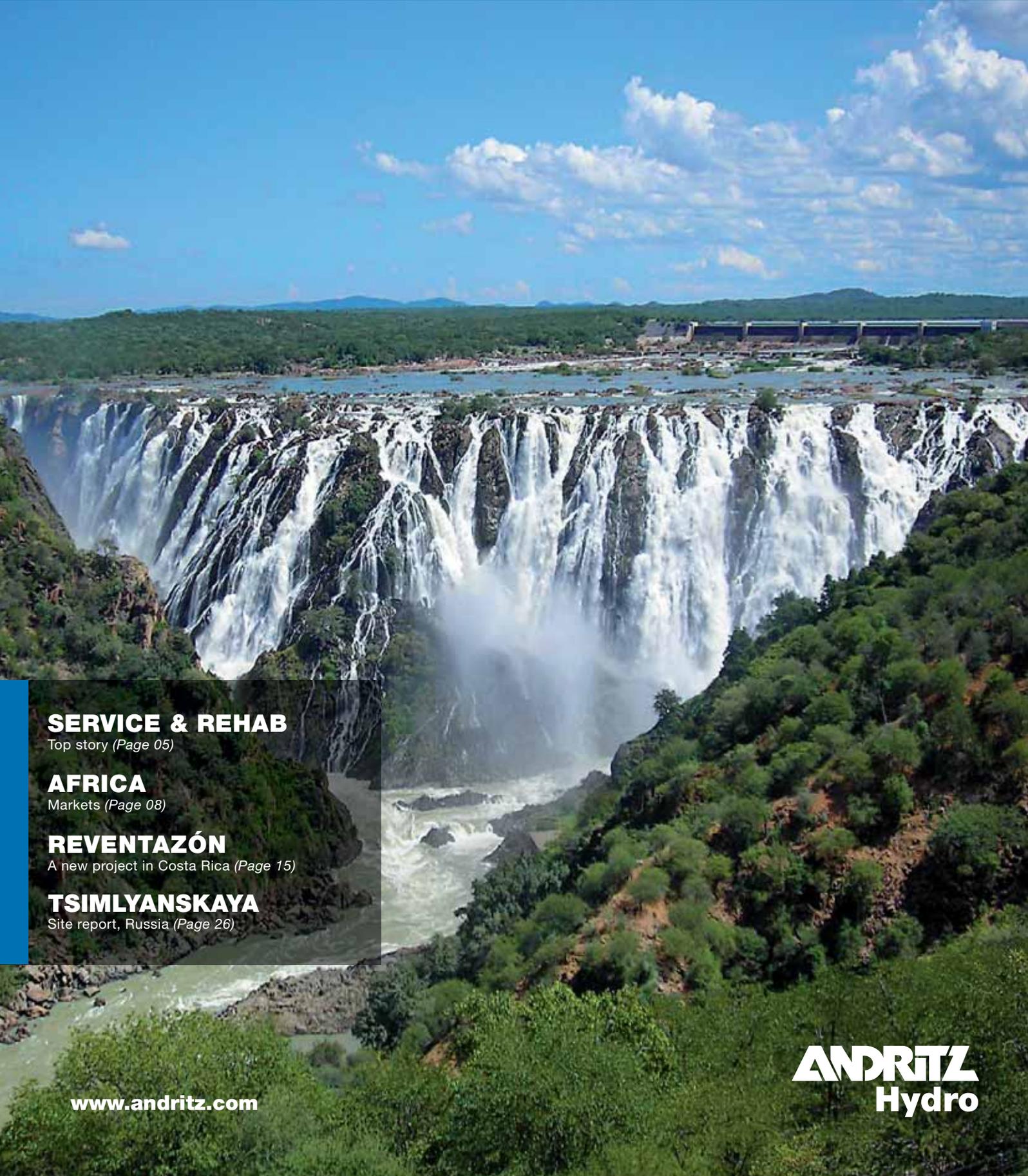


HYDRONEWS

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MAGAZINE OF ANDRITZ HYDRO



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Latest News



USA

ANDRITZ HYDRO Hammerfest, leading tidal energy company, receives the "International Pioneer Award" during the 9th Energy Ocean International Conference & Exhibition held this June in Boston, USA for their contribution and efforts in exploring marine energy. The deployment of the HS1000 is a first step towards developing commercial arrays worldwide.



Albania



On 18 September 2012 the world's largest matrix hydropower plant in Ashta, Albania, was inaugurated by the Albanian Prime Minister, Dr. Sali Berisha, and the Austrian president of the National Council, Barbara Prammer. The hydropower plant consists of two stages: Ashta 1 and Ashta 2 with 45 HYDROMATRIX®-TG units each and a total output of 53 MW from the two power plants.

ANDRITZ HYDRO supplied the electromechanical equipment including all HYDROMATRIX® units. The day before opening, ANDRITZ HYDRO welcomes Albanian customers and partners for the first "Customer Day Albania". The participants used this opportunity, to inform themselves about products and services of ANDRITZ HYDRO.

Germany

ANDRITZ HYDRO received an order from Verbund Innwerke GmbH for the modernization of HPPs Neuoetting and Perach, Germany, including control and

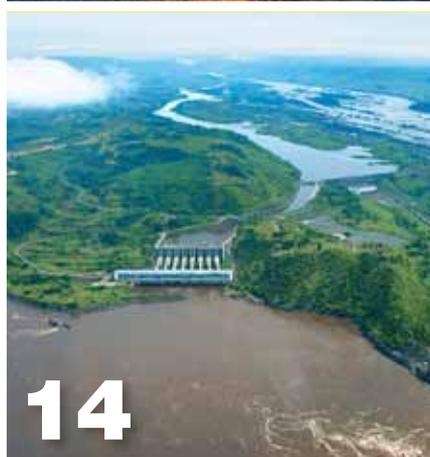
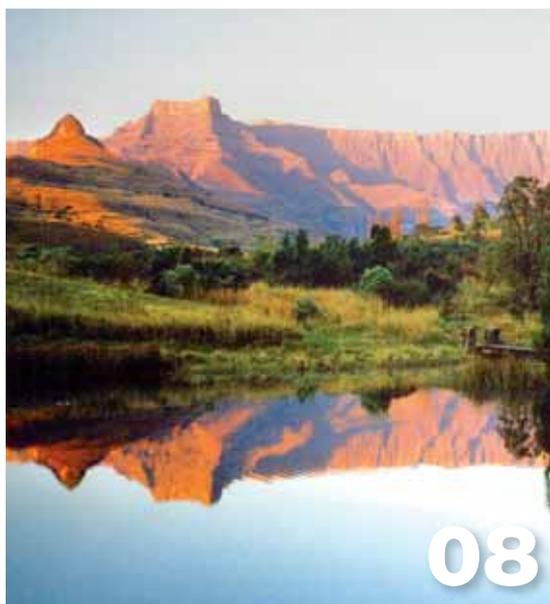
communication systems, turbine controller and static excitation systems. The control and operation of the 6 units and 9 gates will be realized by the proven NEPTUN concept.



Indonesia

The International Seminar on Development of Peaking Hydro Power was held on 31 August 2012 in Jakarta, Indonesia. It was organized by Indonesian electrical power societies MKI and

PLN, the Ministry of Energy, renewable energy society METI and ANDRITZ HYDRO. Speakers, including contribution of ANDRITZ HYDRO, covered a wide range of topics in respect to power sector development and upcoming pumped storage projects.



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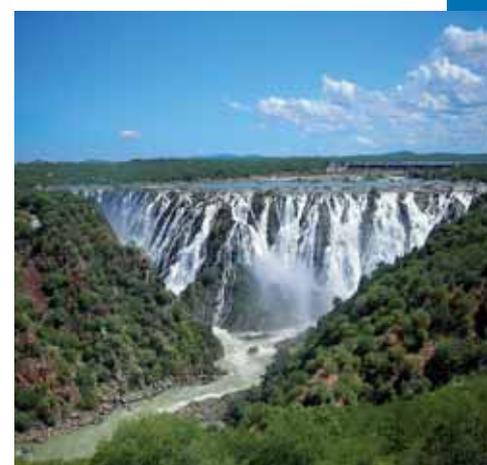
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Ruacana Falls in Namibia, Africa



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Dear **business friends**

One-fifth of global power is generated from renewable energy sources. Approximately 85% of this power is generated from hydroelectric sources, which are therefore by far the most important source of renewable energy.

According to expert estimates, only about one-third of the world's potential hydroelectric power is currently used. Although numerous new hydroelectric power plants are presently under construction or in the planning phase, there is still substantial potential for the future.

At the same time, additional investment is required for modernization, rehabilitation and capacity improvements to existing power plants. About one-half of the equipment used in hydroelectric power plants around the world is more than 30 years old. In North America, 43% of all existing plants are older than 40 years, and the corre-

sponding figure in Europe is 37%. The market for modernizing, rehabilitating and increasing the capacity of installed hydroelectric power plant equipment is therefore concentrated primarily in Europe and the United States, but this need will also increase significantly in other regions.

Africa is one region that requires construction of new power plants and refurbishment of existing hydroelectric plants. ANDRITZ HYDRO has been active in this region for more than 100 years and has supplied more than 50% of all installed turbines. Examples of ANDRITZ HYDRO's present-day modernization and rehabilitation successes in Africa include Drakensberg in South Africa, Kindaruma in Kenya, Edéa in Cameroon and Inga 2 in the Congo. More powerful new plants are planned in order to satisfy a significant ongoing demand for energy in Africa. Projects such as those in Assiut, Egypt or Ruacana, Namibia are good examples of such efforts. Continuing de-

mand for small hydroelectric plants that will contribute to a decentralized power supply will also improve the even distribution of power in Africa in the long term. New technologies are developing well globally. The construction of the world's largest matrix power plant in Ashta, Albania is proceeding on schedule. The first turbines have already undergone a test run.

The next generation of tidal turbines, the HS1000 developed by ANDRITZ HYDRO Hammerfest, is being tested in EMEC in Scotland under extreme environmental conditions.

The growth of the global hydroelectric market, our highly motivated employees, the continuous development of our technologies and the trust that our customers place in us make us well-equipped to meet the challenges of the market.

Sincerely yours,



M. Komböck



W. Semper



H. Heber

Service & Rehab

A global network for a booming market

About 50% of the primary and secondary equipment installed in hydropower plants around the world is older than 40 years. Therefore, the market is increasingly driven by modernization and upgrading of existing hydropower plants on one side, and improvements in reliability and availability of generation on the other. The Service and Rehab (S&R) division of ANDRITZ HYDRO is specialized in optimization of existing hydropower equipment as well as its operation and maintenance. Service and Rehab assists our customers in reaching their goals:

- maximization of energy production yield,
- increased competitiveness, and
- generation of sustainable value.

Based on energy market development, customer goals and plant conditions, S&R developed a concept of service and rehabilitation solutions to achieve maximum customer benefit and return on investment. Service leads to higher profitability and value through continuous improvement in asset management. Rehabilitation achieves higher profitability and value through a single intervention extending residual life and/or implementing state-of-the-art technology.

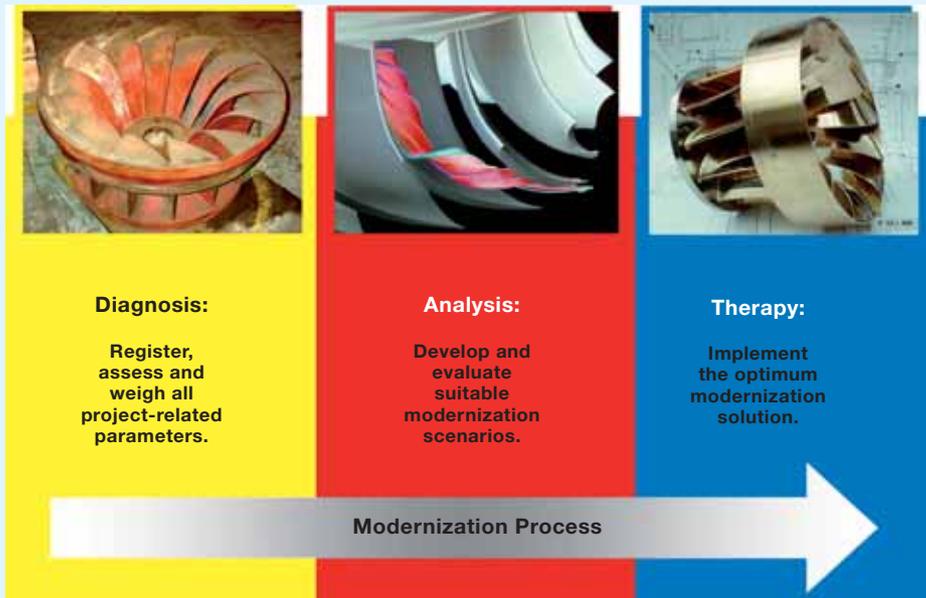


▲ ANDRITZ HYDRO is a full life-cycle service provider in hydropower

The major drivers for modernization are:

- a boost in power generation through optimal utilization of available water resources
- increased revenues from power generation
- reduced service and maintenance costs
- reduced risk of standstill and unplanned maintenance
- improved/maintained reliability and availability of the plant.

Modernization is a very complex issue. Aging of various plant components and systems very much depends on environmental and operational conditions. ANDRITZ HYDRO has developed a structured process for the assessment and modernization of HPPs. Based on our long experience and extensive activity, we find and implement the most economical solution.



The locations serving the international markets are also located in Central Europe. As a European highlight the first Russian S&R contract for HPP lowskaya was awarded to our setup in Moscow.



▲ Iovskaya, Russia

Our so called “3-Phase Approach” systematically ensures tailor-made solutions which guarantee maximum benefit for the owner.

Compared with greenfield projects, the additional challenges involved in modernization projects are:

- assessment of the plant and development of the most economical concept based on smart solutions
- management of the many interfaces to existing/remaining components/systems
- management and handling of the risks which naturally arise in the use of aging equipment
- management of minimization of outage time / loss of customer revenue.

S&R contributes to the “From-water-to-wire” approach, which results in the provision of a huge variety of products and services. S&R's order scope ranges from small spare parts to complex modernization contracts. It executes about 3,500 - 4,000 contracts globally per year.

Market coverage

S&R covers the so called “home markets” with local setups. All other regions and countries are served by the international S&R organization based in Austria and Switzerland, which may be supported by other locations (Italy, Canada, Norway, Sweden, Spain, Brazil, etc.).

The following short tour around the globe will highlight S&R markets and locations.

Europe

For historical reasons Europe is S&R's strongest foothold. About 60% of projects are handled from European locations. S&R has the narrowest location grid in Europe: 3 locations in Northern Europe, 8 in Central Europe, 2 in Southern Europe and 1 in Eastern Europe.



▲ Wiesberg, Austria - before rehabilitation



▲ Wiesberg, Austria - after rehabilitation

North and Latin America

With the acquisition of GE Hydro, ANDRITZ HYDRO significantly improved its service network in North and Latin America. In the NAFTA area we now have 6 locations, including 4 with manufacturing structures. Our latest highlights include the turbine modernization of HPP Necaxa (10 units) in Mexico, which was a follow-up project to the earlier HPP Infiernillo, confirming the short ROI period of less than a year. Our S&R network has improved in Latin America as well. The largest setup is Brazil, with 3 locations. S&R is represented with one location each in Venezuela, Colombia, Peru and Chile. A project highlight in this region is the generator rewind in three Endessa hydropower stations: 3 units at Cachoeira Durada (Brazil), 4 units at Huinco (Peru) and 2 units at Matucana (Peru), representing typical multilocation collaboration within S&R.



▲ Cavern of HPP Rouna 2, Papua New Guinea

Asia

Our home markets in Asia are India, China and Indonesia, with additional local setups in Malaysia, Vietnam and the Philippines. The largest S&R project in Asia, finished last year, was HPP Ambuklao in the Philippines. This project was a typical complex modernization project, covering ANDRITZ HYDRO's complete "From-water-to-wire" portfolio. Energy production was increased after modernization by 40%. An additional example is the replacement and commissioning of two HPP Larona units in Indonesia. Both units were successfully concluded with an extremely short downtime of 60 days only. In Australia, New Zealand and Papua New Guinea S&R can report a growing volume of activities. Projects like control system upgrades and Kaplan rehabilitations in Tasmania as well as the modernization of Rouna 2 in Papua New Guinea are only a few highlights. Recently ANDRITZ HYDRO was awarded the first excitation contract in New Zealand for HPP Aviemore. To guarantee optimum customer support in this region S&R is locally represented in Australia and New Zealand.

Africa

Over the last 100 years ANDRITZ HYDRO has installed approximately

50% of Africa's total installed capacity. Highlights on the continent include fleetcare projects such as the turnkey modernization of Edéa in Cameroon, Jebba, Kainji and Shiroro in Nigeria, generator rehabilitation in Drakensberg and control system replacement in Palmiet in South Africa. In June 2012 the first unit of HPP Kindaruma in Kenya was handed over to the customer in time, meeting all guaranteed performance values.

Summary

S&R activities cover all projects - from

emergency services to complex hydropower plant modernization. The past 5 years' experience has clearly demonstrated the big advantages of the distributed S&R location network. Resource pooling, balancing of annual peaks, and speaking the local language are only a few. All customer needs are met with individual solutions regarding technical, economic, and legal requirements.

Christian Jagob

Phone: +43 50805 5 3336

christian.jagob@andritz.com

▼ Lifting the rotor into the unit Kindaruma #3, Kenya





Africa

The unequalled passion of ANDRITZ HYDRO

▲ View of Drakensberg, South Africa

With major rivers such as the Nile, the Congo, the Niger, the Zambezi and the Orange as well as other innumerable watercourses and lakes, Africa is blessed with abundant hydrological resources that have historically provided the economic basis for the region's societies. Over the past decades, the importance of Africa's rivers has been complemented by their role in the produc-

tion of hydroelectric power. In terms of hydropower potential, Africa boasts enormous wealth. With an economically feasible hydropower potential of around 780,000 GWh, Africa holds 9% of the world's total. The utilization rate of this potential, however, is the lowest of all continents.

Despite its enormous hydropower potential, the continent lags behind when

it comes to full utilization of its hydrological resources. Electrification levels remain a source of concern, as around 70% of the population (and 85% in rural areas) of the Sub-Saharan region has no access to electricity – the highest levels in the world. Out of the 1.3 billion people that lack access to electricity globally, almost 600 million live in Sub-Saharan Africa – making access to electricity one of the most critical issues in Africa. This alarmingly poor record in electrification constrains African societies in many ways – limiting economic growth, influencing the quality of life and hampering development. Major macro-economic indicators such as high economic growth rates, a projected strong increase in energy demand and the doubling of Africa's population by 2050 highlight the need to unlock Africa's hydropower potential more urgently than ever.

ANDRITZ HYDRO – with a passion for Africa

For ANDRITZ HYDRO, a contribution to Africa's efforts to maximize the utilization of its hydropower potential is a clearly stated goal. With more than

▼ Ruzizi I powerhouse, Democratic Republic of Congo



100 years of presence in African markets – the first turbine was supplied in 1910 – and activities across the continent, the company is a leader in Africa's hydraulic energy generation. ANDRITZ HYDRO has supplied or refurbished around 50% (12,278 MW) of Africa's installed hydropower capacity. The company, which has an office in Johannesburg, South Africa, is acting in the African large hydro, small hydro, service & rehabilitation and automation sectors, thus covering all segments of the hydropower business.

Strong position in large hydro-power

ANDRITZ HYDRO has supplied electromechanical equipment for large hydropower stations (including pump storage facilities) across Africa. Just in the last decade the company received orders for numerous large hydro projects such as Beles and Gilgel Gibe (Ethiopia), New Naga Hammadi (Egypt), Manantali (Mali) and Ruacana (Namibia). One of ANDRITZ HYDRO's most recent orders in the large hydro business is installation of electromechanical equipment for the new Assiut hydropower plant in Egypt (see page 11) and rehabilitation work on Inga 2 in the



▲ New turbine for HPP Ruacana, Namibia

Democratic Republic of Congo (see page 14). Most recently, the new unit 4 of Namibia's Ruacana hydropower plant was officially inaugurated in May 2012. ANDRITZ HYDRO supplied 130 meters of vertical penstock, a 94 MW Francis turbine and electromechanical equipment for this project, thus contributing to the security of Namibia's power system supply.

Leader in the service & rehabilitation business

Since many of Africa's hydropower stations were built in the 1960s to 1980s, service, rehabilitation and modernization activities are key to keeping these facilities producing power. ANDRITZ HYDRO leads the way in the refurbishment and modernization of existing hydropower plants in Africa, and has recently conducted projects all over the continent, for example Shiroro (Nigeria), Akosombo (Ghana), Kindaruma (Kenya), Bendera and Ruzizi I (DR Congo) and Song Loulou (Cameroon). One recently finalized project (2011) was the rehabilitation of three units of Edéa, Cameroon's second-largest hydroelectric power plant. ANDRITZ HYDRO achieved a power increase of 40% for units 1 & 2 and 28% for unit 3, and handed over the units to the client on time.

TECHNICAL DATA

Ruacana

Output: 92 MW

Head: 130.50 m

Speed: 272.70 rpm

Runner diameter: 2,700 mm

Manantali

Output: 5 x 41 MW

Head: 55 m

Speed: 214.3 rpm

Runner diameter: 3,840 mm

▼ HPP Manantali, Mali





▲ Turbine as designed for HPP Kashimbila, Nigeria

Compact Hydro – contributing to the decentralization of energy generation

In the small hydropower business, ANDRITZ HYDRO has supplied approximately 200 compact hydropower units to Africa, with about 50 delivered to mining companies in South Africa. In 2011 ANDRITZ HYDRO, as the leader of the successful bidder consortium, was awarded a contract to supply 4 Kaplan turbines to the new 40 MW hydropower station at the Kashimbila multipurpose dam (Nigeria). The contract included generators, switchgears, transformers and associated equipment. ANDRITZ HYDRO will also supervise erection, do the commissioning and perform training activities (duration period: 2012-2014).



▲ Existing control room at PSPP Palmiet, South Africa

Supply of state-of-the art automation systems

ANDRITZ HYDRO is also active in the automation business, with recent delivery of products and services to countries such as DR Congo, Egypt, South Africa and Cameroon. An ongoing project is the supply of a new control system for the Palmiet Pump Storage Power Plant in South Africa. The

contract includes control and monitoring of two generator-motor/pump-turbine (2 x 200 MW) units and all auxiliary equipment with the governor and spherical valve. ANDRITZ HYDRO supplies and installs all new control cubicles with associated equipment such as PLC's and communication networks. The project is scheduled to be completed in 2013.

Hydropower's growing role in Africa

Over the past century, ANDRITZ HYDRO has assisted Africa in developing its hydropower potential in order to "power" economic growth and secure social welfare. As Africa redefines itself in order to achieve a forward-looking energy mix, hydropower – by far the largest source of renewable power on a global scale (85%) – is gaining in importance. The trend towards hydropower allows the continent to reap the manifold benefits of this well-proven technology: hydropower is renewable, clean and environmentally sustainable (no fuel, no waste) and commercially competitive. In addition, hydropower stations have the longest lifetimes (60-90 years) and the highest efficiency

of all power plants (up to 90%). On a global scale, without hydropower CO₂ emissions from electricity production sources would be 30% higher.

ANDRITZ HYDRO has an unequalled passion for Africa – and the conviction that hydropower will substantially help African countries to meet their energy goals.

Christoph Mayer
Phone: +43 50805 5 2691
christoph.mayer@andritz.com

Wilhelm Karanitsch
Phone: +27 (11) 466 2361
wilhelm.karanitsch@andritz.com

TECHNICAL DATA

Kashimbila

Output: 4 x 10 MW
Head: 17.76 m
Speed: 230.8 rpm
Runner diameter: 2,850 mm

Edéa I

Output: 3 x 16.4 MW
Head: 24 m
Speed: 187.5 rpm
Runner diameter: 3,180 mm

▼ HPP Edéa, Cameroon





Assiut

New bulb turbine power station in Egypt

▲ Old Assiut barrage, Egypt

Egypt is about three times the size of Germany - but only four percent of the country's surface area is populated. The fertile Nile Delta is home to 45 million people, and another 17 million live along the river banks in Upper Egypt. The population is growing quickly, and with it the requirements for energy, food and, of course, water.

For several years, the dams on the lower Nile have been undergoing a restructuring program. Reconstruction of the Assiut barrage, which is named after the nearby city and is, at over 100 years, the oldest dam on the Egyptian section of the Nile, will significantly improve conditions for irrigation and navigation. ANDRITZ HYDRO continues its Egyptian success story with this most recent

▼ Head regulator of old Assiut barrage, Egypt



power plant project on the Nile. Following the supply of bulb turbines to the New Esna power station (1989), the extensive rehabilitation of the turbines in Aswan 1 (1992-1997) and the supply of bulb turbines to the New Naga Hammedi power station (2002-2008), this constitutes the fourth major contract in a row for ANDRITZ HYDRO in Egypt. Thanks to its high quality standards and on-time delivery, ANDRITZ HYDRO has an excellent reputation in Egypt.

The entire project is financed by the German KfW Development Bank, and was tendered in several separate lots. ANDRITZ HYDRO was awarded all three lots for electromechanical equipment. The orders comprise supply and installation of four 8 MW bulb turbines, generators, electrical and hydro-mechanical equipment including sluiceways.



▲ Contract signature in Cairo

Contract negotiations took place in December 2011 at the Hydro Power Plant Executive Authority (HPPEA) and at the Ministry of Water Resources and Irrigation (MWRI) in Cairo. The contracts with ANDRITZ HYDRO were signed during a ceremony in Cairo on December 12, 2011.

This is a great success for ANDRITZ HYDRO, which has also secured an important reference project for sluiceways and navigation locks.

Bernd Hindelang
Phone: +49 (751) 29511 410
bernd.hindelang@andritz.com

TECHNICAL DATA

Output: 4 x 8 MW / 12 MVA

Voltage: 11 kV

Head: 4 m

Speed: 78.9 rpm

ANDRITZ HYDRO Hammerfest

New technology for ANDRITZ HYDRO

As renewable energy plays a growing role and international concerns about global warming increase, governments, policymakers, citizens and companies are reexamining the question of the right mix of energy resources and the factors that should contribute to determining this mix.

In line with these important goals, in mid-2010 ANDRITZ HYDRO decided to expand its product portfolio by acquiring shares in the Norwegian company Hammerfest Strøm. This company is a world market leader in technologies for energy generation using tidal currents in coastal waters. At the same time it is actively holding its position in the promising new ocean power market. By end of 2011 participation in the company had increased from 33.3% to 55.4%. Other major shareholders in the company are local Norwegian utility Hammerfest Energi and Spanish utility Iberdrola. The company, which now operates as ANDRITZ HYDRO Hammerfest, is based in the Norwegian city of Hammerfest and has a subsidiary in Glasgow, Scotland.

First 1 MW tidal current turbine

In December 2011, ANDRITZ HYDRO Hammerfest successfully deployed its 1 MW pre-commercial tidal turbine designed to validate the technology for the world's first tidal power array. The machine was installed at the European Marine Energy Centre (EMEC) in Orkney, Scotland. The site provides the world's only multi-berth, purpose-built, open sea test facilities for wave and

tidal marine energy converters. For tidal energy converters, EMEC operates seven test sites at the Fall of Warness of the island of Eday. Meanwhile, the device has been successfully synchronized to the grid, delivering power on the first attempt during initial start-up. ANDRITZ HYDRO Hammerfest's HS1000 tidal device is a horizontal axis turbine, similar to a wind turbine, mounted and locked onto a solid steel structure and positioned on the seabed. The rotor blades are driven by water currents and coupled to an electric generator through a step-up gearbox. Additionally, a dedicated blade pitching system allows optimum adjustment of the rotor blade to the direction and speed of the tidal current.

The new HS1000 turbine is based on the technology used in the HS300 prototype, a smaller turbine with 300 kW electrical outputs. The HS300 was installed in Norway as the first tidal current turbine, with a permanent connection to the public grid in 2004. The prototype was in operation for more than 17,000 hours, delivering power to the grid with 98% availability during testing.

Installation under turbulent conditions

The EMEC site is considered to contain some of the most hostile waters worldwide. Nevertheless, installation of the HS1000 was carried out during the worst operational deployment period of the year, with extremely strong winds and high waves. A special heavy-lift vessel, dynamically positioned, was

used to guarantee precise positioning of the device. Methodologies and procedures were defined so that the equipment could be installed without the support of divers, which would have been much too dangerous in such an environment. The marine installation was monitored by remotely operated vehicles (ROV) equipped with video cameras which transmitted the images on board the vessel to the operators.

World's first tidal turbine array

The HS1000 device, which covers the annual electricity needs of 500 homes, is the same machine that will be used by Scottish Power Renewables (SPR) as part of the world's first tidal turbine array in the Sound of Islay. The company's plans to develop a 10 MW tidal array received consent from the Scottish Government in March 2011. Beyond this, SPR aims to use the turbine as part of even larger-scale projects currently under investigation in the Ness of Duncansby, as part of The Crown Estate's Pentland Firth leasing round.

Realization of demonstration projects is seen as a vital step towards fully utilizing the great potential of power generation from tidal currents. In this scenario, the Islay project will play a key role in helping to verify a range of factors necessary for large-scale deployment of the technology.

Peter Gnos
Phone: +43 50805 5 2694
peter.gnos@andritz.com



▲ Transport of the HS1000 nacelle



▲ Installation of the ballasts



▲ Installation of the HS1000 nacelle

TECHNICAL DATA

Type: HS1000
Rated power: 1,000 kW
Production capacity: above 3.5 GWh/year
Water depth: 50 m
Turbine height: 32.5 m
Nominal speed: 10.2 rpm
Rotor diameter: 21 m

▲ Representation of a tidal turbine array



Inga 2

Strengthen the hydropower market in the Democratic Republic of Congo

▲ Aerial view of the Inga site: powerhouse of Inga 2 (left) and Inga 1 (right)

ANDRITZ HYDRO strengthens its presence in Africa with an important turbine rehabilitation contract for two units at HPP Inga 2 in the Democratic Republic of Congo.

The Inga 2 power station was built on the Congo River in the 1970s, approx. 300 km downstream of Kinshasa, Congo. The power station currently uses only a small portion of its enormous potential for power generation. ANDRITZ HYDRO was awarded a contract in a consortium by the government of the Democratic Republic of Congo to rehabilitate two 178 MW units.

ANDRITZ HYDRO will handle the me-

chanical part of the rehabilitation, including repair and overhaul of the penstocks, hydraulic steelworks and rather large Francis turbines, which have a runner diameter of 6,200 mm. In order to achieve much better performance and higher reliability, the central parts of the turbines will be completely replaced with state-of-the-art equipment. This will also guarantee smoother operational behavior and fewer maintenance requirements. The project will be finalized in 2015.

The fundamental rehabilitation of the two turbines, which have been out of service for many years, will substantially improve the electric power system in Congo. At present the system suffers frequent outages. There is consider-

able potential for further rehabilitation works on the equipment at the two existing powerhouses in Inga. In addition, this strategically important project will allow a closer follow-up of the ambitious plans to further develop the Inga site. In fact, it has the potential to become the most important electricity source for the entire continent.

Patrice Barbeau
Phone: +49 (751) 29511 452
patrice.barbeau@andritz.com

TECHNICAL DATA

Output: 2 x 178 MW
Head: 62 m
Speed: 107.1 rpm
Runner diameter: 6,200 mm



▲ Site for the HPP Reventazón, Costa Rica

Reventazón

The largest hydropower project ever built in Costa Rica

The Reventazón hydroelectric power project consists of a 303 MW hydroelectric power plant and its related facilities, located midstream in the Reventazón River that flows from the central plateau to the Caribbean Sea. This project increases the country's hydroelectric power generation capacity. It improves a stable electricity supply and enables the country to meet its future electricity demand. At the same time it supports the country's economic development by improving infrastructure, not only in the power sector.

The electricity production in the Reventazón hydroelectric power plant is estimated to be 1,560 GW/h per year. This power will be distributed throughout the

country through the national interconnected system. Enough energy will be generated to cover the needs of more than half a million households.

Considering installed capacity as well as average annual electricity generation, this project will be the largest hydropower plant ever built in the country.

After a competitive international tender process, ANDRITZ HYDRO was awarded a contract by the Instituto Costarricense de Electricidad (ICE) for supply of the electro-mechanical package to the Reventazón power project. This includes four Francis turbines with a nominal capacity of 74 MW each, four butterfly type inlet valves, mechanical auxiliaries, one butterfly type valve for the penstock, four generators, and au-

tomation, control and protection systems as well as low and medium voltage electrical power systems.

By mid-April 2012 the ICE had successfully diverted the river, achieving an important milestone in the construction of this project.

Marco Ramirez
Phone: +43 50805 5 2662
marco.ramirez@andritz.com

TECHNICAL DATA

Output: 4 x 74 MW / 86.2 MVA
Voltage: 13.8 kV
Head: 133.4 m
Speed: 300 rpm
Power factor: 0.85

Beyhan-1

Large Francis units for Turkey

An international consortium led by ANDRITZ HYDRO has received an order from Kalehan Enerji Üretim ve Ticaret A.S. for supply and installation of electromechanical equipment for the Beyhan-1 hydropower plant in Turkey.

This represents the first of four Kalehan Enerji hydropower projects planned on the Murat river in the eastern part of the country.

The consortium's supply scope includes three turbine-generator units, transformers, switchgear and all of the electrical equipment. In addition, a small-scale hydropower unit will be delivered to generate power from ecological water flows. This is done in order to preserve its fauna and flora.

Each of the three 186 MW Francis turbines to be supplied by ANDRITZ HYDRO has remarkable dimensions: With a runner weight of more than 80 tons and a maximum diameter of



▲ Francis turbine runner

approximately 6 m each, these will be amongst the largest units of their kind installed in Turkey.

The plant, with its 600 MW installed capacity, will be a cornerstone of the power supply in this growth market region. Thus, another 1,250 GWh/a of renewable energy from clean hydropower will be supplied to the Turkish grid from mid-2015.

Gerald Stelzhammer
Phone: +43 (732) 6986 5263
gerald.stelzhammer@andritz.com

TECHNICAL DATA

Output: 3 x 186 MW
Head: 73 m
Speed: 115.38 rpm
Runner diameter: 5,650 mm

▼ Current site works on the Murat river, Turkey



Kaunertal

New penstock, a milestone for ANDRITZ HYDRO in Austria

▲ Test welding with WIG HD process at workshop

In April 2012, ANDRITZ HYDRO received a contract from Tiroler Wasserkraft AG (TIWAG) for replacement of the existing penstock at HPP Kaunertal.

The contract includes the design, fabrication, supply, installation and commissioning of the new penstock and a surge tank with a steel liner connecting the new and existing penstocks. The project is located next to the village of Prutz in Tyrol, Austria. The HPP Kaunertal has operated continuously for over 40 years. A periodic inspection of the plant showed the necessity of replacing parts of the existing penstock. The new waterway is divided into 4 sections.

- Section A - Surge tank;
- Section B - Distribution Burgschrofen;
- Section C - Inclined pressure liner (penstock) and
- Section D - Horizontal section & distribution.

The contract is executed under the leadership of TIWAG. ANDRITZ HYDRO

▼ Portal Burgschrofen, Austria



offered the project's execution in partnership with KREMSMÜLLER Industrieanlagenbau KG. KREMSMÜLLER will directly fabricate all penstock pipes (up to a diameter of 4.3 m and a length of 6 m) at its Steinhaus workshop in Wels, Austria. It is also responsible for the installation of section D. Components with larger dimensions will be prefabricated in Wels, whereas the final assembly is done on-site in a field workshop about 1,600 m above sea level. ANDRITZ HYDRO is responsible for the design, material procurement, on-site fabrication and installation of sections A to C.

The most essential technical aspects are material quality for the 60% inclined pressure liner, including special creation of thermo-mechanically rolled steel grade of types S580/820M and S620 QL1. The pressure line welding will be executed with WIG-HD "Engspalt" (narrow-gap-weld). All components must fulfill the highest quality and reliability standards. The entire contract period will last 46.5 months. The main work at the site is scheduled for early 2013 through August 2015.

This order marks quite a milestone in ANDRITZ HYDRO's development of high-quality and state-of-the-art technologies for such applications. It once

again confirms our excellent and long-standing cooperation with customers in Austria.

Erich Neugschwandtner
Phone: +43 (732) 6986 8075
erich.neugschwandtner@andritz.com

TECHNICAL DATA

Steel liner for Surge Tank

Diameter: from 3.5 to 6.3 m
Material: S355ML; S460 ML; S500M
Thickness: 20 mm to 50 mm
Length: approx. 455 m
Total weight: 1,312 ton

Distribution Burgschrofen

Diameter: from 2.5 to 4.3 m
Material: S355ML; S460 ML
Thickness: 20 mm to 50 mm
Length: approx. 99 m
Total weight: 398 ton

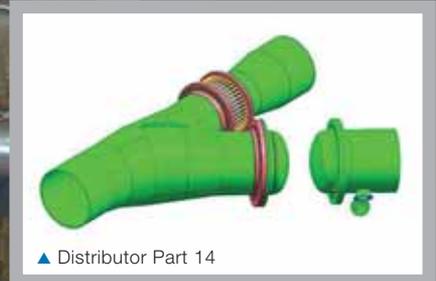
Inclined Pressure Liner

Diameter: 4.3 m
Material: S580/820M; S620 QL
Thickness: 25 mm to 52 mm
Length: approx. 1,416 m
Total weight: 5,802 ton

Horizontal Section & Distribution

Diameter: from 2.5m to 4.3 m
Material: S355ML; 460ML; S500M;
Thickness: 44 mm to 115 mm
Length: approx. 319 m
Total weight: 1,738 ton

TOTAL WEIGHT Section A to D: 9,250 ton



Umluspen

Important rehabilitation in Sweden

▲ HPP Umluspen, Sweden

A **NDRITZ HYDRO** received an important contract from **Vattenfall** for the rehabilitation of two 52.8 MW Kaplan turbines and two generators. The power station is located in Storuman in Lappland, Sweden, about 300 km from Östersund. It is equipped with two Kaplan turbines and two generators built in 1957.

Rehabilitation will increase the power station's output by 8 GWh/year. The plant delivers electricity to 1,600 normal households and is included in Vattenfall's large rehabilitation program carried out between 2010 and 2023.

The turbine lot includes a model test, two new oil-free self-lubricated Kaplan runners, and new high pressure units. The turbine will be manufactured by ANDRITZ HYDRO in Nälden, Sweden, the model test will be carried out at ANDRITZ HYDRO in Tampere, Finland.

The generators will be totally refurbished with new windings, new cores, a new pressure system, new key bars and a new cooling system.

A total output of 55 MVA will be achieved. The engineering work will be fulfilled by ANDRITZ HYDRO in Västerås, Sweden and ANDRITZ HYDRO in Vienna, Austria. All on-site activities will be performed by ANDRITZ HYDRO Sweden. The project is very important for ANDRITZ HYDRO,

▼ Machinehall of HPP Umluspen, Sweden



for the ANDRITZ HYDRO AB location in Västerås, Sweden, and for the Scandinavian market.

Anna Fahlén

Phone: +46 (21) 108855

anna.fahlen@andritz.com

TECHNICAL DATA

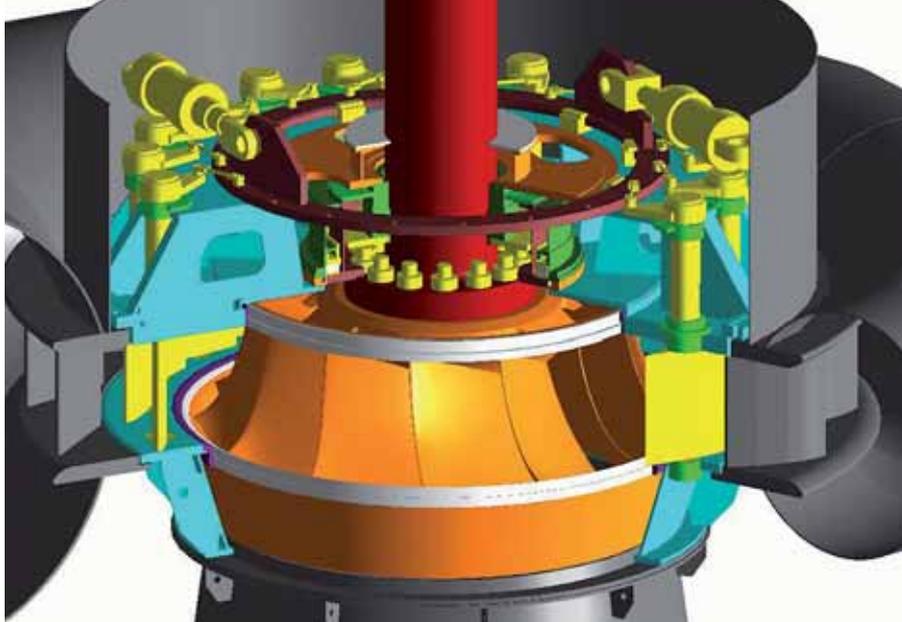
Output: 2 x 52.8 MW / 55 MVA

Voltage: 12.4 kV

Head: 34.5 m

Speed: 150 rpm

Runner diameter: 4,880 mm



▲ Vertical Francis turbine



▲ Signing Letter of Intent in the Austrian embassy, Bogota

Carlos Lleras

New 84 MW project in Colombia

ANDRITZ HYDRO confirms its strong market position in Colombia with a new contract for electromechanical equipment for the 84 MW Carlos Lleras Restrepo hydropower project.

ANDRITZ HYDRO has received an order for all electromechanical equipment for the new Carlos Lleras Restrepo hydropower project, which will be built near Medellin in the Colombian state of Antiochia. The owner, Hidroelectrica del Alto Porce S.A. ESP (HIDRALPOR) belongs to the civil works group MINCIVIL. The contract includes two Francis turbines and generators with an output of

42 MW each, as well as inlet valves, control systems, auxiliaries, penstocks and gates. All equipment will be supplied, installed and commissioned by ANDRITZ HYDRO.

Besides the attractive technical and commercial proposal, ANDRITZ HYDRO's long-term experience and presence in the country and service quality contributed to this decision. A Letter of Intent has already been signed by both parties during a January 2012 visit from a high-ranking Austrian delegation, which included the state secretary in the Ministry of Foreign Affairs, Dr. Wolfgang Waldner

and the president of the Chamber of Commerce, Dr. Christoph Leitl.

HPP Carlos Lleras Restrepo will be built by the civil works company MINCIVIL approx. 50 km from the city of Medellin, on the Medellin River near the village of Popalito. The net head will be 117.6 m, while the flow will be in the range of 80 m³/sec. Commissioning is planned for summer 2015.

After receiving a contract for three Francis turbines for the 820 MW Sogamoso project in 2010, and several orders in the area of Compact Hydro and Service and Rehab, this award again confirms the fruitful cooperation between ANDRITZ HYDRO and our clients in Colombia, a country which still boasts enormous hydropower potential to be utilized in the coming years.

Ingolf Neudert
Phone: +49 (751) 29511 201
ingolf.neudert@andritz.com

TECHNICAL DATA

Output: 2 x 42 MW
Head: 117.6 m
Speed: 360 rpm
Runner diameter: 1,980 mm

▼ Rio Medellin - Municipality of Barbosa near Popalito village, Colombia





Santa Teresa

New hydropower for the Andes in Peru

▲ Machu Picchu, Peru

Luz del Sur is one of the leading power utilities in Peru. The utility plans to expand its electricity production through construction of the 98.5 MW Santa Teresa hydropower plant. In the very competitive hydro market of Peru, Luz del Sur assigned the electro-mechanical equipment contract to ANDRITZ HYDRO.

The Peruvian economy has grown continuously for over a decade. In 2010 the increase was close to 9%, and in 2011 it was almost 7%. In fact, Peru's electricity demand rose more than 9% between 2009 and 2010. Hydroelectric power plays a significant role in covering this energy demand.

The Santa Teresa hydroelectric power plant will be built in the Urubama valley in the Cusco region. It is located close to the Machu Picchu archaeological site, and uses the tailwater discharge from the corresponding hydropower station. Typically, rivers in the Andes carry a high amount of sediment. In order to provide high erosion resistance and to extend their working life, the turbine components are protected using coating technology. The construction of the Santa Teresa power house and penstock will take place underground to ensure minimal environmental and visual impacts.

One key element in the assignment of this project to ANDRITZ HYDRO was

their successful record in project execution and quality supplies. The contract for the new powerhouse includes the delivery of two (51 MW) Francis turbines for a head of 178 m, two (57 MVA) generators and governors as well as protection and control systems. The project is executed by ANDRITZ HYDRO Austria together with ANDRITZ HYDRO Italy and ANDRITZ S.A. in Peru. The Peruvian office is responsible for local transport and installation. Commissioning for both units is planned for mid-2014.

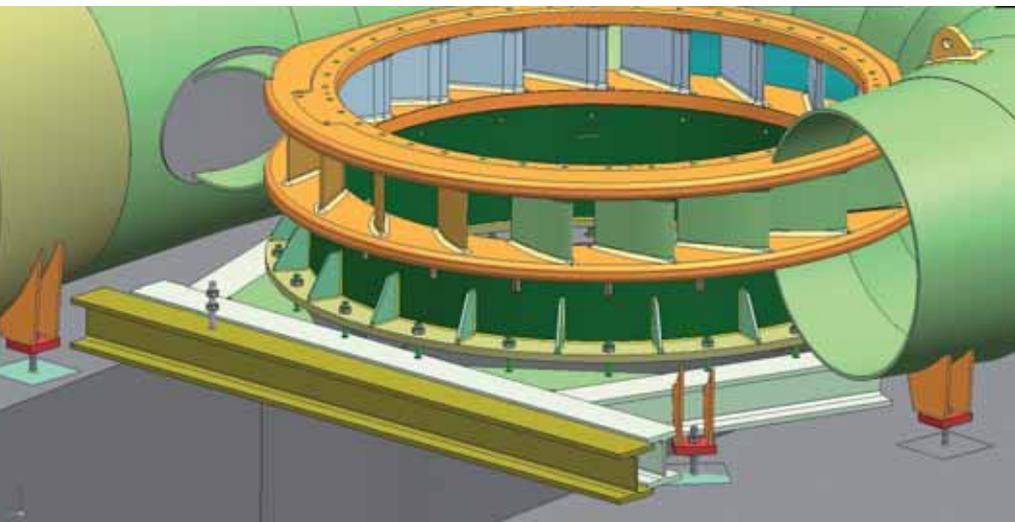
With a long history in Peru, ANDRITZ HYDRO strengthens its presence in South America with this huge contract for the Santa Teresa project.

Oliver Gielesberger
Phone: +43 50805 5 2638
oliver.gielesberger@andritz.com

TECHNICAL DATA

Output: 2 x 51 MW
Head: 178 m
Speed: 360 rpm
Runner diameter: 1,930 mm

▼ Spiral case



Upper Tamakoshi

Largest project so far in Nepal

In 2012 ANDRITZ HYDRO signed a contract for one of the most prestigious hydropower projects in Nepal - the 477 MW HPP Upper Tamakoshi - under development by Upper Tamakoshi Hydro-power Ltd, established by Nepal Electricity Authority (an authority under the Nepalese government).

So far the HPP Upper Tamakoshi is the largest project in Nepal that uses the country's own funds in its implementation. The project is a run-of-river type with live storage. Compared to other run-of-river projects investigated in Nepal, the HPP Upper Tamakoshi ranks as one of the most attractive projects due to its limited environmental impact. It has also been approved by the government of Nepal.

Upper Tamakoshi will produce peak energy for Nepal. The scope of supply for this project includes:

- 6 units of high head (805 m) Pelton turbines including electronic speed governors
- 1 unit of main shut off valve
- 6 units of spherical inlet valves
- 6 units of generator with static excitation
- along with equipment (digital protection, computerized supervisory and control system, 1 phase 220 kV power transformers, and gas insulated switchgear including 220 kV XLPE power cable and auxiliary systems).



▲ Contract signing ceremony

The HPP Upper Tamakoshi has followed international bidding procedures, and all major global electro-mechanical equipment manufacturers participated in this prestigious project. This shows how desirable the Nepalese market is in terms of its hydro potential.

ANDRITZ HYDRO received the Letter of Intent on 9 February 2012. Upper Tamakoshi Hydro Power Ltd. (UTKHPL) signed the contract on 26 February 2012. The award of this contract reinforces ANDRITZ HYDRO's leading position in Pelton turbine technology.

Dnyaneshwar Deshmukh
Phone: +91 (7480) 400403
dnyaneshwar.deshmukh@andritz.com

TECHNICAL DATA

Output: 6 x 79.5 MW / 6 x 90 MVA

Voltage: 13.8 kV

Head: 805 m

Speed: 600 rpm

Runner diameter: 1,976 mm



▲ Powerhouse HPP Vrutok, Macedonia

Vrutok

Market entry in Macedonia

In March 2012 ANDRITZ HYDRO signed its first direct contract with Elektrani Na Makedonija (ELEM), Macedonia's state power producer.

Vrutok is the largest hydropower plant in Macedonia. The HPPs Raven and Vrben are part of the Mavrovo system and were commissioned in two stages: 1957/1958 and 1973 with 201 MVA installed capacity. The plant encompasses 42% of the totally installed hydro capacity in Macedonia.

Contracted work at HPP Vrutok include replacement of four generators, high-voltage cables, and a firefighting system for generators and transformers. Furthermore, two excitation transformers and four electrical brakes will be modernized, and the control and protection system will be updated. At HPP Raven the bearing lubrication system, two busbars and media voltage cables will be replaced.

Macedonia imports approximately 30% of its energy mix. Therefore one of the most important criteria for choosing ANDRITZ HYDRO was to



▲ Signing ceremony

meet the project's challenging time schedule. Finally, it was the variety of proposed technical solutions, timing and references which convinced ELEM to choose ANDRITZ HYDRO during the competitive international bidding process. As a result, the modernization work at HPP Vrutok is expected to increase the plant's available production capacity from 168 MVA to 184 MVA,



▲ HPP Raven, Macedonia

and provide up to 50 GWh/year of additional production. It will improve efficiency and decrease machine losses by as much as 7 GWh/year, and will result in savings in CO₂ emissions and maintenance costs. The project is financed through a loan from Germany's KfW and is expected to be finished in May 2014.

Ewald Hesse
Phone: +43 50805 5 2671
ewald.hesse@andritz.com

Maksida Joldic
Phone: +43 50805 5 3928
maksida.joldic@andritz.com

TECHNICAL DATA

Output: 4 x 41.4 MW / 46 MVA
Voltage: 12 kV
Speed: 500 rpm



Baglihar 2

Three more Francis turbines for India.

▲ Downstream view to Baglihar Dam, India

The power station is located in the northwestern Indian state of Jammu & Kashmir, on the river Chenab. ANDRITZ HYDRO, as consortium member, was recently awarded a contract to supply electromechanical equipment for the second stage of the Baglihar hydro-power station. The same consortium carried out the work on Baglihar stage 1. Due to the client's great satisfaction with the consortium's high performance during the Baglihar 1 project, ANDRITZ HYDRO could refer during the negotiations to the high-quality equipment that was delivered for Baglihar 1.

The "original" order for Baglihar 2 was signed in June 2002, but was not put into force until now. In 2006 and 2008 negotiations began again, but there was no significant progress until a revised offer was presented in January 2010. Intensive technical discussions in 2010, followed by commercial discussions in 2011, finally led to the commencement of the contract ten years after the original was signed.



▲ Francis runner during manufacturing

ANDRITZ HYDRO will deliver complete turbines, governors, butterfly valves and mechanical balance of plant for the three 151 MW Francis turbines. In the second stage of extension the capacity at Baglihar will be increased to 900 MW in total.

During the monsoon rains the Chenab river will transport more than 3 million tons of sand. To protect the turbines, ANDRITZ HYDRO's unique SXH™70 tungsten carbide hard coating will be applied to the runners and wicket gates. This will ensure that the turbine can withstand the harsh, abrasive environment.

The runners will be manufactured by ANDRITZ HYDRO in Ravensburg, Germany while the SXH™70 coating will be applied in Kriens, Switzerland. All other parts will be delivered by ANDRITZ HYDRO India, including the three butterfly valves DN 4,600.

Thilo Pohlmann
Phone: +49 (751) 29511 417
thilo.pohlmann@andritz.com



▲ Challenging transport for large components

TECHNICAL DATA

Output: 3 x 151 MW
Head: 125 m
Speed: 187.5 rpm
Runner diameter: 3,730 mm

Lewiston

ANDRITZ HYDRO US secures large generator / motor upgrade

▲ Niagara Falls, USA

On 26 June 2012 the New York Power Authority's (NYPA) Board of Trustees awarded a construction contract to ANDRITZ HYDRO. The project comprises the overhaul of 12 generator units at the Lewiston Power Plant in Lewiston, New York. The award of the generator contract is one of many parts of an upgrade to the Lewiston pump generating plant. This contract represents another significant milestone for ANDRITZ HYDRO in the US market. It is our first contract with one of the largest non-federal government utilities and thus represents a large portion of the highly competitive US multi-turn coil market.

▼ Overhead view of Lewiston pump generating plant, New York



▲ Southern face of Lewiston assembly bay

In 1950 the US and Canada signed the Niagara River Water Diversion Treaty. This treaty ensures water flow for the aesthetics of Niagara Falls, while the remainder is shared equally by both countries for hydroelectric power production.

The Lewiston power plant came on line in 1961 with a generator/motor rated at 25 MVA. In the 1980s the generator/motors were rewound to an up-rate of 36 MVA. The ratings associated with the contract between NYPA and ANDRITZ HYDRO are further up-rated to 38 MVA at 0.9 pf, 13.8 kV.

Upon completion the Lewiston generator/motor upgrade will deliver a plant capacity of 456 MW of low cost energy to New York businesses and residents.

Each generator outage is scheduled for 4.5 months. Work will take place on one unit at a time. The first outage will begin in January 2013; the end of the project is scheduled for 2021. The contract includes system studies, new stator windings, new rotor poles, new surface air coolers, supply-related disassembly, installation and testing. Unit disassembly/assembly will be performed by the turbine contractor, and commissioning will be performed by NYPA with technical supervision provided by ANDRITZ HYDRO.

John Parker
Phone: +1 (704) 731 8878
john.parker@andritz.co

TECHNICAL DATA

Output: 12 x 38 MVA
Voltage: 13,8 kV
Head: 29 m
Speed: 112.5 rpm
Runner diameter: 5,300 mm



▲ Estreito Unit #4, Francis runner and turbine shaft assembly

Estreito

Successful modernization of a hydropower plant in Brazil

In Brazil, **ANDRITZ HYDRO Inepar** successfully modernized the HPP Luiz Carlos Barreto de Carvalho, better known as HPP Estreito and one of five FURNAS' power plants with power exceeding 1,000 MW. Inaugurated in 1969, the plant is located in the city of Pedregulho near the city of Franca, São Paulo State and has six 175 MW Francis turbines, totaling 1,050 MW in installed capacity.

Modernization of HPP Estreito began in February 2005. ANDRITZ HYDRO Inepar considered the complete electromechanical equipment including the modernization of six Francis turbines, six generator stator parts, control system cranes, gates and Penstocks and Bus bar. Although there were no reliable

▼ Francis runner transportation



technical documents, a detailed study of all components was made during the modernization process in order to guarantee reliable technical documentation for the entire project in future. The contract included the installation of an air injection system with a lower ring of 1-4 turbines. It became the first major challenge of this project. We initially planned to install a rubber hose just below the bottom ring. Unfortunately, this solution was not good enough and we had to change the system without disassembly the complete unit. In this way, several holes were made in the bottom ring, in order to allow the access to replace the hoses with stainless steel pipes.

Another challenge was the recovery of the hydraulic profile of the Francis runner blades. These blades had been operating for over 40 years and, after too many cavitation damages recovering processes, presented profile distortions. During the recovery process the damaged material was removed, and a combination of ASTM A309 and Cavit alloy was applied and the profile was ground. After disassembly, new activities out of scope were performed, which increased the overhaul and upgrade period to around 580 days.



▲ The power plant after modernization

The success of this project was based on the good relationship between FURNAS and ANDRITZ HYDRO Inepar. The team, consisting of professional factory assembly supervisors, engineering staff and project managers, performed the work with dedication and high quality.

The modernization project at HPP Luiz Carlos Barreto de Carvalho is an important milestone for ANDRITZ HYDRO Inepar, consolidating its name among the world leading suppliers of hydropower equipment. It is a benchmark for future project feasibility studies for potential customers in Brazil such as FURNAS, CEMIG, TRACTEBEL and COPEL.

Valdir Castro Oliva
Phone: +55 (16) 3805 3304
valdir.oliva@andritz.com

TECHNICAL DATA

Power Generating Units:

Output: 6 x 175 MW

Speed: 112.5 rpm

Turbines:

Type: Francis Vertical

Runner Diameter: 6,200 mm

Generators:

Output: 13.8 kV

Voltage: 60 Hz

Transformers:

Type: Single Phase

Output: 1199.88 MVA

Voltage: 13.8 / 345 kV



▲ Workshop test



▲ Kaplan turbine runner assembly

Tsimlyanskaya

New Kaplan turbine runner for Russia

At the end of 2011, ANDRITZ HYDRO successfully delivered a 54 MW Kaplan turbine runner for the Tsimlyanskaya hydropower plant. This rehabilitation project, which will be completed by September 2012, was ANDRITZ HYDRO's first turbine contract in Russia since 1992.

The Tsimlyanskaya hydropower plant was erected between 1949 and 1952, and was originally equipped with 4 Kaplan units (50 MW each). The original units began operation between 1952 and 1954. Since then the plant has mainly operated as a full load power plant. After more than 56 years of operation, some of the equipment had significantly exceeded its expected lifetime.

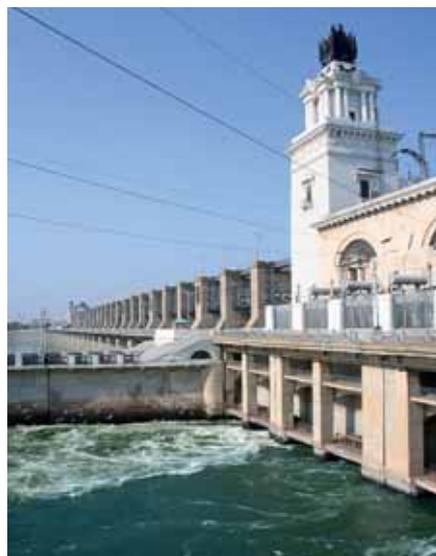
▼ Transport of Kaplan turbine runner



In June 2008 ANDRITZ HYDRO was awarded a contract to design a complete new turbine and supply new runner blades and new governors for rehabilitation of unit #4 of the Tsimlyanskaya hydropower plant. Our task was to boost the nominal power of the unit from 50 MW to 54 MW by increasing both efficiency and discharge while, at the same time, improving cavitation behavior.

Work was moving forward, but during the „World Economic Crisis“ the customer developed financial problems after the Ruble's exchange rate dropped from 20 Rubles to 1 Euro towards the 40-Ruble range.

▼ Tsimlyanskaya hydropower plant, Russia



After long-term, tough and sinewy negotiations that stretched from late 2009 through July 2010, ANDRITZ HYDRO entered into a direct contract with LUKOIL-Energoengineering, the owner of HPP Tsimlyanskaya. This new contract also included repair and machining of parts from other suppliers, and assembly of the complete turbine runner in our workshop in Graz, Austria. At the end of 2011, ANDRITZ HYDRO successfully delivered the 54 MW Kaplan turbine runner for the Tsimlyanskaya hydropower plant. The rehabilitation project will be completed by September 2012.

Günther Hess
Phone: +43 (732) 6986 2837
guenther.hess@andritz.com

TECHNICAL DATA

Runner diameter: 6,600 mm
Max power: 54,000 kW
Total runner weight: 153 tons
Efficiency: up to 94%
Speed: 88.24 rpm

Lötschen

Successful restoration after flood damage

▲ Valley of Loetschen, Switzerland

One of the most devastating storms in years hit the Swiss canton of Wallis on 10 October 2011, resulting in damages across the entire region and costing millions. Areas around Lötschental and Kandertal, where the Lötschen center is located, were especially affected.

ANDRITZ HYDRO was immediately informed by the center's operator (EnAlpin) and a site inspection was swiftly arranged.

The extent of the storm damage was immense. The basement floor was entirely flooded, and water levels in the machine hall and control systems room reached a height of approximately 35 cm. All of the electromechanical equipment in both machine groups suffered damage. Client requirements for delivery and maintenance and, above all, target dates for resuming operations were extremely ambitious and challenging.

▼ After flooding



The strategy ANDRITZ HYDRO presented to the clients was accepted in its entirety, and contained the following points and target dates:

Machine Group 1:

Phase 1:

- Emergency maintenance, delivery of AC/DC distribution and MCC cabinets
- The machine group's resumption of operations
- by end February 2012.

Phase 2:

- Maintenance and partial replacement, such as the hydraulic turbine regulator and the complete control system for the power station
- by end February 2013.

Machine Group 2:

- Maintenance and partial replacement, such as the hydraulic turbine regulator and the complete control system for the power station
- by end May 2012.

The job was completed under tight deadlines and required a high degree of flexibility from all project participants and divisions. Outstanding cooperation enabled all challenges and, consequently, all contractually guaranteed deadlines to be met. Even in the context of this extraordinary project,

ANDRITZ HYDRO again demonstrated its strong commitment, flexibility and focus on the customer – to the full satisfaction of its client.

Christoph Bütikofer

Phone: +41 (41) 329 5372

christoph.buetikofer@andritz.com



▲ Hydraulic aggregate after restoration



▲ Commissioning of motor control center (MCC)

TECHNICAL DATA

Output: 120 MW

Head: 650 m

Speed: 500 rpm



▲ The apprentices will be trained in close cooperation with the Technical University in Mardin, Turkey.

Apprentice training center **Mardin**

Official opening ceremony in Turkey

Turkey is of long-term importance for ANDRITZ HYDRO, and a variety of projects range from large to smaller hydropower plants. ANDRITZ HYDRO now also emphasizes its social responsibility in this country, especially in the South-East Anatolian region.

In 2010 ANDRITZ HYDRO decided to plan and build an apprentice training center in Mardin, South-East Anatolia and operate it for several years. After a

short construction period the center was inaugurated on 4 May 2012 and handed over to its destiny. 3 Turkish ministers, local mayors and governors attended the opening ceremony as well as the Austrian ambassador and the trade commissioner.

Over the next three years more than 100 young people from the region will be trained as skilled metal workers, electricians and certified welders. This training is fully financed by ANDRITZ

HYDRO. After three years the training center will be handed over as a gift to the local Technical Institute in Mardin. In close cooperation with the Technical Institute, the training center's curriculum is based on one that corresponds to Austrian apprenticeship training. The students are trained in theory and practice and in the English language. This kind of curriculum, where both theoretical and practical training is offered, is a first in Turkey. It is expected that it will set an example and will be



▲ The apprentices' workshop established by ANDRITZ HYDRO in Mardin, Turkey.

followed by other Turkish industrial giants. Turkey, with its high unemployment rate compared to Europe, also lacks qualified manpower. This curriculum will open an avenue to meeting Turkish industry's demand for qualified manpower.

Herewith ANDRITZ HYDRO wants to take on a leading role in supporting and guaranteeing the future development of the young generation in South-East Anatolia.

Wolfgang Hofmann
 Phone: +90 (312) 4088001
 wolfgang.hofmann@andritz.com

▼ Local mayors and governors attended the opening ceremony.



▲ The protocol took a high interest in the opening of the Mardin Training Center.

▼ In the opening of the school in which 36 high school students receive education.



Russia THYNE certification



According to the requirements of the grid authorities, prototypes of all commercial excitation systems must be tested and approved prior to installation at Russian power facilities. The certification process is carried out by the High Voltage Direct Current Power Transmission Institute (NIIPT), located in St. Petersburg.

The electro-dynamic simulator at the NIIPT laboratories comprises more than 1,000 physical models of generators, prime movers, transformers, transmission lines, complex loads, dc transmissions, etc. It is used to simulate the dynamic behavior of excitation systems under the real physical conditions of the Russian power grid.

ANDRITZ HYDRO undertook NIIPT tests in February 2012. After 2 weeks of intensive work in St. Petersburg all THYNE excitation systems were certified to operate in the Russian power system. Furthermore, we are proud to note that THYNE1 is one of only two foreign excitation systems which met all requirements on the first attempt, without any readjustments needed.



Markus Egretzberger
Phone: +43 50805 5 6928
markus.egretzberger@andritz.com

Canada Terror Lake

Kodiak Island is a large island off the south coast of the U.S. state of Alaska, separated from the Alaskan mainland with an isolated grid system.

The main power source for this island today is a hydropower generating facility located on the Kizhuyak River, approximately 25 miles southwest of the city of Kodiak.

In 2005 ANDRITZ HYDRO supplied two new Pelton runners. On 22 December 2011, Kodiak Electric Association, Inc. (KEA) awarded ANDRITZ HYDRO a contract to design, manufacture and supply the third turbine for the Terror Lake hydropower generating facility. The new unit will be integrated into an existing bay at the powerhouse. Technical challenges for this 11 MW Pelton turbine will include operation under a net head of 346.3 m, a special shaft seal design and the application of a tail water depression compressor.

ANDRITZ HYDRO will be in charge of turbine design and manufacturing, while Hyundai Ideal Electric will be the selected supplier for the generator. ANDRITZ HYDRO will be responsible for delivering all of the mechanical equipment to Seattle, Washington. From there, special shipment via float plane, boat or barge will be required in order to ship the turbines to the remote site. Delivery of the major components for this project is scheduled for February 2013.

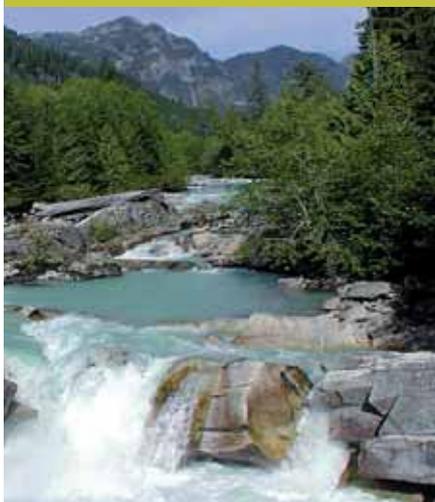
Michele Stocco
Phone: +1 (514) 428 6854
michele.stocco@andritz.com



TECHNICAL DATA

Output: 11.7 MW
Head: 346.3 m
Speed: 720 rpm
Runner diameter: 1,060 mm

Canada North West Stave River



In January 2012 ANDRITZ HYDRO received notice to proceed with a new project in British Columbia, supplying 3 Francis turbines to the North West Stave River Hydro Electric Project.

Well-known Cloudworks Energy Inc., located in Vancouver, had already finalized many projects with ANDRITZ HYDRO. The company was subsequently sold to Innergex Renewable Energy, a developer of renewable energy projects in North America. Based on experiences gained from former projects, Innergex will work together with ANDRITZ HYDRO on the new North West Stave River Hydro Electric Project.

The HPP consists of three Francis turbines, two large 8 MW and one small 3.3 MW and will use powerhouse designs similar to those used for the previous HPP Upper Stave project. For the turbine inlet valves and generators, the project team will be able to reuse designs used in HPPs Upper Stave and Kwalsa – both ANDRITZ HYDRO projects.

Leroy-Somer, which manufactured the generators for all present Kwalsa and Upper Stave projects, will be the preferred supplier for the North West

Stave River Hydro Electric Project in order to apply the experience it gained. The same applies to TIV supplier D2FC. Innergex and ANDRITZ HYDRO expect the project to be operational by end 2013.

Michele Stocco
Phone: +1 (514) 428 6854
michele.stocco@andritz.com

TECHNICAL DATA

Small unit

Output: 3.3 MW
Head: 68.08 m
Speed: 514 rpm
Runner diameter: 912 mm

Large units

Output: 2 x 8 MW
Head: 68.08 m
Speed: 450 rpm
Runner diameter: 1,250 mm

Turkey Sirakonaklar & Gökgedik



ANDRITZ HYDRO strengthened its position as market leader in Turkey with the successful finalization of the Sirakonaklar (3 Pelton vertical) and Gökgedik (2+1 Francis horizontal) projects. Completion of these projects was made possible by competent cooperation between ANDRITZ HYDRO teams in France and Turkey.

Sirakonaklar and Gökgedik are the first projects where ANDRITZ HYDRO Turkey has supplied the full EPS scope including automation, protec-

tion and SCADA. Both plants were put into commercial operation in March 2012. HPP Sirakonaklar is a run-of-river type project located in the Ispir province of Erzurum. It is the first hydropower plant project by 2M Energy and Electric Production Inc.

W2W equipment supply and site installation have been realized by a consortium consisting of ANDRITZ HYDRO in France and Turkey and Leroy Somer in France. The Gökgedik run-of-river project, located in the Andırın province of Kahramanmaraş, began in September 2010. The customer, Uhad Energy Inc., is a sister company of Kale Energy which has previously realized the HPP



Kale project with ANDRITZ HYDRO. W2W equipment supply and site installation have been realized with the same consortium structure as Sirakonaklar.

Alp Törelİ
Phone: +90 (312) 4088020
alp.toreli@andritz.com

TECHNICAL DATA

Sirakonaklar

Output: 3 x 6,100 kW
Head: 301.6 m
Speed: 750 rpm
Runner diameter: 930 mm

Gökgedik (large units)

Output: 2 x 10,500 kW
Head: 145.1 m
Speed: 600 rpm
Runner diameter: 1,090 mm

Gökgedik (small unit)

Output: 3,890 kW
Head: 145.1 m
Speed: 1,000 rpm
Runner diameter: 630 mm

Taiwan Pa Tien

The construction of the Wu Shan Tou Reservoir took almost ten years, from 1920 to 1930, but when completed it not only had a major impact on the rural society of the time, but also supported Taiwan's economic development.

For more than 80 years, irrigation of over 100,000 hectares of farmland on

the Chia Nan plain in the west of Taiwan has functioned independently of rainfall, and a continuous crop supply can be assured. Due to its uniqueness and importance to Taiwan's development, the Wu Shan Tou reservoir is even being considered as a potential World Heritage site.

In 2002 a vertical Kaplan turbine, supplied at that time by VA Tech Hydro, was started up, with a runner diameter of 2.35 m and a power of 9 MW.

Thus the storage height and the water retained by the dam added up to additional and valuable power production. In order to extend the usable water flow, the customer, Chia Nan Enterprise Co., entrusted ANDRITZ HYDRO again with supply of a Compact Axial Turbine CAT1200.

In memory of the young engineer who designed it and was responsible for the construction of the Wu Shan Tou reservoir, the new plant will carry his name: Pa Tien.



Bernhard Mueller
Phone: +49 (751) 29511 495
bernhard.mueller@andritz.com

TECHNICAL DATA

Output: 2,200 kW
Head: 23 m
Speed: 514 rpm
Runner diameter: 1,200 mm

Austria Reichensteinquelle

By beginning of July 2012 ANDRITZ HYDRO received from VA Erzberg GmbH the order for the delivery and installation of a vertical Pelton/Generator unit. Putting into operation is scheduled by end of March 2013.

The scheme station is a run-off-river power station in the iron ore mining of the Erzberg in Styria, Austria. Via collectors of the Reichenstein spring, inlet basin, penstock (DN 500 mm, approx. 4,044 m long) flows the water to the power house, which is equipped with a 4-nozzle Pelton



turbine, generator (2,000 kVA, 690 V), control system as well as the transformer and medium voltage equipment. The power transmission to the 10 kV grid of VA Erzberg GmbH will be done by a buried power cable up to new transformer station and in addition connected to the public network.

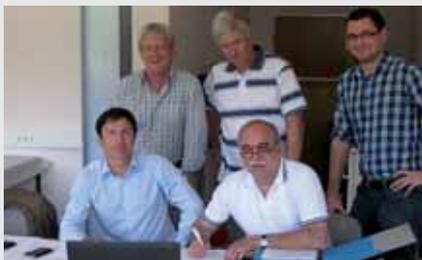
In the year 712 a document mentioned for the first time in writing the mining of the ore mountain. Even today this is the most important economic basis in this region. Currently, every year approximately 2 million tons are ore

mined and be transported by rail in the steelworks to Linz and Leoben-Donawitz, Austria.

Edwin Walch
Phone: +43 (732) 6986 3473
edwin.walch@andritz.com

TECHNICAL DATA

Output: 1,730 kW
Head: 489.2 m
Speed: 1,000 rpm
Runner diameter: 920 mm





▲ Compact Hydro Indonesia

According to figures published by the Indonesian State-run Power Utility Company, PT PLN (Persero), Indonesia has a total hydropower potential of approximately 75,000 MW. 70% is available for large scale hydroelectric schemes, and the remaining 30% for compact or micro hydro power generation. Based on the Indonesian government's new ACT for Renewable Energies, in effect from early in 2010, the COMPACT HYDRO business in Indonesia is growing again after a decade of silence. Since then the Indonesian government has encouraged the private sector to develop the energy power sector with renewable energy solutions.

The Indonesian government introduced new legislation establishing a fixed feed-in-tariff for electricity generated from mini hydroelectric power projects between 1 and 10 MW. The feed-in-tariff is different for each island in Indonesia, with the highest amounts allocated to the most difficult areas to reach. Unfortunately, most of these energy resources are located in remote regions of the country, which is why only a fraction has been utilized.

PT. ANDRITZ HYDRO has been present

in Indonesia for about 30 years and now covers 80% of the Indonesian hydropower market. It has been more than a decade since ANDRITZ HYDRO built a COMPACT HYDRO power plant in Indonesia, with the latest plant, the HPP Kolondom, commissioned in 1997 and generating 800 kW. This hiatus by ANDRITZ HYDRO was due to lack of keen investors - a direct result of the lack of availability of government incentives at the time. The new situation has allowed ANDRITZ HYDRO to successfully sign several COMPACT HYDRO contracts in Indonesia, all with different clients.

Some of these projects will begin commissioning towards the end of 2012, and all others in 2013/2014. As a result of this development ANDRITZ HYDRO Indonesia formed a separate group specializing in COMPACT HYDRO projects. ANDRITZ HYDRO Indonesia is cooperating with ANDRITZ HYDRO India on these projects. India is responsible for the design, manufacturing, and delivery of the COMPACT HYDRO offshore equipment supplied to Indonesia. The Indonesian COMPACT HYDRO group is currently assisting various clients at prospective project sites all over Indonesia in an effort to harness hydropower in compact ranges to provide sustainable renewable energy for the Indonesian

people. ANDRITZ HYDRO's 30-year presence in Indonesia and our establishment of reliable customer relations bring a bright future for COMPACT HYDRO and hydropower generation business development to the country.

Hoedani Hadijono
Phone: +62 (21) 3906929
hoedani.hadijono@andritz.com

TECHNICAL DATA

Bungin, South Sulawesi

Output: 2 x 1,500 kW

Head: 70.9 m

Speed: 1,000 rpm

Runner diameter: 586 mm

Lubuk Gadang, West Sumatera

Output: 2 x 4,150 kW

Head: 55.0 m

Speed: 600 rpm

Runner diameter: 1,030 mm

Segara II, West Nusa Tenggara

Output: 2 x 2,430 kW

Head: 144.8 m

Speed: 1,000 rpm

Runner diameter: 562 mm

Cianten II, West Java

Output: 2 x 2,670 kW

Head: 60.8 m

Speed: 750 rpm

Runner diameter: 775 mm



As a followup to ANDRITZ HYDRO's presentations concerning modernization and rehabilitation of Francis and Kaplan turbines, generators and pump storage technologies as well as solutions for small-scale hydro, Russian and international visitors took the opportunity to discuss their special requests. Our professional conference team and well-organized booth offered a perfect backdrop for this information exchange.

HydroVision Russia Moscow, Russia

In early March 2012 ANDRITZ HYDRO participated for the third time in the leading annual energy fair in Russia – Russia Power, with its co-event HydroVision Russia. To cover Russia's future energy demand, interest in hydropower and

electromechanical equipment for hydropower stations is strongly increasing. The number of exhibitors, and therefore the exhibition area, doubled once again compared to last year.

All over the world hydropower is becoming more and more interesting – for local utilities as well as for investors and project developers. Spring is trade fair season, and ANDRITZ HYDRO participated in several hydropower and renewable events in order to present our capabilities all over the world.

Asia 2012 Chiang Mai, Thailand

Asia is one of the most rapidly growing hydropower markets in the world. Following former events in Thailand, Vietnam and Malaysia, this year ASIA 2012 took place in Chiang Mai, Thailand. Different aspects of hydropower were discussed and presented in several sessions. ANDRITZ HYDRO participated with dedicated paper presentations on pump storage, coating, generators, Pelton turbines and small hydro.

2012 was an important and very successful event for ANDRITZ HYDRO, emphasizing our position as a leading supplier in Asia.



The layout of the booth followed demand for additional information exchange between the audience and our presenters. One highlight of Asia 2012 was the "Welcome Reception" on the rooftop terrace of the Hotel Empress in Chiang Mai. All delegates enjoyed Thai specialties cooked directly in front of them. As co-sponsor of the evening, Mr. Josef Ullmer welcomed all delegates on behalf of ANDRITZ HYDRO. Asia



Customer Day

Tiflis, Georgia



Georgia runs a very ambitious development program for hydropower. The Georgian government launched its privatization process in 2009 with the award of licenses for 80 new hydropower plants with a total capacity of more than 2,200 MW – ranging from Compact Hydro plants up to large power stations.

In order to be optimally positioned in this rapidly growing market, ANDRITZ HYDRO held the first Georgian customer day in May 2012 in Tiflis, the capital of Georgia. Among the approximately 100 invited participants from industry, banks and financial institutions



as well as consulting firms, two deputy ministers from the Department of Energy participated. The large number of participants and the interest in ANDRITZ HYDRO's lectures and presentations validates our market strategy in Georgia.

Hydroenergia 2012

Wroclaw, Poland

Hydroenergia is traditionally regarded as the key event in the small hydropower sector, during which new political, financial and technical sector developments are debated and assessed.

The 2012 congress in May attracted several hundred delegates from Europe and other parts of the world.

ANDRITZ HYDRO participated with our Compact Hydro specialist from Linz and a dedicated booth.

The event offered a unique opportunity to generate new business by demonstrating products and services to a wide range of clients strongly interested in the development of hydropower.

Powertage

Zuerich, Switzerland

In June 2012 the „Powertage“ – the leading event of the Swiss energy industry - took place in Zuerich, Switzerland. More than 2,000 market specialists and interested delegates from politics, industry and utilities used the opportunity for an intensive information exchange between all participants.

ANDRITZ HYDRO participated with several paper presentations and a nice booth. The event organizers as well as all 152 exhibitors were very satisfied with the high level of interest and the successful fair. This biannual event is a good opportunity to present ANDRITZ HYDRO's leading position in Switzerland.

EVENTS:

Viennahydro 2012
21 - 23 November 2012
Laxenburg, Austria
www.viennahydro.com

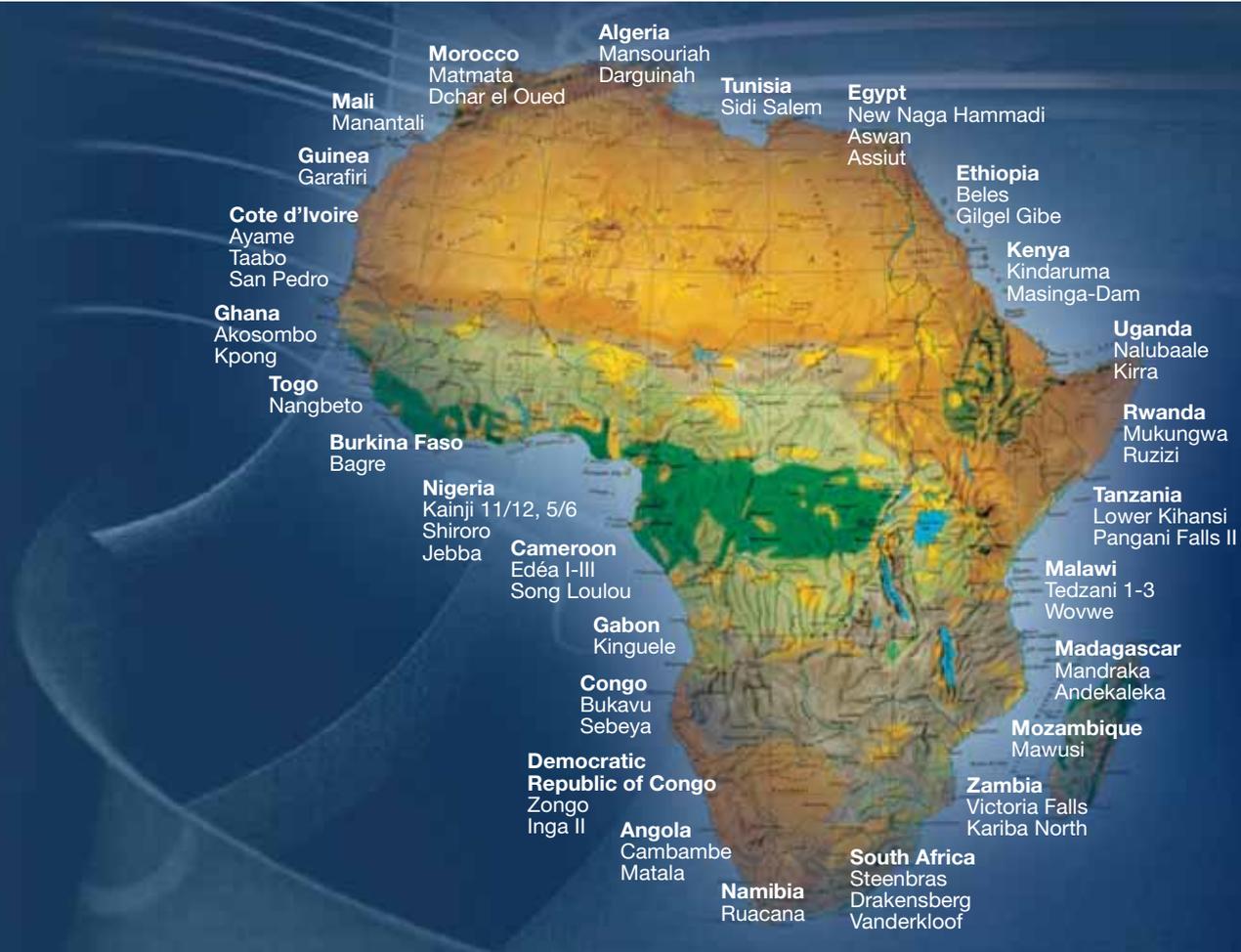
HydroVision Russia 2013
05 - 06 March 2013
Moscow, Russia
www.hydrovision-russia.com

Jens Päutz
Phone: +43 50805 5 2675
jens.paeutz@andritz.com

www.andritz.com

Hydropower for Africa

Renewable and sustainable energy for the future



ANDRITZ HYDRO is a global supplier of electromechanical equipment and services (“From water to wire”) for hydropower plants. With over 170 years of experience and more than 30,000 turbines installed, we are a world market leader for hydraulic power generation, from small hydro applications to more than 800 MW of output.

We have a passion for Africa: with a market presence for over 100 years, ANDRITZ HYDRO has supplied or refurbished around 50% of Africa’s installed hydropower capacity. Our African activities cover all parts of the hydro-power business – large hydro, service & rehabilitation and small hydro. **From water to wire.**



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