VOITH

hypower

by Voith Hydro — N° 35

Discover your full potential!

Powering Your Existing Hydro Potential

Editorial
hypower N° 35

In challenging times, every kilowatt is precious – and that means the time has come for hydropower service teams. They are the ones who can harness untapped potential.

This magazine is all about them. For example, you can read a story from Brazil about an exciting race against time, or about two different spare parts strategies in the Philippines. I also recommend the double interview with Voith subsidiary Green Highland and Triple Point about comprehensive service.

Harnessing potential is what we accomplish with our portfolio, which, as our overview shows, supports you at every stage of the asset life cycle.

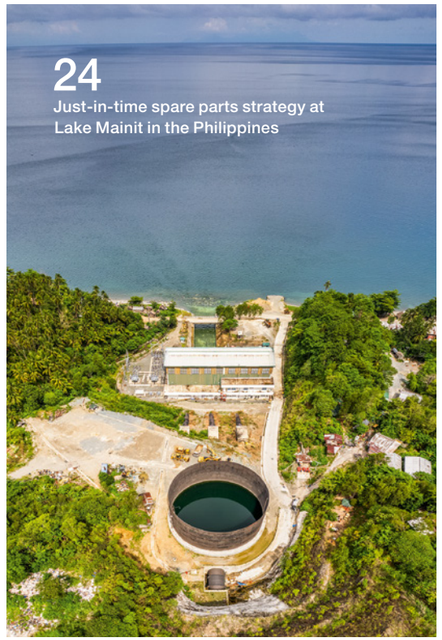
For our approximately 800 service employees, customer satisfaction is a personal mission. The same goes for the entire Voith Hydro team, which is passionate about making renewable energy reliable. Let's work together to determine what is best for your plant.

Dr. Tobias Keitel
President and CEO
Voith Hydro

12
HyService unleashes potential in all phases of a system's life cycle

08
Alex Reading talks to Christophe Arnoult about holistic service

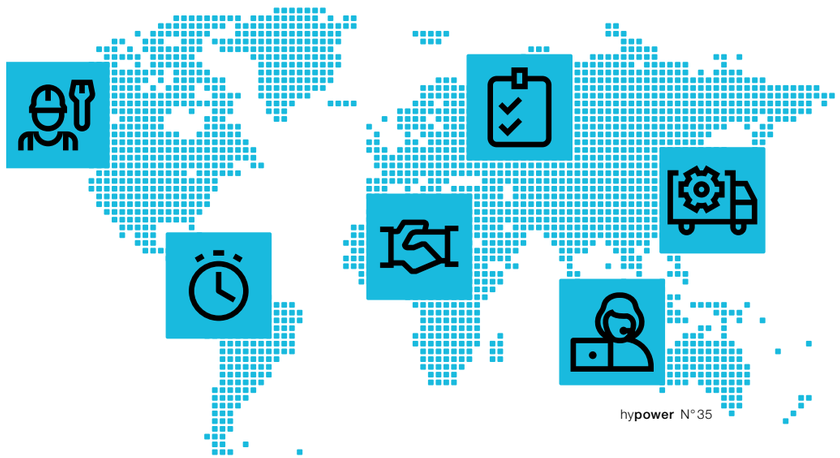
32
Voith Hydro started in Brazil 60 years ago

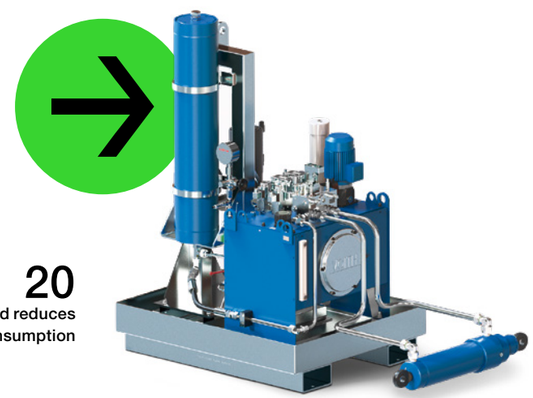


24
Just-in-time spare parts strategy at Lake Mainit in the Philippines

Contents

28
Always close by: the Voith Hydro Service Hubs worldwide





20
HyCon GoHybrid reduces energy and oil consumption

Publishing information

Publisher:
Voith Hydro Holding GmbH & Co. KG
Alexanderstr. 11
89522 Heidenheim, Germany
hypower@voith.com

Responsible for content/Editor-in-Chief:
Kathrin Goebel,
Voith Hydro Holding GmbH & Co. KG

Editorial team:
Archetype GmbH
Munich, Germany

Design:
stapelberg&fritz gmbh,
Stuttgart, Germany

Printing:
Wahl-Druck GmbH
Aalen, Germany

Photo credits:
Cover and back cover: Jan Hosan (photos);
pp. 04–05: Snowy Hydro (photos),
Getty Images (background);
p. 06: Thomas Dashuber (portraits),
KURUM International SH.A. (photo);
pp. 13–16, 18–19: Thomas Dashuber (portraits),
TurboSquid (3D models), Lightshape (rendering);
p. 20: Statkraft (photos);
pp. 21, 31: Thomas Dashuber (portraits);
pp. 24–27: Jan Hosan (photos),
shutterstock (maps);
pp. 28–29: s&f (illustration);
pp. 32–35: Jan Steins (illustrations),
Adobe Stock (map);
pp. 36–37: Getty Images (background);
All other photos are from Voith.

Feedback:
If you have any questions or comments about this issue of hypower, please contact us by email at hypower@voith.com or via www.linkedin.com/company/voith-hydro

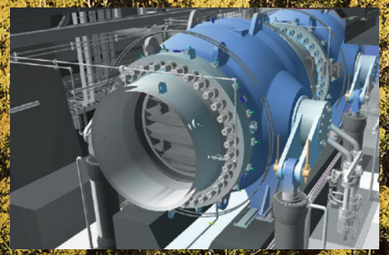
voith.com

Update on Snowy 2.0

In 2019, planning began for Snowy 2.0, the Australian pumped storage power plant that the country is building in order to open up a new chapter in sustainable energy generation. Voith is supplying the electrical and mechanical components, including three innovative variable-speed pump turbines. Today, in 2024, the major international project continues to make steady progress.

Heidenheim

The planning and engineering teams in Heidenheim are also delighted with the successful completion of the FAT. Key engineering services for the intelligent pumped storage power plant in Australia are being carried out in Heidenheim. At the start of the project, the team from the Brunnenmühle site carried out the model tests for Snowy 2.0.



GER

Shanghai

All six spiral cases with stay rings have been accepted by the customer, and some have already been delivered to Australia. The second pump turbine runner passed the final acceptance test (FAT) with the customer. Four of the twelve spherical valves have already been completed. The first generator is being prepared for the final customer test.

CHN

New South Wales

Site visit: In the spring, teams from Voith Hydro, Snowy Hydro, and the Future Generation joint venture met on site to assess progress and address key challenges in the areas covered by Voith.

AUS

News

News from the world of Voith Hydro

There are two new members on the Voith Hydro Management Board, and news regarding the modernization of the Shkopeti hydropower plant.

Management Board Expanded

The global Management Board of Voith Hydro is receiving a boost for the fields of service and projects. To cater to the growing relevance of our service-based business, Voith Hydro has appointed Sunil Pandiri to the Management Board as the new Chief Service Officer. The new CSO will be a driving force for, among other things, the ongoing strategic development of Voith Hydro's range of services. Previously, he was CEO of the North Europe & Middle East Region at Siemens Gamesa.

Moreover, Andreas Wellmann has been the new President Projects since March 2024. In this role, he is responsible for project management, field service, and scheduling. He continues to hold his role as CEO & President of Voith Hydro EMEA.

A Boost in Capacity

In January 2024, Voith Hydro successfully completed the modernization of the Shkopeti hydropower plant for the customer Kürüm International SHA. The plant, which dates back to the 1960s, was extensively modernized over the course of two and a half years. Thanks to Voith's speedy work, it was even possible to bring the plant back into operation earlier than planned, and it is now generating electricity again – with an increase in capacity from the original 24 megawatts (MW) to 27 MW. One aspect that makes this plant special is the seven-blade runner – a real rarity in the industry.

The Shkopeti reservoir, located roughly 35 kilometers north of Tirana in the middle of Albania, feeds the Shkopeti hydropower plant, which operates two Kaplan turbines. The reservoir dams up the Mat, the sixth longest river in Albania, at a height of 102 meters above sea level.

New Management Board members Sunil Pandiri and Andreas Wellmann

Modernization completed: capacity increased from 24 MW to 27 MW

"Once built, hydropower plants can remain in operation for a century and produce energy sustainably, which I find fascinating. And that's not all – innovative services can be used not only to maintain their profitability over the years, but to even increase it. Nothing is more fulfilling than helping to unlock untapped potential with your own hands."

Raman Izouli
Site Manager

Page 07 → 20

A Look at Key Trends

innovate.

VOITH

Service is Holistic Work

Mountains, slopes, lakes, and a lot of reliable rain – hydropower is Scotland's most important resource. The investors at Triple Point ensure that this resource is utilized, while the service experts at Green Highland – a Voith company – ensure continuous operations. An interview about comprehensive approaches, customer relationships, and responsibility for the future.

> We are one of the few hydro O&M contractors in the UK with fully equipped and qualified technicians who are on the ground in Scotland solving problems."
>
> **Alex Reading**
> CEO of Green Highland

1 Green Highland CEO Alex Reading (l) in conversation with Christophe Arnoult, Portfolio Director at Triple Point (r).

2 Scotland produces around 85% of the United Kingdom's hydropower.

How long have your two companies been cooperating?

Alex Reading: For 14 years. Green Highland has its origins in the development of hydropower projects. In 2008, we were awarded a contract by Forest and Land Scotland, one of the largest landowners in Scotland. Our job was to manage assets in the north of Scotland. As part of this, we started working with Triple Point in 2010. At first, they helped us out with this project before helping us with a range of others later on. So, we started by working together on the development, construction, and commissioning of plants, and today we also work together on plant operation and maintenance.

Why did Triple Point decide to work together with Green Highland?

Christophe Arnoult: It was a relatively straightforward decision. Green Highland has extensive know-how of all phases of the assets lifecycle and has a strong local presence in the region. It is very difficult to find an operator with this kind of presence and network that can get things done so quickly. We also appreciate the all-round service provided by Green Highland as well as the company's expertise – administrative, financial, technical, environmental; simply everything from assessing the hydrologic resource to the provision of data to ensure that the plants are operated optimally. →

Alex Reading
CEO of Green Highland

Green Highland, a company owned by Voith, is an operation and maintenance (O&M) specialist based in Perth, Scotland. The company currently oversees about 40 hydropower plants.

Christophe Arnoult
Portfolio Director, Triple Point

Triple Point Energy Transition is an investment trust specialized in projects for the transition to a low-carbon economy. Christophe Arnoult works in the field of renewable energies and energy transition and is responsible for assets such as hydropower plants.

Green Highland has been part of the Voith Group since 2021. What has changed since then?

Christophe Arnoult: During this time, there was a shift from a developer-owner strategy to a service strategy. The focus is very much on customers and listening to them. The Group's aim is to keep improving their service. I see that as a customer. We can simply call, have easy access to different people in the team, and there is always a comprehensive answer to everything.

Alex Reading: Because we have our origins in being a developer and were an owner and operator, we know exactly what customers are looking for. We understand that operation and maintenance are about more than just the turbine, generator, and plant. There is much more, like the hydrology – or knowledge of the water, civil infrastructure, lease agreements, insurance … We know that you have to look at things from an all-in perspective and can accomplish that. And, in the background, we have Voith and all the company's enormous technical resources, which enables an even greater level of trust.

Alex, you currently oversee nine plants for Triple Point in Scotland. What does the collaboration between you – the service provider – and the customers involve?

Alex Reading: A large number of our customers are investors from London, and it can often be a challenge to understand the technology and details. That is why it is a genuine pleasure to work with Christophe. He has an engineering background, so when we took him to the construction site, he understood immediately what was going on. This is what we do with all our customers – we invite them to Scotland so that we can show them everything. Even just the distribution of the projects across Scotland is something that needs to be experienced. It takes a couple of hours to travel between each site, and we also have to deal with rivers and large bodies of water; we need to deal with mountain trails and lots of things that do not sound that important, but still need to be taken into consideration. It is a lot easier to get things done when the customers understand our comprehensive approach.

Christophe, what is the cooperation with Green Highland like? What is Triple Point looking for?

Christophe Arnoult: Triple Point is based in London while Green Highland is local. We need to be able to rely on Green Highland fully. This trust also comes from the quality of the answers that we receive. The answers are always backed up with data, information, and reports. We are thousands of miles away in London and do not have the resources to be there locally and do everything ourselves all the time. So, the all-round service provided by Green Highland is hugely important for us.

Alex Reading: We are one of the few hydro O&M contractors in the UK with fully equipped and qualified technicians who are on the ground in Scotland solving problems. That is why customers have a good experience with us, like during a project where the generator cut out and we were able to say to Christophe, "Normally, that would take three months, but we needed less than two weeks to get it back in operation."

How do you attract the right employees that make this level of service possible?

Alex Reading: First, we look for competent, professional individuals who are highly motivated and dedicated. Occasionally, we need to call our people on a Sunday morning and ask, "Can you visit this plant?" In those moments, we need people who jump out of bed and say, "I'm there!" Additionally, we rely on our team's internal development. We train our employees ourselves, and our apprentices travel through the Highlands, one of the most beautiful parts of the world, work on hydropower plants, and love their jobs. What's more, we can now offer young people different career opportunities since Voith gives them the opportunity to take on larger challenges. I know the team is looking forward to this.

> "We can simply call, have easy access to different people in the team, and there is always a comprehensive answer to everything."
>
> **Christophe Arnoult**
> Portfolio Director, Triple Point

Christophe Arnoult: This is something that we can sense. Whenever I ask the team a question, I get a passionate answer in return that I can rely on. They want to share their knowledge and provide insights, and that is really nice from a customer's point of view. There aren't any major changes within the team either. This continuity and experience at Green Highland, as well as their patience and genuine interest in technology and service, is really pleasant.

What do your plans for the future look like?

Christophe Arnoult: We pursue a long-term stewardship approach of our assets. Our responsibility is to make sure that the assets are kept in their best condition. We want to ensure that our plants are always operated the best way possible – by the people who are the most competent and look after not only the asset itself, but also its entire surroundings, including all other stakeholders. That is why we signed a long-term contract with Green Highland. We have shared goals and the same vision of how to achieve them.

Are you reaching your full Potential?

Unfold your untapped potential

The HyService portfolio supports all phases of your plant's life cycle.

The potential of a hydropower plant comes down to two things, the water you have (nature) and how well your team can make use of that potential.

Experience the HyService effect and fully maximize your plant's performance at every stage of its life cycle. Here, our experts provide some insights and tips.

1 Identify your Potential

5 factors that can hinder your plant's performance

1. Lack of regular evaluation, leading to inefficiencies and missed opportunities, thereby limiting your plant's potential.
2. Absence of or incomplete data, leading to unresolved problems, misguided strategies, and sub-optimal decision-making.
3. Out-of-date staff training, leading to unforced errors, i.e., equipment damage, forced outages, and unnecessary safety risks.
4. Inadequately planned operations and maintenance, leading to unplanned downtime and higher-than-expected operating costs.
5. Neglecting strategic spare parts planning can risk extended machine downtime and operational disruptions.

2 Optimize your Potential

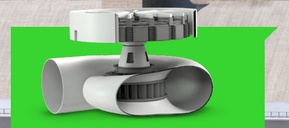
5 key rules to reach your plant's full capacity

1. Maximize the potential of your investment using intelligent assessments empowered by digital solutions.
2. Train your experts to give them the confidence to tackle challenges and make effective decisions.
3. Team up with proven O&M partners when developing your maintenance strategy, leverage their resources and expertise.
4. Incorporate a spare parts management strategy, consider various scenarios and their costs if a plan is not implemented.
5. Plan your modernization cycles. Invest in sustainable upgrades that address your needs today and in the future.

3 Restore & Boost your Potential

5 ways to restore your plant's output

1. Leverage your maintenance outage time and boost machine efficiency whenever you can.
2. Routine maintenance extends a plant's life and provides valuable insights into future needs or opportunities.
3. Be prepared for an emergency. Having a trusted service partner can limit damage and restore functionality quickly.
4. Be data-driven. Predictive spare parts management improves performance and reduces costs.
5. Invest in technology and solve problems before they arise. Up-to-date automation and digital systems enable this.



Advanced design helps to maximize a plant's potential.

The HyService effect

Powering your Potential over a Lifetime

Curious? Scan the QR code and check out our full-service portfolio!

"Uncover the obstacles and unleash your plant's untapped potential."

Dirk Fuchs,
Global Head of HyService Automation and Digitalization

"Don't be satisfied with anything less than your full potential!"

Dr. Thomas Mahnke,
Global Head of HyService Spares

"Even as your plant ages, you can restore and upgrade its potential."

Raphael Baeurlen,
Global Head of HyService CAPEX (Refurbishments and Upgrades)

“The Swiss Army knife of renewable energies”

Dr. Tobias Keitel, CEO of Voith Hydro, on the new functions of hydropower and the role good service plays in this context.

Energy demand and energy supply have changed rapidly in recent years. How has this impacted hydropower?
Tobias Keitel: Previously, there was one thing a hydropower plant had to do above all else: function as efficiently as possible. Our engineers work hard to find the “sweet spot” for each customer – that combination of the greatest efficiency and the ideal conditions for the components in each system. With the increasing importance of renewable energies, hydropower is facing an additional task, too. It has to jump in when there is no wind blowing or sun shining. This makes it “reserve and control energy,” which is something that fossil energy sources used to be. That means, among other things, a greater number of load changes and start/stop cycles. For pumped storage in particular, the number of cycles has increased from 35,000 in the 1970s to between 120,000 and 180,000 among the world’s most modern systems.

What does that mean for operators and their systems?
The lifetime of a hydropower plant and the requirements for the components are changing, and this needs to be considered during the planning or modernization of a system. Not only that: hydropower plants also increasingly have to transform into the Swiss army knife of renewable energies.

How does that affect other requirements beyond lifetime?
Hydropower plants need to be increasingly adaptable; they need to respond more quickly and be more flexible to regulate. In the past, the systems were just simply left on for days at a time. Nowadays, they not only have to be connected and disconnected, but also frequently start up and shut down on partial loads.

How is Voith responding to this in terms of development?
Some systems need to be reconceptualized so that they are fit for the future. To this end, we have launched a range of initiatives such as the Francis+ project. This project aims for systems to be able to operate without limitation on a partial load while simultaneously improving energy efficiency and lowering maintenance costs. We are also optimizing Kaplan turbines with special regulation solutions to make them able to run in frequency control mode with as little damage as possible. Pumped storage facilities can additionally operate like a synchronous condenser and ramp up to a full load in significantly less than a minute.

What role does service have in this development?
Service is at the core of it. Many of the above measures, apart from sheer maintenance, are typical service and modernization projects. On top of that, wear and tear is increasing due to the changed load profiles. In such cases, it is recommended to think of a corresponding maintenance and service strategy as well. Reliable, interruption-free operation all year round is more important than ever.

Dr. Tobias Keitel, CEO Voith Hydro

Michael Rendsburg, COO Voith Hydro

What makes service excellent?

A question put to Michael Rendsburg, Chief Operating Officer (COO) of Voith Hydro.

“Customers appreciate our can-do mentality.”

Why is it advisable to present services as products?
Michael Rendsburg: Presenting a service as a product improves clarity. In my view, customers buy products because they have clear expectations of what they’re going to receive from them. With services, there’s often a gray area surrounding the things included in a package. In this context, it’s important to clearly and transparently communicate what is included in a service package and what isn’t.

What does good service in the hydropower sector entail?
What is key for good service is that problems are solved directly and quietly without the customer needing to get deeply involved. The customer should feel the added value without having to be part of the complex background processes. Our service technicians are known for their can-do mentality. Instead of responding with, “I’ll need to discuss that first,” they get straight to the matter and find solutions. Our customers appreciate that.

What challenges are there in hydropower service?
Unleashing a customer’s full potential, which is why our motto is “Powering Potential.” It’s about gaining the best leverage possible from the technical, human, and financial potential of our customers. An important aspect of this is being there for the full life cycle of a hydropower plant, from purchasing new assets to conducting regular operations all the way to repowering and decommissioning. We seek to harness the full potential in each of these phases.

How can digital solutions and AI help with service in the future?
Many experienced service technicians will be retiring in the next few years. Digital solutions will play a key role in safeguarding this expertise. Predictive maintenance based on sensor data, for example, can be an important element. Diagnostics are also important. Using data, we can identify problems proactively and, ideally, prevent them. AI will have a part to play in this sooner or later, too.

HyCon

GoHybrid Off to a Flying Start

The new hydraulic turbine governor system with variable-speed pump drive is already being installed in a second Swedish power plant.

Sustainability, energy efficiency, conservation of resources – in Scandinavia, these qualities are highly valued. This is why the Finnish energy company Fortum invested in the future back in 2021 and equipped its Nain project on the Uvån River with the smallest version of the GoHybrid unit.

Shortly afterwards, Voith Hydro signed a contract with the Norwegian energy group Statkraft to supply a larger model for the Harrsele run-of-river power plant on the Ume River in Vasterbotten, Sweden. The power plant operates with three Francis turbines, each with a capacity of 73.4 megawatts – perfect conditions for the HyCon GoHybrid system.

60–95%
lower energy consumption

Compact and highly innovative: HyCon GoHybrid is paving the way for the next generation of hydraulic governor systems for power plant operators.

"The system uses highly dynamic, variable-speed pump drives in a closed loop instead of control valves," explains Thomas Zeller, Technical Product Management Hydraulic Controls at Voith Hydro. "As a result, the GoHybrid achieves the same functionality at a higher level of safety than conventional solutions while significantly reducing oil consumption, energy requirements, and noise levels."

This is because using the GoHybrid system reduces oil consumption by 60 to 90 percent and improves energy efficiency by 60 to 95 percent. In addition, the turbine governor saves space and is quieter.

Other advantages include lower maintenance costs compared to conventional systems and reduced downtime on site thanks to fast installation and initial operation. "The system information is also of a higher quality, as more data is available without the need for additional hardware," says Zeller.

In Harrsele, the requirements were that all units should take part in primary control for two-thirds of the year (more than 6,000 hours) without any allowed frequency deadband. This means that the sensitive turbine governor must react to even small changes in frequency in order to guarantee the stability of the power grid. "This is a very demanding operating mode for the hydraulic governor, and therefore for the entire mechanical distributor arrangement, as small movements are required continuously," explains Zeller.

The tests and acceptance procedures for the HyCon GoHybrid system at the factory went very well. Now the system needs to demonstrate its capabilities in the plant during continuous operation in primary control over the next few months. By the end of the year, a first reliable résumé can be drawn up, showing the hydro world that the GoHybrid is able to perform even in the most demanding operating mode.

"Service is becoming increasingly important in the hydropower sector, while at the same time offering an exciting working environment for experienced professionals and talents. With their hard work and dedication, they make a decisive contribution to meeting the growing energy needs of both society and industry. And they do so in breathtaking landscapes and as part of highly motivated teams around the globe."

Katrin Huber
Senior Vice President Human Resources Voith Hydro

Page 21 → 30

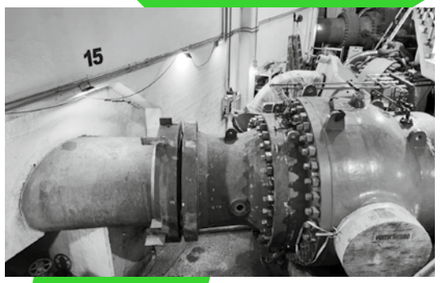
New Systems and Services

trans form.

Underground Pit Stop

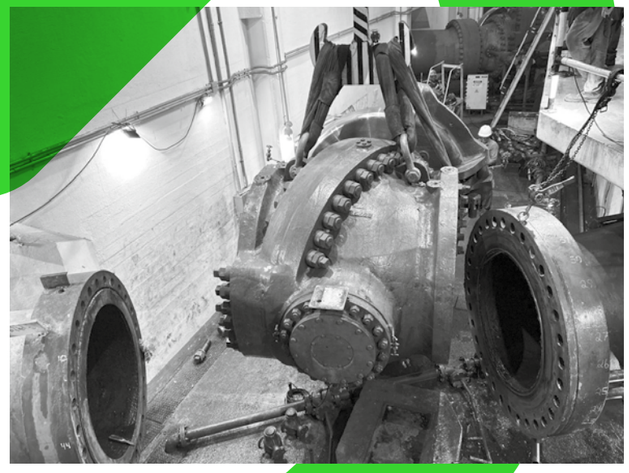
Day 1

Now it's getting tense: The team has prepared everything for the new spherical valve. The clock is ticking.



Day 2

The critical phase has been reached: Everything is waiting for the downstream adjustment ring, which is delivered "just in time" by truck from São Paulo after the final finishing touches have been made.



Day 1

The HyService team only has 45 hours to replace the spherical valve. The disassembly of the old device marks the halfway point.

Click here for the exciting video featuring a time-lapse recording of the replacement of the spherical valve.

Day 2

Transportation from the Voith plant went smoothly and the new downstream adjusting ring arrived on time. Everything fits – thanks to the precise coordination between the workshop and the plant.

Replacing the spherical valves at the Henry Borden complex in the Brazilian city of Cubatão is a race against time.

The day Dimítrius Almeida sets off for work feels a little like the day of the World Cup final. The team has been preparing for this final for months, spare parts and tools are ready at hand, contingency plans have been written, and all the substitute players are in position.

The Voith Hydro project manager and the teams in Cubatão and at the Voith Hydro production hall in São Paulo have rehearsed the process dozens of times. The moment the employee of the local water authority Empresa Metropolitana de Águas e Energia (EMAE) confirms to the team that the pressure in the pressure pipe is zero at 720 meters above sea level, the clock starts ticking.

From this point on, Voith Hydro's service experts have just 45 hours to replace one of the six spherical valves at the Henry Borden underground hydropower plant. The reason for the rush is a unique geological phenomenon: the pressure of the surrounding groundwater acts on the downpipe installed in the mountain. Without the counterpressure of the water flowing through the pipe, there's a risk that the pipe's carbon coating will be damaged and the pipe will bulge. Calculations have shown that this effect will occur after roughly 45 hours.

60 tons and 1.2 meters in diameter

Luckily, the team already has quite a bit of experience dealing with this challenging task. This is because it's now the third of a total of six spherical valves that are being replaced and refurbished as part of the maintenance project. Each spherical valve weighs 60 tons and has a diameter of 1.2 meters. The spherical valve currently up for maintenance is being replaced with one that has already been refurbished.

But what sounds simple in theory poses a number of challenges in practice and under time pressure. Although the system has a modular design and all of the spherical valves are basically identical, there are still differences between the old and new units depending on the level of wear and their operational history. These differences will be eliminated during the refurbishment process at the Voith workshop in São Paulo, 120 kilometers (km) away.

Not all of the components can be completely prefabricated, however. In some cases, the exact condition only becomes visible during disassembly. In this case, the corresponding spare part must be refurbished at the factory within the specified time frame and then quickly delivered to the plant. Replacing the downstream adjusting ring, which ensures the spherical valve's seal and stability, plays a key. As soon as the old adjusting ring is removed, it is measured and its mechanical condition meticulously documented. This report is then immediately sent to the Voith production team in São Paulo.

HyService for Henry Borden: As part of the maintenance project, Voith Hydro was tasked with refurbishing the six spherical valves and the digital control system.

The Henry Borden hydropower plant complex in Cubatão has 14 machine units with an installed capacity of 889 MW. It consists of two power plants: "External" with an output of 469 MW and "Underground" with an output of 420 MW. The latter is located in a cavern 120 m long, 21 m wide, and 39 m high. Construction of the plant began in 1926 and the first phase was completed in 1950. The entire complex plays an essential role in flood protection and supplying water and energy to the region around São Paulo.

Surgical precision in the tightest of spaces

A blank of the adjusting ring, which is already waiting there, is then precisely prepared so that it corresponds exactly to the component in Cubatão. Once the part is finished, it is loaded onto a truck and sent on its way to the plant – a trip that takes roughly three hours. Once there, the installation team immediately begins installing it.

In order to achieve all of this within the 45-hour time frame, months of preparation are necessary. Similar to a surgical procedure, every step of the process and every position of the employees, components, and tools is precisely defined. In this context, it must be noted that working in this confined space underground isn't without its hazards. That's why the work is only carried out under the strictest safety precautions.

"The pressure during a project like this is comparable to a pit stop in a Formula 1 race," says Project Manager Dimítrius Almeida, who is on site at the Henry Borden plant almost continuously. "There really is zero room for error." The team has already successfully mastered this complex task twice with the first refurbished valve taking 37.5 hours to replace and the second only 36 hours. "But something unforeseen can always happen that sets us back a long way, and you have to be prepared for that."

Crossing the finish line

Like the previous two times, the team once again succeeds – all of the connections, valves, and the adjusting ring are correctly installed after nearly 39 hours. A final check of the system, then the time has come: the EMAE employee opens the downpipe's water inlet and the water once again flows at full speed towards the refurbished spherical valve.

"It's like finally crossing the finish line," says Leandro Lucas Pereira Silva, the Sales Manager responsible for supporting the customer. "A project like this is unique; there's no blueprint for it. This makes the experience we have at Voith across the globe that much more important. But above all else, one thing is key to our success: the smooth collaboration between the customer and the teams at the factory and on site, as well as the experts who support us worldwide in the Voith Hydro network."

Don’t Spare the Details:

Effective Spare Parts Strategies

From the lake to the sea: The intake of the Lake Mainit hydropower plant.

The right spare parts strategy can protect against costly operational interruptions. Two hydropower plants in the Philippines demonstrate how customized solutions save time and money – and a mountain of stress.

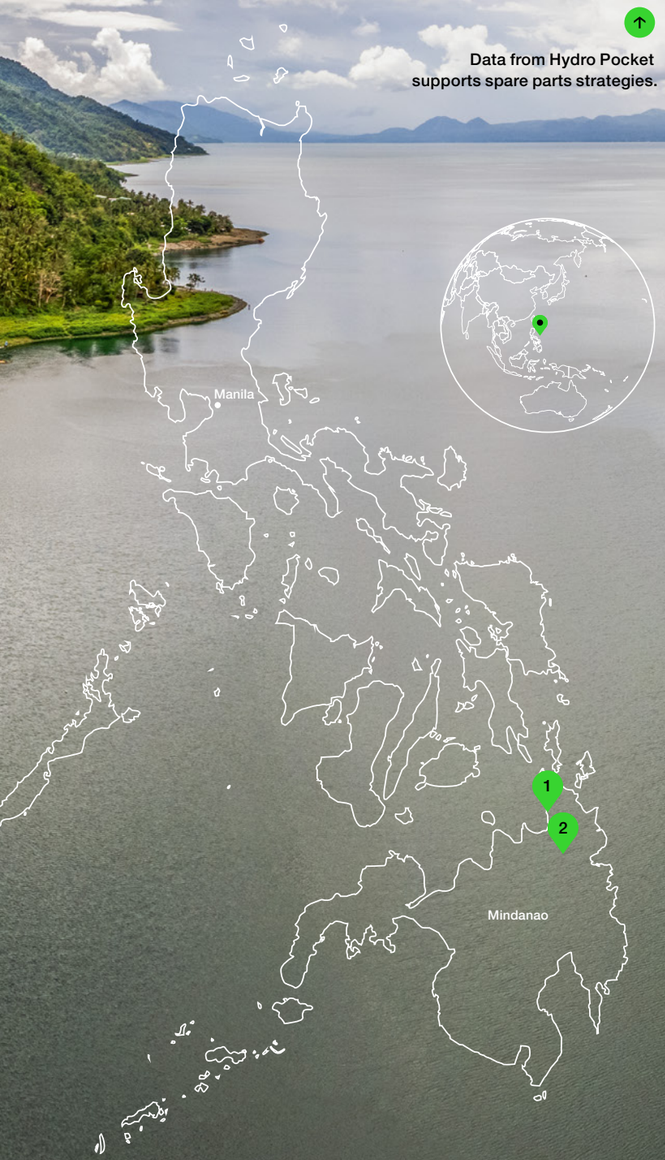
Data from Hydro Pocket supports spare parts strategies.

The smallest parts can cause the greatest damage – like a power unit’s sensor in a hydropower plant that reports a fault. When this happens, the unit needs to be shut down and the possible causes checked, then a spare part needs to be ordered and replaced. In the worst-case scenario, the unit remains out of operation during this period of time.

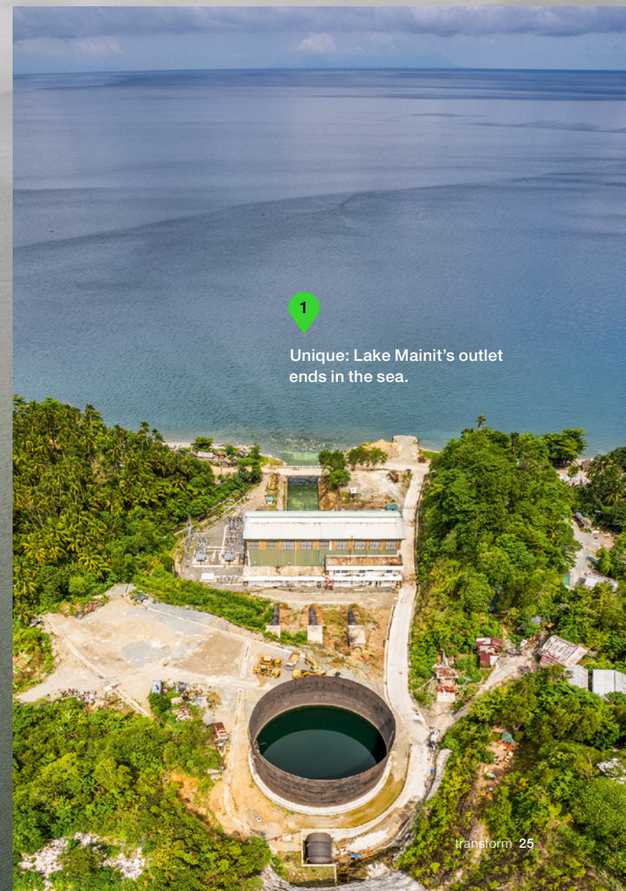
As such, sound spare parts planning is worth its weight in gold. Voith Hydro offers customized strategies that are optimized with digital tools to guarantee customers maximum system availability.

Two power plants, two different spare parts strategies

In the Philippines, two hydropower plants use the Voith HyService Spare Parts offering in different ways to ensure that the plants are perfectly positioned not only for the present moment, but also for the future.



Picturesquely located: Power house right on the beach.



Unique: Lake Mainit’s outlet ends in the sea.

The Lake Mainit hydropower plant is located in Agusan Del Norte in the Philippines, in the northeastern part of the island of Mindanao, and first went into operation in March 2023. “The plant is quite unique,” explains Elddie San José, the Country Marketing Manager at Voith Hydro responsible for supporting the plant. “At the Lake Mainit plant, three vertical Francis turbines produce a total of 24.9 megawatts of energy. What’s unlike any other plant in the world is that the water is harnessed from a lake at an elevation of 32 meters above sea level and passes through a man-made tunnel that is 3,044 km in length before reaching the power house, and is then discharged into the ocean. This means that it’s neither a run-of-river power plant nor a run-of-lake power plant, as the water doesn’t flow back into the lake. The Energy Department has labelled it an impounding and flood control hydropower plant.”

The name comes from the word *mainit* from the Visaya language group spoken in the Philippines and means “hot.” The water temperature of the lake is around 40 degrees Celsius. One of the main purposes of the Lake Mainit power plant is to provide flood protection. During heavy rainfall, the entire area would often flood, including the neighboring towns. The construction of the hydropower plant made it possible to permanently regulate the lake’s water level and has been declared by Philippine government to be an Energy Project of National Significance.

In February 2024, Agusan Power Corporation, which operates the power plant, entered into a long-term service agreement with Voith Hydro. Voith will support the company with maintenance plans and maintenance work for the power plant for the next three years.

Hydro Pocket supports the spare parts strategy

In the process, the Voith team is also receiving support from a digital tool: Hydro Pocket, a cloud-based, all-in-one solution for small- and medium-sized hydropower plants. The software provides real-time data directly on mobile devices. “The transparent view of all plant assets, the visualization of the data, and the intelligent analysis processes help optimize maintenance and repair planning and reduce malfunctions and unplanned downtime,” says Engr. Roehl Gallardo, EVP of Engineering for Lake Mainit.

On-site in Asiga: Voith Hydro Country Marketing Manager Elddie San José.

The spare parts strategy that the Lake Mainit operators have opted for is a lean, just-in-time solution: as the spare parts supplier, Voith India is responsible for providing the spare parts, Elddie San José manages the replacement process on site, and Voith experts in Germany, India, and the Philippines continuously evaluate the data generated by Hydro Pocket and can react immediately in the event of malfunction reports and make decisions together with the operators.

Shortly after the implementation of Hydro Pocket at the end of 2023, the system detected a fault. “A sensor reported abnormal pressure in Unit 3’s main inlet valve. After a thorough investigation, we discovered that the sensor, a pressure transmitter, was defective and was triggering the wrong signal. Our expert in Heidenheim was able to derive this from the data, informed me along with the Regional Digital team, and we checked it on site together with the power plant employees. The specialists from Voith India and Germany arranged for the spare part to be delivered so that the faulty sensor could be replaced with a new one,” explains Elddie San José.

The in-stock spare part in Asiga is installed directly.

Thanks to Hydro Pocket, operators can see how much power is generated without being on site.

Ready for use after a short inspection: the spare part from the warehouse.

Real-time data for spot trading

Only about 30 kilometers from Lake Mainit, there’s another hydropower plant located in Bohol Sea on the shores of the Pacific Ocean. Asiga is a small plant with two units and a total capacity of 8 MW, which are used for spot trading, i.e., for trading on the spot electricity market. “The operator Asiga Green Energy Corporation (AGEC) has completely different needs,” explains Elddie San José. “They use the real-time data from Hydro Pocket to generate reports. With Hydro Pocket, operators can identify how much electricity is being generated without having to be physically present at the power plant. They can also assess what different messages mean or how likely it is that the system will come to a standstill. This is the best basis for deciding how many megawatts to feed into the grid at what time in order to maximize profits.”

For AGEC, precise analyses in real time and predictability are therefore essential. If the company commits to providing a certain amount of electricity for a certain time on the electricity trading market and is unable to meet this commitment due to a disruption or incorrect calculation, it must pay a penalty.

In order to achieve the best possible results, AGEC has signed a long-term service contract with Voith, which combines the use of Hydro Pocket with forward-looking consulting and planning activities by a team of Voith experts. This includes 10 hours a month during which the power plant’s maintenance teams meet with experts from Voith. These meetings are used to determine what the daily operating processes are like and which spare parts will be needed in the next three months. There’s also a quarterly meeting in which the spare parts requirements are discussed and the experts make recommendations. In addition, the service includes arranging spare parts orders and deliveries for the on-site warehouse.

Predictive maintenance: the perfect solution

For Asiga, Voith has implemented a predictive spare parts strategy. Predictive maintenance is based on the evaluation of data that analyzes malfunctions and anticipates failures and spare parts requirements. This maximizes availability and increases the service life of the equipment. Furthermore, it makes it possible to more accurately plan spare parts logistics.

A well thought-out, customized strategy like this therefore reduces costs for operators over the medium and long terms and prevents losses due to long downtimes. “It’s an effective and reliable method of managing spare parts for hydropower plants,” says Elddie San José. “Together with the expertise that Voith provides, it saves customers time and money.”

A worldwide network of experts

With its predictive spare parts strategy, Voith Hydro not only supports its customers with analysis and planning work, but also handles list creation and spare parts replacement, for example. “Voith experts are on hand to support the companies at all times. What’s more, a service agreement with Voith opens up a universe of comprehensive expertise for plant operators like us, with experts who exchange ideas worldwide in order to find the best possible solution for the specific issue,” says Engr. John Cortel, Operation and Maintenance Manager at AGEC.

Voith Hydro places an emphasis on collaboration and its employees are globally connected. This enables the company to increase efficiency, reduce risks, and ensure maximum capacity utilization. And as a result, it ultimately increases customer satisfaction.

Support Wherever It's Needed

Voith Hydro service hubs support hydropower operators around the world.

USA

Tania da Silva,
Nashville, TN, USA

Tania has more than 15 years of experience in the hydro business and diverse areas of quality, process improvement, root cause analysis, manufacturing and site processes/ quality audits. Her strength lies in clear communication: customers can always expect quick answers from her as one of her goals is to immediately let them know-how their situation is progressing. For the industrial engineer who majored in mechanics, it is particularly important to gain a precise understanding of the problem in order to deploy the best possible experts and thus find the optimal solution. When she isn't working, she enjoys reading and traveling and is always eager to expand her knowledge.

Tania's motto:
I aim to serve my customers helping them to be more efficient with their time to solve problems they bring us.

BRA

Vitor Carvalho Viu,
Porto Velho, Brazil

Vitor is a skilled communicator, a team player, and a talented strategist when it comes to field service. When solving problems for his customers, he can rely on his creativity as well as that of the entire team behind him. Together, they not only come up with the best solution, but also create added value for the customer. He is currently working on the application of soft coating on turbine blades and on a cavitation monitoring system. The latter is particularly helpful in rivers with high levels of sedimentation. When he isn't working, Vitor enjoys playing sports and spending time with his family.

Vitor's motto:
My principles are trust, proactivity, and responsibility. They guide me in every customer interaction and motivate me to achieve excellence and outstanding results.

POL

Tomasz Dudkiewicz,
Wola Krzysztoporska, Poland

Tomasz is a passionate and dedicated customer service expert. He always responds to customer inquiries quickly and comprehensively. They can rest assured knowing that Tomasz will solve their problems as if they were his own. With his 24/7 availability, he offers an unparalleled and one-of-a-kind service. He is an excellent listener and observer and therefore gets to know customers' needs very well. When he isn't working, Tomasz enjoys traveling and loves discovering new cultures and meeting new people.

Thomasz's motto:
My experience shows that a little help today means a lot of loyalty tomorrow. Giving the customer your full attention no matter what the problem is always pays off.

When it comes to hydropower plants, stable, efficient, and uninterrupted operation over their entire life cycle is absolutely essential. This requires the plants to be continuously monitored and maintained. Operators often lack personnel, expertise, or an effective maintenance strategy, however, which can lead to unplanned repairs or even stoppages.

In such situations, it's important to have qualified service partners nearby. They can quickly restore operations or – even better – minimize the risk of failures or reduced performance from the outset by taking proactive measures.

To this end, Voith Hydro operates service centers around the world close to its customers. From these globally distributed locations, more than 500 experienced technicians carry out regular inspections and maintenance work for their customers. And in an emergency, they are quickly on site to solve problems. In addition, they also advise operators on how they can maximize the value of their plants, today and in the future.

Power the potential

From quickly procuring spare parts to identifying hidden potential – thanks to these service hubs, customers have access to the comprehensive expertise and performance of a hydropower specialist at all times. They are the ones who unleash the full power of the plants worldwide. True to the motto: Power the potential.

800

Around 800 Voith Hydro staff ensure customer satisfaction in the service sector.

IND

Gaurav Mengi,
Jammu, India

Gaurav is a civil engineer with a passion for and extensive experience in contract and project management who drives innovative solutions to achieve the best results for his customers. He believes that a project begins by gaining a thorough understanding of the customer's issues so that he can then offer solutions that are as precise and clear as possible. Clear communication regarding the schedule and optimal follow-up support are also important to him. The swimming enthusiast and family man firmly believes in the power of teamwork and is also always open to learning new things in his private life, reads a lot, and participates in current social discussions.

Gaurav's motto: Exceed expectations, foster trust.

"Service has undergone some exciting developments in the hydropower sector and plays an important role today. In Latin America, for example, there are now many power plants in operation that produce energy continuously over an impressively long period of time. This continuity is built on competent service, and Voith Hydro plays a key role in achieving this in the region."

Luis Constantino
Director HyService and
Sales Latin America

Page 31 → 41 Insights and Inside Views

reflect.

Voith Hydro

Brazil:

Six Decades Full of Power

Voith Hydro's success story in Brazil – from building the Itaipu turbines to passionate service teams for state-of-the-art facilities.

1

Inauguration of Voith S.A. on September 22, 1966, with public dignitaries.

2

Delivery for the Estreito plant.

3

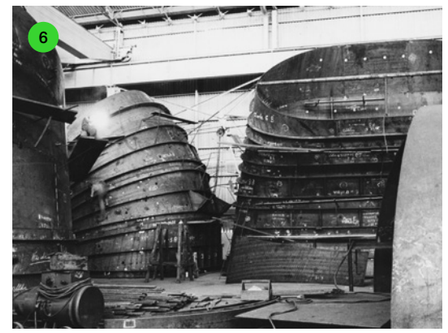
Large transports in a large country.

4

The finished runner for Estreito in factory assembly.

5

The Itaipu dam.



6

Giant suction pipes for Estreito

Voith Hydro established a subsidiary in Brazil exactly 60 years ago. The history of Voith Hydro in Brazil is closely connected to the development of hydropower in the region. One outstanding project was the delivery of turbines for the Itaipu power plant in 1978, which was the largest in the world back then. Today, São Paulo is one of the company's most important locations. There, the Voith Hydro experts not only develop new projects to support Brazil's sustainable energy strategy, but also work in top-notch, experienced service teams to ensure that the potential of the existing plants delivers maximum returns. →

1905

Delivery of the first five turbines to Brazil for the Itatinga hydropower plant.

1964

Founding of Voith S.A. Máquinas e Equipamentos in the Jaraguá neighborhood of São Paulo with 295 employees.

1966

Official opening: The production workshop is opened. It is Voith's first production unit on the American continent.

1970

Opening of foundry: In the 1970s, Voith receives a contract for twelve units for Itaipu, the world's largest hydropower plant.

1978

Contract awarded for the Itaipu hydropower plant on the border between Brazil and Paraguay.

1984

The Itaipu hydropower plant starts operation with the commissioning of the first machine unit.

1990s

Production starts for components for Chinese hydro projects, including the world's largest Francis turbine for Wu Qiang Xi.

2000

Siemens and Voith Hydro merge: The São Paulo site now supplies generators and equipment for automation and the plant periphery.

“My time at Voith in Brazil is a significant part of my biography.”

Helmut Bronowski

Former Chief Engineer

My history with Voith in Brazil
After being an apprentice draftsman at Voith, I studied mechanical engineering in Ulm, Germany, and returned to Voith afterward on a scholarship. Starting in September 1965, I worked as a designer at the newly established location in São Paulo for four years. It was a great place, with two production halls and a three-level office building overlooking the Pico do Jaragua mountain. In 1978, I went back to São Paulo again as Head of Construction, this time with my wife and our two small children. I have many positive memories of Brazil.

An unforgettable project
There are many, for example the first big challenge, namely the production of almost all the parts for the turbines of the large power plant “Estreito”, but above all the runner. Shortly before I started, Director Wernicke, who had hired me, came to São Paulo and asked me if I knew what we were getting into. Part of my simple answer later became famous: “We don’t know exactly what to expect, but we can do it.” Young people are optimistic, and we did it: the 90-ton runner was prefabricated in three parts in Heidenheim. It was then transported to São Paulo, where it was welded together and further processed. The next challenge was to transport the 90-ton runner with a diameter of 6.5 meters safely to the construction site. The transport company Superpesa developed a sensational transport vehicle for this purpose. When loading the runner, the carrier bridge bent so much that it scraped against the ground. The transport could therefore not be carried out as planned. After a detailed analysis at Voith, it turned out that the bending moments for the support bridge had been calculated incorrectly. This had to be reinforced at the Voith Hydro São Paolo’s manufacturing facility in order to carry out the transport safely. But as I said, we made it.

A German-Brazilian memory
How cold it was! In winter, the temperature fell to about five degrees Celsius at night. Back then, there wasn’t any heating and the employees sat in the office wearing coats, gloves, and blankets. Ironically, I felt colder in Brazil than I ever did in Germany, even with thick, warm clothing!

The changing nature of service
Service has always been an important aspect in the hydropower sector, however the service offering has developed significantly over the course of my career. Spare parts were even produced for other power plants back in the years from 1955 to 1969. The core of the service mindset back then was to fix problems immediately after find-ing them, if possible.

“Voith knows how important people are for the company – and invests in them.”

Manuel Goncalves

Current Technical Director

My Voith history
I participated in a Voith trainee program as an engineering student in 1983. I spent the final four months working in the turbine governors section of the hydropower department. In the early 1990s, I switched to proposal engineering. In 2000, I was appointed Head of Proposal Engineering, and in 2007, I became Technical Director.
I am responsible for the engineering of turbines, generators, automation, hydraulics, and other technologies.

An unforgettable project
In 1999, Lajeado was one of the first major projects in Brazil. They were difficult times economically, and we were not in the best position among our competitors. So, our Engineering Manager and CEO decided to collaborate with experts from Germany, Austria, and the US. After about eight months of hard work, we secured the contract. The project was a turning point and opened doors to other major projects.
Another notable project was the Belo Monte project, which was carried out a few years later. At that time, we formed a consortium with two other companies. Internally, we made the strategic decision to take over the automation and balance of plant, which included mechanical, electrical and other systems. Initially, this decision seemed risky as it involved 18 large machines and required extensive coordination with our partners in the consortium. However, with the support of the Board of Directors, we accepted the responsibility and delivered everything successfully after four years. This project has become one of our most important references and demonstrates Voith’s capabilities as a reliable equipment supplier.

A German-Brazilian memory
I went to Germany for the first time in 1992. My wife became pregnant shortly before this and it was easier for her to stay in Brazil, so I went alone. During this time, I had exciting duties and learned a lot from my experienced colleagues in Heidenheim. On a personal level, though, it was a challenge. You see, we didn’t have cell phones 40 years ago! In the end, I was very happy when I could ultimately go back to my wife and my daughter!

The changing nature of service
Many of our projects have been in operation for a long time, so service has become even more important. Customers expect extensive support, which includes technical support, immediate spare parts delivery in emergencies, and defect fixes as well as error analysis and intelligent maintenance planning. Voith’s strength is the extensive knowledge that it has accumulated over the last four decades. Our experience in the delivery of numerous power plants combined with our automation know-how has given us invaluable expertise.

7 “We can do it” – the motto of the Voith Hydro team in Brazil right from the start.

8 A modernized runner shortly before delivery in 2023.

2002
Voith Siemens Hydro Power Generation is honored by the magazine *Exame* as the most respected mechanical engineering company in the country.

2016
Commissioning the automation system and complete balance of plant for Belo Monte, the largest 100% Brazilian hydropower plant.

2022
Modernization of the Porto Colombia hydropower plant, which went into operation in 1973.

2023
An environmental agreement is signed with the government of the state of São Paulo to reduce greenhouse gas emissions.

Voith Hydro Marks 30 Years in China

Back in 1994, Voith entered the Chinese market in Shanghai with just a few employees. Today, 30 years later, the company has over 400. The range of services provided has also grown during this time. From planning and procurement to production and project management to implementation and HyService, the Voith team in Shanghai covers the entire spectrum of hydropower business.

This goes hand in hand with the key role that Voith Hydro China plays in the region's major hydropower projects. One particular highlight is the world-famous Three Gorges hydropower plant, with its capacity of 22.5 gigawatts (GW) and the associated flood protection, shipping, and water utilization benefits. Voith Hydro China supplied key turbine and generator components for the VGS consortium (Voith-GE-Siemens) for six hydropower units of the project, which went into in operation for the first time in 2004.

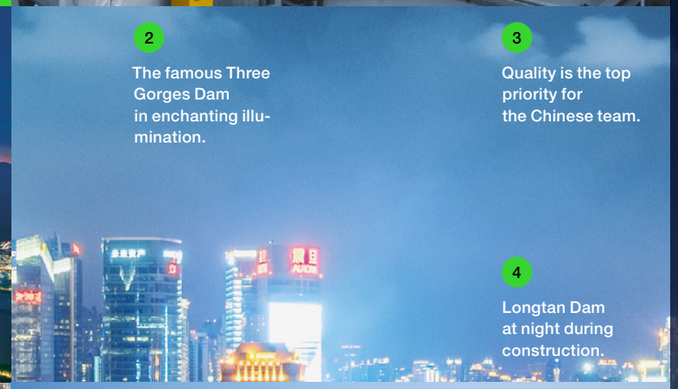
Other prominent projects include Xiluodu and Wudongde, which rank fourth and seventh in the world in terms of plant capacity, respectively. Voith Hydro has also excelled in the field of pumped storage power plants, with the team notably delivering China's biggest power plant of this type. Another milestone in this field was the Changlongshan project, the world's first pumped storage power plant with a rated speed of 600 rpm and a capacity of 350 MW. The project was extremely challenging in terms of both planning and production.

3

Quality is the top priority for the Chinese team.

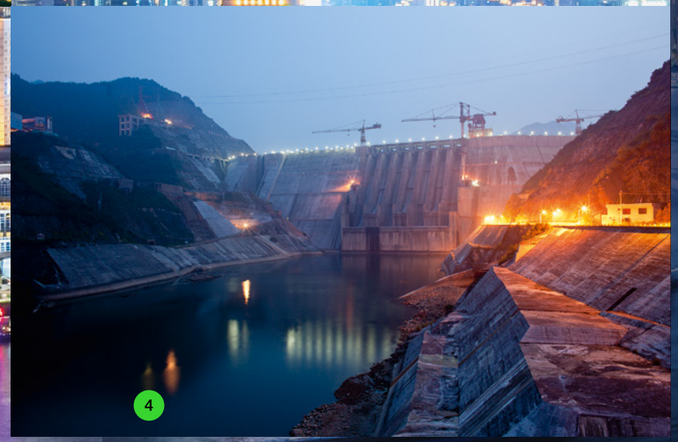
2

The famous Three Gorges Dam in enchanting illumination.



4

Longtan Dam at night during construction.



4

1

Shanghai at Night – Voith Hydro has been active here for three decades.

Always on the cutting edge

Voith Hydro's 30 years in China also represent 30 years of passion for technological innovation, which, together with Voith Hydro's extensive expertise, will help the country achieve its ambitious carbon reduction targets. But the engineers and technical experts in China aren't just innovative when it comes to the core components; the team is also always on the cutting edge when it comes to digital hydropower solutions in order to provide customers with greater efficiency and flexibility.

Over the course of three decades, the team has forged numerous long-term partnerships for every stage of hydropower development. Together, they have always succeeded in satisfying the project requirements and adapting to Chinese hydropower operators' highly dynamic approach. Thanks to their agility and efficiency, the team has always been able to complete the projects on schedule.

Focus on sustainability and digitalization

Even after 30 years, the team believes it is ideally positioned to meet the market's future challenges. In this context, the main focus is on environmental protection and supporting the transition to a lower-emission energy supply. This is because hydropower, as the most important sustainable energy source, also plays an important role in China in terms of balancing out the fluctuations in wind and solar energy. In addition, the team will increasingly support customers in making their systems environmentally friendly, for example with technologies to protect water and fish.

30 years in figures

Total of 94 projects in 25 countries worldwide,
293 turbines with 85 GW of capacity,
110 generators with 40 GW of capacity

in China

Voith Hydro Shanghai is celebrating three successful decades on the market as a leading supplier of hydropower technology.

Since Voith Hydro Shanghai Ltd. was founded in 1994, the team has achieved many milestones. A few of them:

1997
Voith is awarded the contract to supply six machine units for the world's largest hydropower plant, the Three Gorges Dam.

2004
The first of six units for the Three Gorges Dam goes into operation.

2008
Voith is awarded a contract to supply three generators and three Francis turbines for Xiluodu.

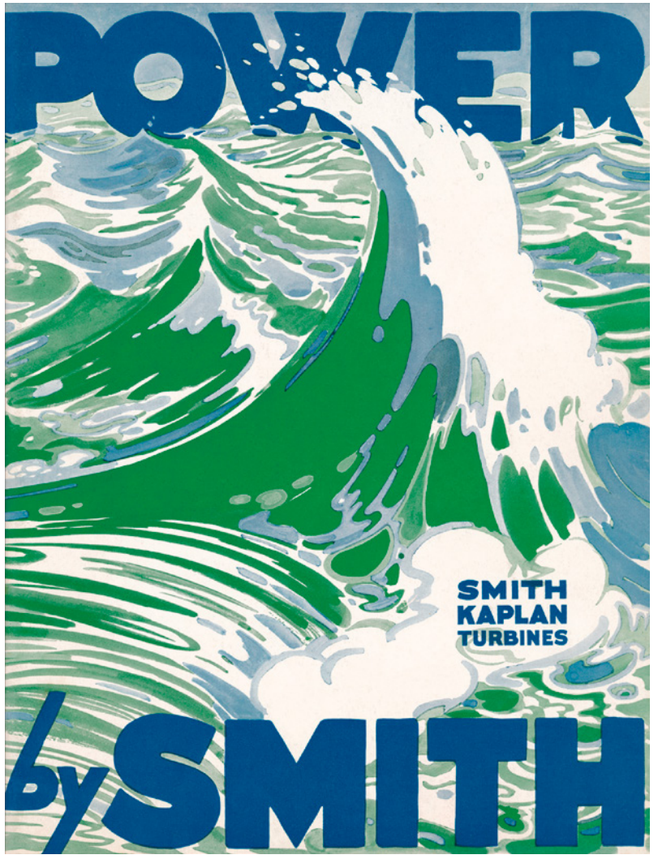
2011
Delivery of the runner for the fourth-largest hydropower plant in the world, Xiluodu.

2015
Contract awarded for the seventh-largest hydropower plant in the world, the Wudongde hydropower plant.

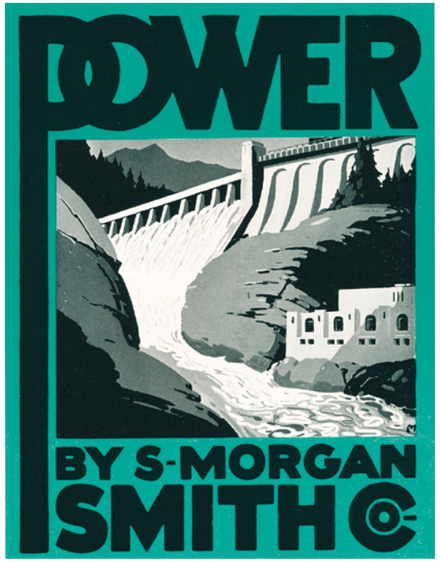
2019
Voith Hydro Shanghai wins the 2019 National Quality Project Golden Award for the Hongping pumped storage power plant.

2022
Voith enables the full commercial operation of the Changlongshan pumped storage power plant.

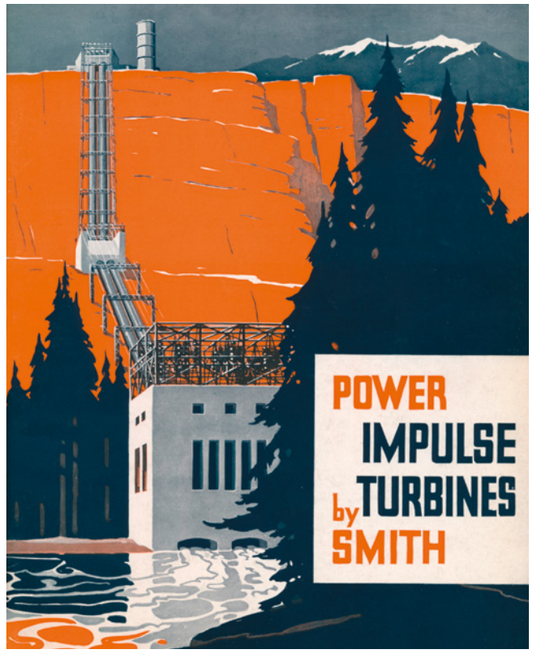
2023/2024
Voith enables the full commercial operation of the Henan Tianchi and Fujian Xiamen pumped storage power plants.



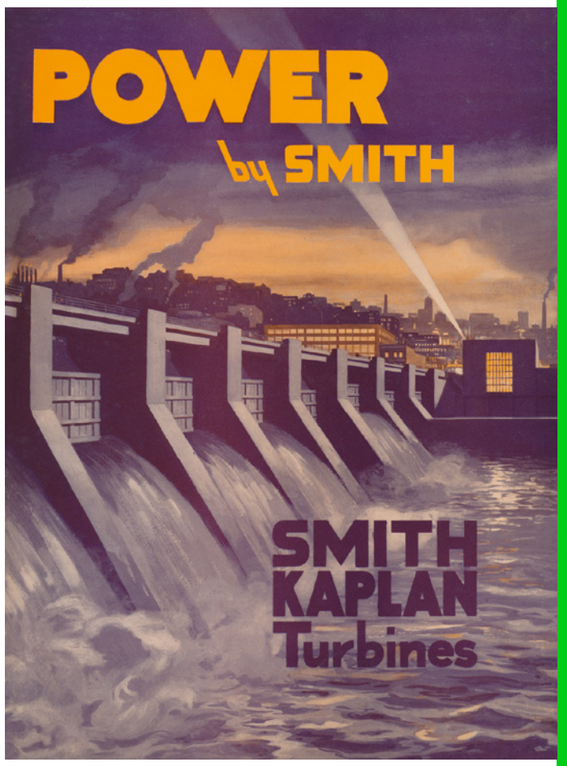
1



2



3



4

Power Poster

Like in all industries, hydropower equipment makers have always tried to present their field of business in a very specific light. The trends that have dominated over the decades can be seen in the subjects of posters and magazines. Voith Hydro has merged with or acquired a large number of other companies in the global hydropower industry over its history. This diversity is also reflected in the different advertisements of Voith's subsidiaries, which are now integrated into their parent company. A look at some of the publications reveals an astounding wealth of graphic themes and subjects. We asked hypower Art Director Maik Stapelberg to share a few examples of hydropower's ability to unlock not only kinetic, but also creative energy.

Advertising and design are always a reflection of their times – and hydropower is no different.

1

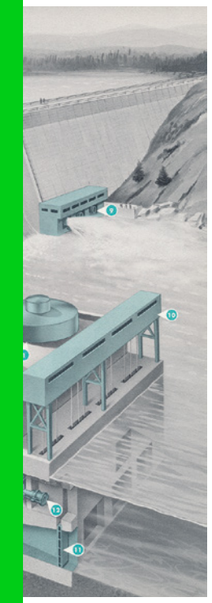
The design of this poster by Morgan Smith is reminiscent of the iconic woodblock print "The Great Wave off Kanagawa" by Katsushika Hokusai. The stylized wave in shades of green and blue conveys the water's dynamic motion and power. The word "POWER" written strongly at the top emphasizes the might of the waves. The message is reinforced by the text's integration into the wave itself. Overall, the design achieves a dramatic effect with clean lines and flat color fills, making it an impressive piece of art as well as advertising.

2 + 3

The other images from Smith are characterized by a broad palette of design styles and are always certain to surprise and capture people's attention – just as an advertisement should.

4

More drama, more "POWER by SMITH": This poster's style references the early- to mid-20th century with bold, block-shaped Art Deco typography and contrasting colors. The scene of a hydropower plant with flowing water and a city in the background conveys progress and human achievement, with similarities to movie posters from the same era.



1

3

5

This image shows a technical drawing of a mechanical control drafted by hand on a drawing board. The drawing dates back to 1897 and was used by Riva as the creative basis for the cover of a brochure. The drawing's style is akin to the work of Leonardo da Vinci.

6

With this advertisement for the company Alois Kössler, the clean, block-shaped typography and asymmetric design channel the Swiss style. The Swiss style is a graphic design trend that emerged in the 1950s and 1960s. It is characterized by precise lines, simplicity, and clarity, and was a response to the ornamental and decorative styles that shaped design in the early 20th century. The man-machine relationship is highlighted by the illustration of a Kaplan turbine at the center. The human appears above the powerful turbine – because he controls it.

A side note:
Morgan Smith, the company that produced some of the images you can see on these pages, was bought by Allis-Chalmers and later became Voith Hydro.

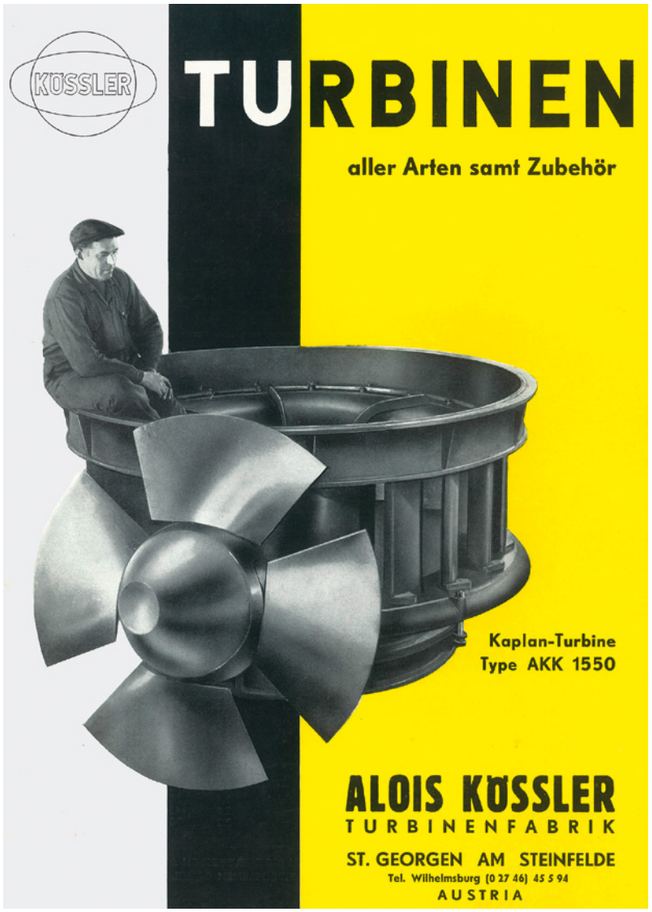
7

The changes over time are especially visible in technical drawings. This example from a Riva brochure captivates with impressive precision. You have to bear in mind that the only tools that draftsmen and draftswomen used were pencils and rulers. Compared with modern digital methods like Building Information Modeling (BIM), it was significantly more challenging to produce such graphics by hand.

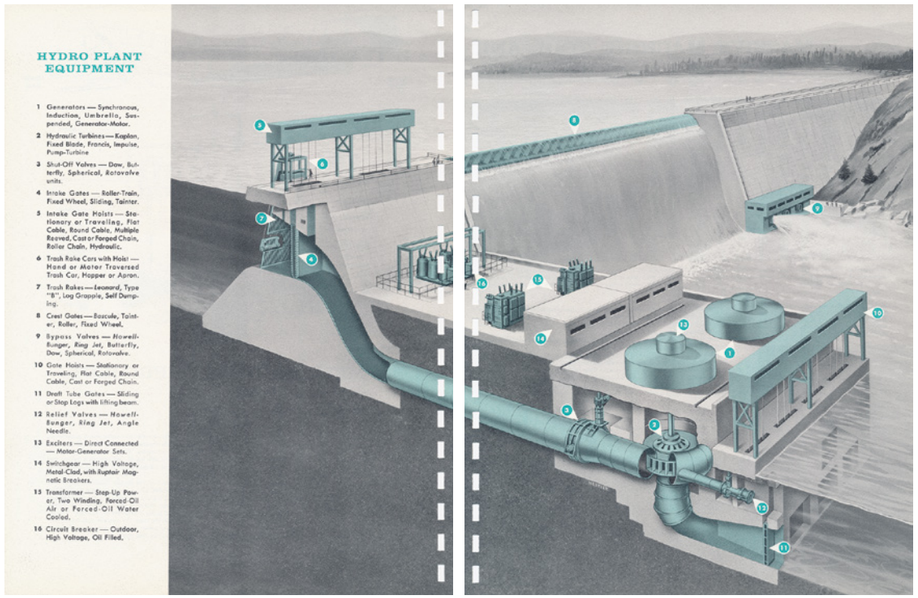
The list of mergers and acquisitions that have taken place throughout Voith Hydro's history is considerable. The customers of these hydropower specialists today put their trust in the best-in-class HyService provided by Voith Hydro.

- Allis-Chalmers, USA 1986
- Riva-Hydroart, Italy 1992
- Fuji Electric Hydro, Japan 1997
- Siemens Hydro, Germany 2000
- Westinghouse, USA 2000
- SHEC, China 2000
- VG Power, Sweden 2006
- Kössler, Austria 2007
- Vortex Hydrosystems, Canada 2013
- Sintaksa, Croatia 2021
- Green Highland Renewables, UK 2022

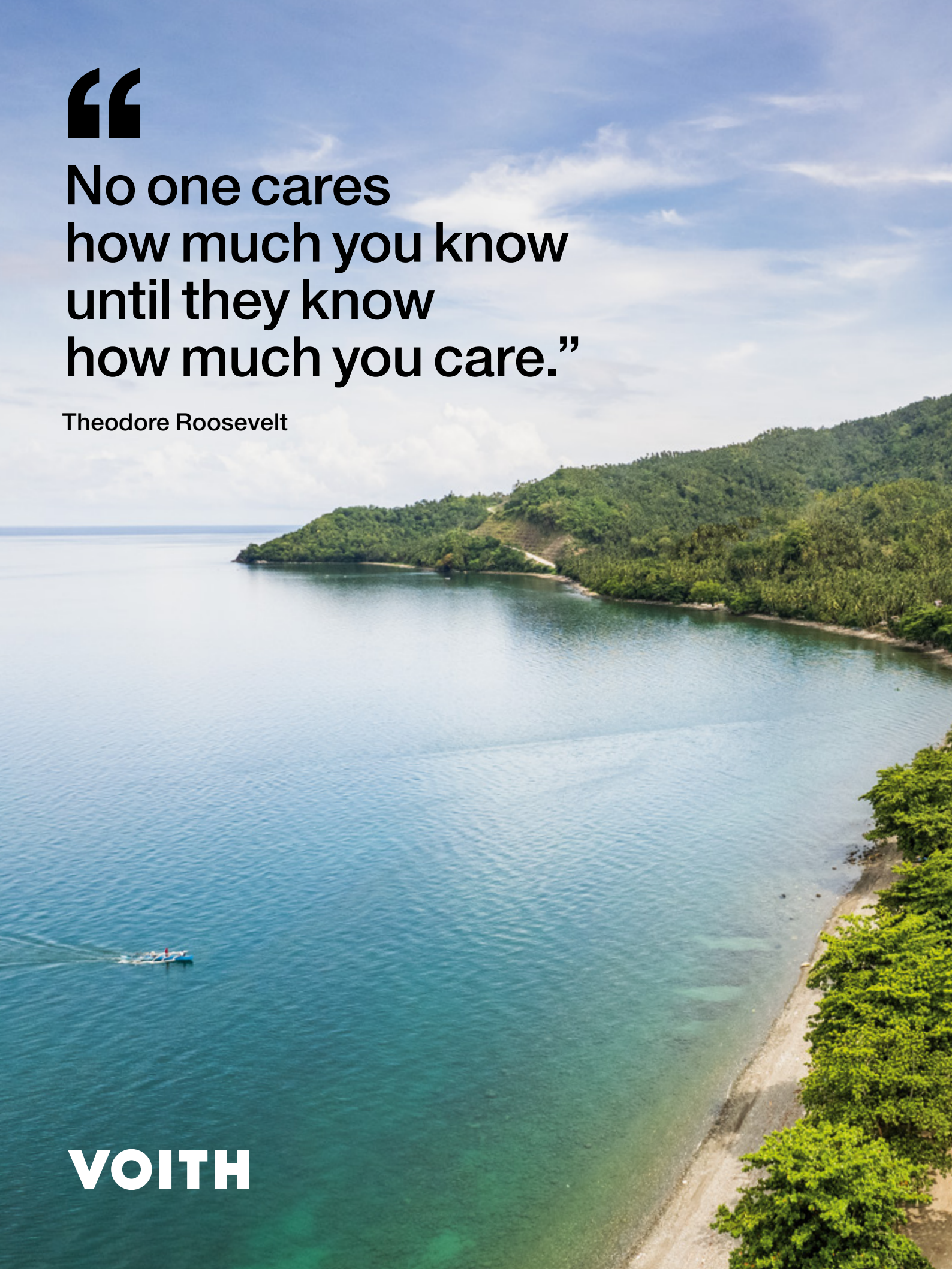
5



6



7


“No one cares
how much you know
until they know
how much you care.”
Theodore Roosevelt
VOITH