitor the flow. Voith Hydro in York, USA, is currently in the middle of an 11-year contract to refurbish all eight turbine and generator units.

An operation like this is not without its challenges, however, particularly when working in older facilities. "On the last unit Voith disassembled at Ohio Falls," says Brent Leib, project manager for Voith Hydro in York, "we found that a quarter of each runner blade was missing, there were large holes in the discharge ring, the unit was out of level and the generator stator core was not fully supported at the connection to the frame." Following this discovery, Voith had to work closely with the field crews and powerhouse owners to develop a new work plan, costs and schedule for the additional work.

When the fully refurbished facility is in operation it will have increased generating capacity from 80 to 101 MW. And thanks to the modern machinery, the power plant owners can look forward to reduced maintenance and repair costs over the 50- to 60-year working life span of the new units, all at no additional impact to the environment. //



The Ming Tombs Reservoir near Beijing plays a vital role in China's pumped-storage infrastructure.

# WIND AND WATER WORKING AS ONE

Voith is committed to further developing pumped-storage systems as a crucial technology partnership for stabilizing the inherently variable supply of wind energy.

Pumped storage is emerging as the backbone of infrastructure crucial to the transition from nuclear and fossil fuels to renewables. The attraction lies in the load balancing that pumped storage enables power plants to achieve: energy is stored as water and being pumped from a lower elevation to a elevated reservoir; when demand for electricity is high, the stored water is released through turbines, which drive an electrical power generator – and more electricity is sold. This stabilizes the grid and maintains quality.

The market niche for pumped storage received a boost in the 1970s with nuclear power plants. Excess night-time energy was stored for release, particularly at noon and in the evenings when consumption surged. In those days, pumped-storage plants (PSPs) operated according to a fixed schedule with just a few mode changes from generation to consumption a day. Today's and future focus of PSPs lies more in interaction with fluctuating renewable energies.

Already today, PSPs have different *modi operandi* with more frequency control and faster reaction times. This enables them to store the excess energy with a turnaround efficiency of up to 80 percent.

**Wind energy is plentiful** and now accounts for more than 2.5 percent of >

GREEN ENERGY MIX



1



2



3

1 The Guangzhou pumped-storage plant is among the world's most technically advanced.

2 The lower reservoir at Guangzhou. Water for the system comes from the nearby Liuxihe River.

3 Energy supply from wind turbines is fluctuating. The ability to "store" power in PSPs is crucial to availability.

“Whatever is produced has to be consumed – and vice versa. The balance is crucial. Otherwise, there is the risk of costly blackouts.”

Lars Meier, Chief Engineer, Voith Hydro York

▷ total worldwide electricity generation. However, the supply of wind energy remains intermittent.

“Whatever is produced has to be consumed – and vice versa,” explains Lars Meier, Chief Engineer at Voith Hydro York, USA. Meier is co-author of a paper on market trends in pumped storage that was recently crowned technical paper of the year at the Hydrovision International conference. “The balance is crucial, otherwise there is the risk of disturbances to the grid or costly blackouts which can cause damage costing an average of €8 per non-produced kilowatt-hour.”

With pumped storage, wind and water power can complement each other and help countries meet targets for reducing greenhouse gas emissions. PSPs also provide ancillary services such as regulation energy and reserve generation. They can also shorten transmission paths, if they are located in relative proximity to the consumer in combination with the right infrastructure.

**In the race to gain** a technological edge, China is trying to avoid mistakes made elsewhere. The country’s emphasis is on developing renewables – mainly solar, wind, hydro power and biogas – and on achieving a 17 percent reduction in CO<sub>2</sub> emissions alone by 2015. Driven by huge domestic demand and vast financial resources, in 2010 every second newly installed wind turbine was in China. The nation’s total installed hydro power capacity is expected to reach 380 GW by 2020, according to China Research and Intelligence, a Shanghai-based market research and consulting firm, in 2011.

State-of-the art technology, such as the digital governor for a unit at the Shi San Ling PSP near Beijing’s Ming Tombs, is being deployed. Commissioned this April by Voith, four 200 MW reversible power units make it the largest station in northern China. Voith supplied four sets of pump turbines, main inlet valves and speed governors. Shi San Ling began operating in 1997, and the units have since provided reliable peak load and modulated frequency as well as emergency back-up power for the entire Beijing-Tianjin-Tangshan region.

Commissioned in 2000, Guangzhou, in China’s southern Guangdong province, is among the world’s most powerful PSPs. Voith supplied four of its pump-turbine motor-generator units. The plant is realized as an underground power station and provides an overall power output of 2,400 MW.

However, the environmental and social issues of large-scale hydro power projects have prompted more support for smaller hydro power facilities. Rural hydro power capacity is expected to reach 74 GW by 2015, according to China’s Water Resources Ministry.

**In Europe**, the 70-year-plus cooperation between Voith Hydro and the Vorarlberger Illwerke AG (VIW) has reached new horizons. In 2009, a storm brought operations at VIW’s second-largest power station, Rodundwerk II, in Austria, to a complete standstill. Voith Hydro was tasked with rebuilding and modernizing the hydroelectric equipment.

Werner Neyer, VIW’s project manager, said that the team faced big ▷



A view inside the power house of Guangzhou

“We were under extreme time pressure and had to fit a hydroelectric generating set, which was 35 MVA bigger, into the existing structure.”

Werner Neyer, project manager at Vorarlberger Illwerke AG



Kops reservoir  
in Austria

challenges. A seven-ton pole had detached from the rotor, ruining the generator and partially damaging the turbines. Certain phases, such as getting the dimensions of the motor generator right, proved to be critical. “We were under extreme time pressure and had to fit a hydroelectric generating set, which was 35 MVA bigger, into the existing structure.”

It was worth the effort: Overall output increased from 276 MW to 295 MW, and that of the generator was raised from 310 to 345 MVA. Rodundwerk II began operating again this February. In June, Voith secured a contract for upgrading VIW’s Kops I plant. Voith Hydro will construct, assemble and deliver three new double Pelton turbines and regulating components, including installation.

**While the driving factors** behind a mix of PSPs and wind energy are variability in consumption, the intermittent nature of wind, grid stability and frequency management, achieving the right balance also depends on government policies. China’s 12th Five-Year Plan called for non-fossil-fuel energy production to reach and stay above 11 percent of total energy production by 2015.

In OECD Europe, a total of 76 pumped-storage units capable of producing 11,562 MW have been commissioned or are in planning for the period 2011-2020. The region’s worldwide leadership in wind power capacity is expected to be maintained until 2035, with growth in generation from wind sources averaging 6.4 percent annually. Water and wind must continue to work together. //

The power of water is bringing clean electricity to South America.

## A SPLASH OF GREEN

Ferreira Gomes will bring hydroelectric power to one of the few regions in Brazil still reliant on fossil-fuel plants.

Generator stator frame including winding



Generator rotor with shaft-coupled, which is lifted down inside stator



Assembly of upper thrust bracket and its bearing



The largest electricity market in South America, Brazil has traditionally been enthusiastic about the benefits of hydro power, which accounts for 88 percent of electricity fed into its national grid.

But there are what could be considered “black spots,” one of which is the State of Amapá in the north of the country. Here, three-quarters of installed capacity involves generation from fossil fuels.

That, however, is set to change with the development of the new Ferreira Gomes hydro plant on the Araguari River.

Part of the Brazilian government’s PAC 2 Growth Acceleration Program, the Ferreira Gomes project is strategically important and intended not only to contribute to the economic development of the region but also to the overall efficiency of the country’s energy system.

The project involves the construction of a low-environmental-impact reservoir of just 17.72 km<sup>2</sup>. Anticipated benefits include increased reliability of supply combined with better-quality power for the region as a whole.

Voith Hydro has been selected as the main supplier of equipment to the project. This includes three 87 MW Kaplan turbines, three 94 MVA generators, HV transformers, substations and ancillary mechanicals such as ventilation, drainage and fire-containment systems. Crucially, Voith has also been entrusted with automation of the entire plant and training of the operational team.

Voith’s manager for the Ferreira Gomes project, Leonardo Colombini, notes that Voith is well positioned to take on this important task for the Brazilian government. Another Voith installed hydroelectric plant was built in 1975, some 15 km upstream of Ferreira Gomes, at Coaracy Nunes. Voith now has two factories in Brazil, including a new one opened in the north of the country in 2010.

There is significant potential involving larger and wider rivers in northern Brazil, he observes. This will provide opportunities to develop new cities and neighborhoods for Brazil’s expanding economy. Voith will be there, he says, ready to employ the latest technologies in hydroelectric production for the benefit of the Brazilian people. //

EXCELLENCE – INNOVATION

# BREAKING NEW GROUND

At Smith Mountain, Voith is **pushing the boundaries of generator technology**. Just one example of the company's commitment to developing novel approaches for boosting efficiency.



Smith Mountain power plant is located on the Roanoke river in Virginia, United States.

Longstanding historical problems need innovative solutions – and that’s exactly what we provide,” says Stanley Kocon, Vice President of Sales and Marketing at Voith Hydro’s United States headquarters in York, Pennsylvania.

It came as no surprise, therefore, when American Electric Power (AEP) approached York in spring 2011 asking for a proposal on the uprating and re-winding of two large generator units at its flagship Smith Mountain pump storage project near Roanoke, Virginia.

The previous year AEP engineers had attended a symposium on hydro coils at Voith’s then recently modernized state-of-the-art manufacturing facility in Mississauga, Ontario. This had given AEP engineers the opportunity to familiarize themselves with Voith generator technology and to discuss design and production possibilities with its experts.

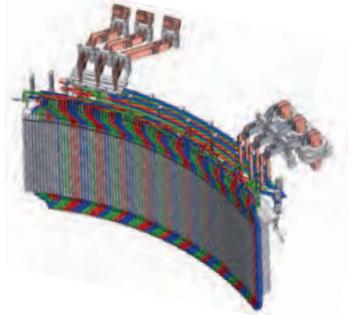
As a result Voith was included in the RFP for Smith Mountain and ultimately won the contract, which includes the design and field installation of stator coils up-rated from their original output of 189 MVA to 212 MVA. Attaining such an increase required significant creative efforts on the part of engineering, manufacturing and field operations as well as extremely close liaison between Voith personnel in York and in Mississauga.

The output rating is the highest ever produced by Voith utilizing a multiturn coil design and incorporates the company’s globally standardized Micalastic system to maintain Class 155 insulation. A significant amount of leading-edge coil and generator design technology has been integrated. The power increase is being achieved by expanding the size of the copper cross-sections – the total mass of the coil is 11.1 metric tons of copper. Voith designer Dino Slijepcevic notes that taken together, the number of slots (567), the core length of 1.8 meters and the bore diameter of 10.69 meters presented a large challenge.



The output rating of the new generator is the highest ever produced by Voith Hydro.

Computerized design tools allowed modeling of the performance of the Smith Mountain generator.



“On Smith Mountain it was hard to reach the desired power output within the existing slot geometry,” explains Slijepcevic. “Using a roebel bar was not an option in this case. So we’re putting more material in to get more power out, and we’re fortunate that Voith has the tools to do this.”

Design colleague Jeff Fenwick, also involved on the Smith Mountain project, agrees. “Voith has considerable experience working on refurbishment and upgrading of other manufacturers’ equipment, often up to 100 years old,” he says. “There is never a single, stand-alone solution. You have to work within existing limits, or work around them where possible. Each job presents its own challenges.”

Much detailed work was required in collecting data and analyzing existing equipment to identify the scope for improvement, because this is a non-OEM unit for Voith, says project manager at Mississauga, Richard DeBoo. “The customer was exceptionally helpful and the project is a really good example of how such a partnership can work,” he says.

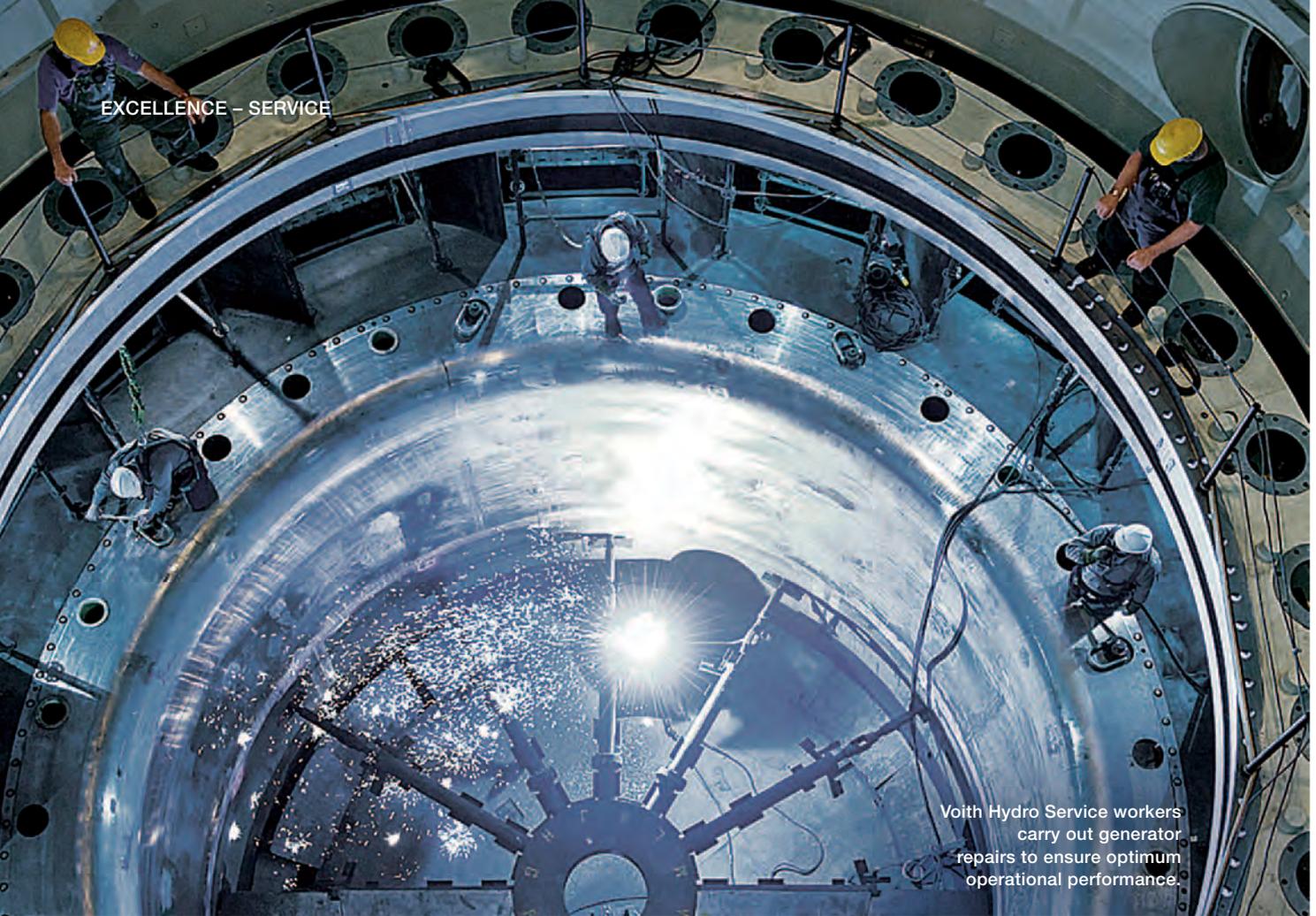
This is just one of the 12 to 14 generator upgrade projects undertaken by the Mississauga facility per year, in locations as diverse as North America, Russia, Turkey and Sweden.

The way Voith incorporates research activities into the generator business as a whole reflects its focus on innovation. Thomas Hildinger, currently based in São Paulo, Brazil, has overall responsibility for this. He explains that innovation is undertaken at two levels.

Basic research involves the company’s own researchers and often close liaison with university researchers. For example, researchers in the São Paulo facility, which specializes in insulation technology, are currently looking into the potential use of nanoparticles.

Alongside this, Voith’s Hydro Engineering Company (VHEC) provides the worldwide operating entities with design guidelines and technical support. “In many respects the VHEC is a hub,” Hildinger says, “facilitating a transfer of information, knowledge and know-how between operating units.”

Occasionally major changes in generator technology occur. For example, Voith is currently undertaking a leading-edge variable-speed motor generator project in Portugal. However, most changes are incremental improvements: “We are constantly looking at how we can achieve greater efficiencies with fewer inputs – how we can drive efficiency for the customer.” //



Voith Hydro Service workers carry out generator repairs to ensure optimum operational performance.

## MAINTAINING EXCELLENCE

Downtime is expensive, which is why **service and maintenance** form an important part of Voith Hydro's product portfolio.

**Service excellence is a guiding principle** for Voith Hydro, which specializes in providing a full range of services throughout a plant's life cycle. In the United States the company recently restructured its operations in order to maximize benefits for its customers. The new Voith Hydro Services is a true one-stop shop, offering a complete range of parts and repairs from its headquarters in Chattanooga, Tennessee, and its subsidiaries in Springfield, Oregon, and York, Pennsylvania.

Matthias Schumacher, Voith Hydro Holding's Head of After-Market Business worldwide, explains: "In the past we had two separate service divisions in the United States, each with its own responsibilities. Now, we have combined the strengths of these entities into a single provider of a full line of services. By doing this, we can provide optimum support for our US customers."

Wherever Voith Hydro operates, its experienced teams of welders, machinists and engineers have the know-how, technologies and equipment it takes to come up with the most effective solutions for each client. Whether the job demands design and construction, turnkey replace-in-kind, optimized repairs or a plant's complete rehabilitation, Voith Hydro's customers can always count on the shortest possible downtimes and longer-running machinery.

**To make sure all its customers** around the globe have access to the same high-quality services, Voith Hydro's After-Market division recently prepared a service product portfolio handbook for the company's service centers worldwide. "This new handbook is the essential and fundamental guideline for our global service organization and supports our drive to offer a full range of customized services everywhere we operate," Schumacher explains.

Whatever its clients need, Voith Hydro guarantees solutions on-site, on-time and on-budget. As Schumacher puts it, "We aim to maintain a constant dialogue with our customers over the full life cycle of a plant to ensure flawless operations. Downtime is expensive. We know that flexibility and speed are the most important assets we can offer." //



# 8 MW

**OFFSHORE WIND TURBINES** outfitted with new AeroDrive technology produce “plant quality” power: Designed for 8 MW turbines, with its consistent rotation speed, AeroDrive renders frequency converters obsolete. AeroDrive combines Voith Turbo’s hydrodynamic transmission technology WinDrive with transmission specialist Renk’s gear unit Aerogear, maximizing reliability and minimizing plant malfunctions. //

## LED TUBES RETIRE OLD-STYLE LIGHTS

# 200,000

Saving 200,000 kilowatt-hours of energy a year can contribute towards saving €200,000.

**IT HAS BEEN** in the cards for years, and now energy-inefficient light bulbs are finally biting the dust. Highlighting this hugely significant and environmentally motivated change of direction is DIW Instandhaltung, a company of Voith Industrial Services. For its customer NTN Antriebstechnik, DIW is producing an incredible energy saving of 200,000 kilowatt-hours a year. A significant investment by the company means that its 18,000-square-meter production hall no longer features old-style lighting; instead, the

space is now fully lit by more than 1,000 super-modern LED tubes. NTN is fully signed up to the ISO 14001 management system, which tracks all aspects of the relevant legal and environment rules, laws and regulations. An important element of the installation of the 30-watt LED tubes not only signals the end of the lifespan of countless inefficient T8 lights, but it will also produce a savings for NTN Antriebstechnik of around €200,000 in electricity and equipment across the new lighting’s lifetime. //

## RECORD SPEEDS BUT NOT JUST ON PAPER

**FROM ITS WORLD-RECORD** start-up speed of 1,662 meters per minute, the Voith Paper Integrated EcoMill (IEM) at Perlen Paper’s PM 7 site in Switzerland is impressive in every way. While record speeds may impress many, the plant’s environmental statistics are even more of a wonder. Take, for example, the fact that modern technology means the site uses 30 percent less fresh water than before – an effect of the new water management. Or that the site takes its fresh water from its own well – e.g. for cooling – and after use discharges it back to its original source ... uncontaminated. And then there is the use of 5 percent less electrical energy per metric ton of paper produced, which before long should be bettered by achieving an even more efficient ratio of around 10 percent lower thermal energy usage. Recycling, of course, is fundamental to Perlen Paper’s PM7 performance, and Voith LowEnergyFlotation (LEF) technology ensures that energy use during the ink-removal stage has been reduced by more than 30 percent. //



# 34,000t

**THE TROUGH THAT** will lift ships at the Three Gorges Dam spanning the Yangtze River in China weighs in at an impressive 34,000 tons – the same as 60 fully loaded A380 airliners. It will considerably alleviate ship traffic on China’s major transportation artery. The 120x18x3.5-meter basin will transfer ships over a vertical distance of 113 meters, reducing the time of transit from the 3.5 hours it currently takes to pass through the locks to just 30–40 minutes. Four giant towers made of reinforced concrete will hold the trough, which will be powered by electric motors. Voith Turbo supplied the eight cardan shafts that transmit power to the pinions. //



# 1,662 m/min

The record start-up speed of Voith Paper’s new Integrated EcoMill.



Taming the wind and waves takes more than just technical skill – efficient teamwork is indispensable.

# WINNING ON WATER

International sailing professional and America's Cup winner Christian Scherrer talks about teamwork in competitive sailing – and how it relates to teamwork in business.

## What kind of attitude does it take to be a successful crewmember?

Full commitment and passion. You've got to love what you do and want to be successful. You have to work hard and work as a team.

## What are the key elements that make a winning team?

You need the right people: not only the ones with the right technical competences, but also the right social skills and the right cultural competences. The common goal is most important: what the team wants and what the team can get. And when the team wins, every member wins at the same time.

## Have you experienced cultural differences while sailing? How do these affect teamwork? Can such differences be beneficial?

There are differences in mentalities between different cultures. When you put a multicultural team together, it takes time to get a feel for that. Later on, though, I think a variety of cultures in a team is something that's enriching, because everybody brings a different background, know-how and point of view.



Swiss sailing pro Christian Scherrer regularly competes for international sport's oldest trophy, the America's Cup. As a consultant, he applies lessons learned as a crewmember.

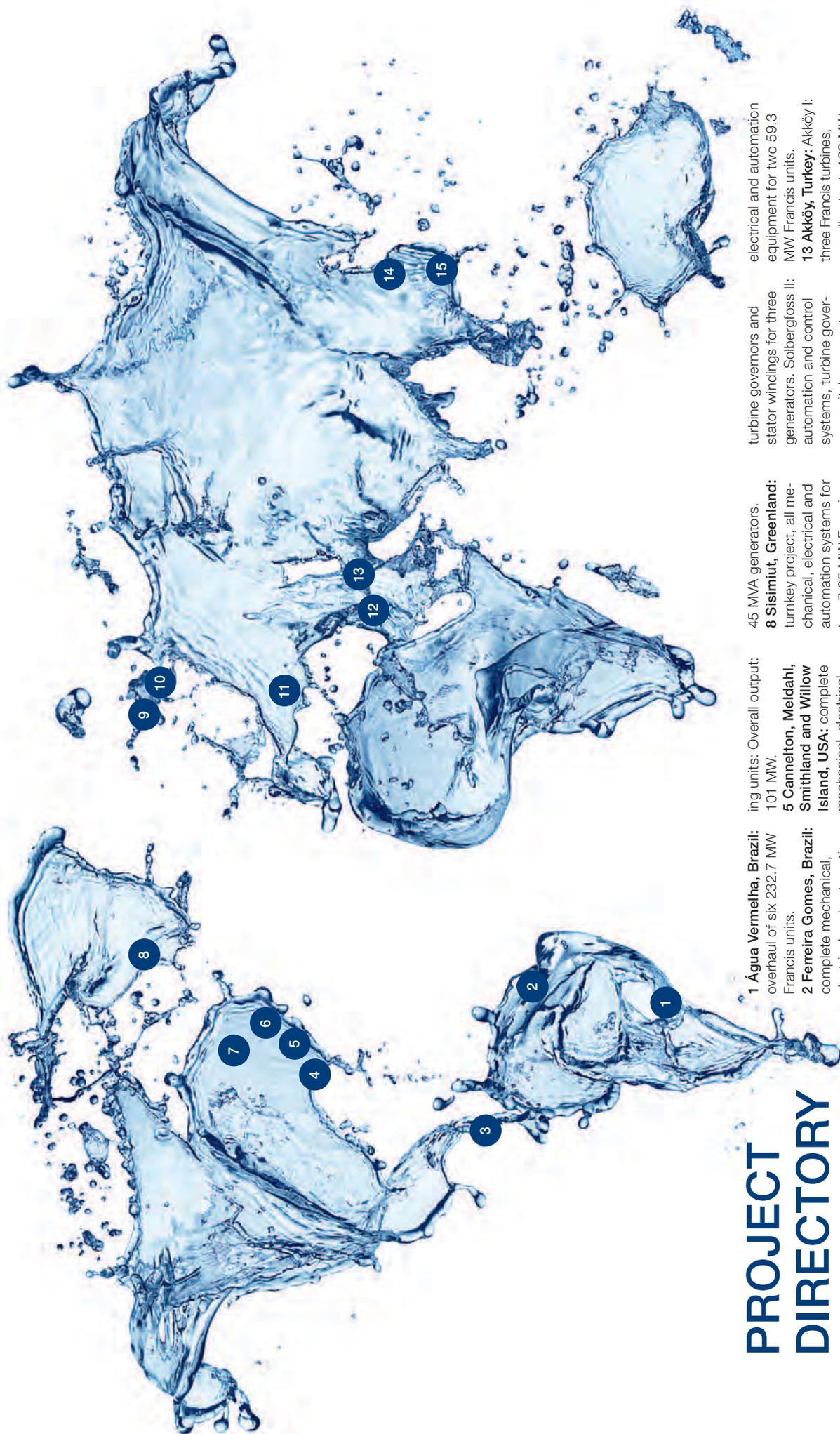
I think most business teams, and also sailing teams, are international now; it's part of the game.

## Conditions during a race don't usually provide the best background for communication. What have you learned from those challenges out on the water?

It's still important to communicate – communication is key wherever you work. It's got to be the right communication, and it's got to be able to flow in the right way and in the right amount.

## Do you have any specific team-building exercises that you would recommend?

Spending time together doing something that you don't usually do when you work – whatever it is. It's definitely a good thing to be in a different environment, to learn about people and to know how they work and try to achieve something together. Therefore, one of the great things to do is to go on a sailboat in a group. Or learn something totally new, where everybody starts from scratch. Do that outdoors, do it in a different environment and build something new. //



# PROJECT DIRECTORY

All plants mentioned in this issue and Voith's scope of supply

- 1 Água Vermelha, Brazil:** overhaul of six 232.7 MW Francis units.
- 2 Ferreira Gomes, Brazil:** complete mechanical, electrical and automation systems for three 87 MW Kaplan units.
- 3 Palo Viejo, Guatemala:** turnkey supply for two vertical Francis power units. Overall output: 86 MW.
- 4 Ohio Falls, USA:** refurbishment of eight generating units. Overall output: 101 MW.
- 5 Cannelton, Meldahl, Smithland and Willow Island, USA:** complete mechanical, electrical and automation systems. Expected overall output: 313 MW.
- 6 Smith Mountain, USA:** design and field installation of generator stator coils.
- 7 Des Joachims, Canada:** modernization of three

- 45 MVA generators.
- 8 Sisimiut, Greenland:** turnkey project, all mechanical, electrical and automation systems for two 7.65 MW Francis units.
- 9 Rånåsfoss, Norway:** Rånåsfoss II: switchgear modernization. Rånåsfoss III: six propeller turbines, generators and automation system.
- 10 Solbergfoss, Norway:** Solbergfoss I: overhaul of turbine governors and stator windings for three generators. Solbergfoss II: automation and control systems, turbine governor, switchgear system overhaul.
- 11 Rodund and Kops, Austria:** Rodund II: new 295 MW pumped storage unit. Kops I: three double Pelton turbines and controller components.
- 12 Akköprü, Turkey:** complete mechanical, electrical and automation equipment for two 59.3 MW Francis units.
- 13 Akköy, Turkey:** Akköy I: three Francis turbines, overall output: 103 MW; Akköy II: two 116.78 MW Pelton turbines.
- 14 Shi San Ling, China:** four sets of pump turbines, with inlet valves and control system.
- 15 Guangzhou, China:** supply of four pumped-storage units.

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Voith Hydro Holding GmbH & Co. KG  
Alexanderstr. 11  
89522 Heidenheim, Germany  
Tel: +49 7321 37 0  
Fax: +49 7321 37-7828  
[www.voith.com](http://www.voith.com)

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