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HYDRO POWER GENERATION

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HyPower

Customers magazine for Voith Siemens Hydro



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Editorial

Voith Siemens Hydro Power Generation

On the way.



*Dr. Hubert Lienhard
Chairman of the Board
of Voith Siemens Hydro
Power Generation*

Dear clients and partners,
dear readers,

The late publication of our annual year's results from fiscal year 2001/2002 is the right moment to reflect on how successful Voith Siemens Hydro has been in its third year of the Joint Venture. Order intake as well as sales have exceeded expectations by far. Our ambitious goals were fully achieved. The new year running will be another challenge to meet goals in a market situation where investments financing and project development are even more under the influence of reluctance and delays.

However, we are trustful that our strategic orientation leads to the right results: as a well-positioned company that sees itself as a project company and with the competence of a full-liner in hydro we are focusing on strong markets with hydro potential that can add-up remarkably to a country's power generation mix. You can see this especially in India and China. And you can see in this issue's market highlight on India, that our activities are well underway. The new company in New Delhi has started working close to the market and has an impressive number of projects going on locally that are already in our books. And we expect more to come!

The co-operation agreement with FKI's Czech SEM Brush unit will very soon enable us to provide much better opportunities for manufacture of and service for generators up to medium-sized capacities, so especially clients in Europe will profit from the location's workshop vicinity with their service needs on the electrical side of the machine. Our R&D activities for new insulation materials are another effort in a series of programs to achieve optimization and control through the whole operation process of a hydraulic machine. At the same time, we do not neglect sophisticated solutions for smaller plants, too, in automation and control.

Service on the whole is an ever increasing share of hydro business where Voith Siemens Hydro has been developing its special concept on Integrated Solutions, with its assessment and partnering approach. Customer relationship, where the bottom line counts at the end of not only assessments but also fulfilled contracts and shortest outage time management, as well as operation and maintenance of hydro power plants, are only self-understood facets of the complete range of our services and products.

With this in mind, the newly achieved ISO 9001:2000 group certification was only another logical step towards the completion of these services: quality, services, processes, behavior and commitment from any Voith Siemens Hydro location, wherever you go.

Last, but not least, our participation in the record projects of Itaipu, Tucuruí, Three Gorges, and Goldisthal, as well as our latest awards in Eastern Europe and China strengthen our confidence that we will – despite severed market conditions – again steer our hydro business with success on the basis of a sound financial background, our high-end technology and in close, trustful and reliable relationship with you: our customers.

Whatever your opinion and business interests are: please do not hesitate to let me have these!

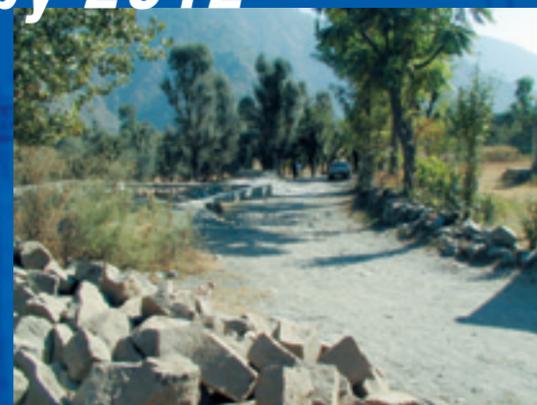
Yours sincerely

Dr. Hubert Lienhard

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Boosting India's hydro electric sector: Power on demand by 2012

Electricity is the backbone of modern life in the industrialized world, a crucial ingredient for economic growth. A reliable and sufficient supply of electrical power is essential to guarantee India's economic development. Today, India suffers from a 13% peak load shortage and projections foresee a dramatic increase in energy demand. To bridge the gap between demand and supply, total installed capacities will have to be doubled by 2012 to about 210,000 MW. Boosting the hydro power capacities plays a prominent role in the ambitious plan of the Indian government to achieve this goal.



Baglihar area

Priority for hydro projects

Six years ago, India celebrated 100 years of hydro power development. Then and now, the installed capacity of India's hydro power stations represented roughly one fourth of the Indian power mix. There is an estimated potential of 150,000 MW of hydro electric power in the country, of which only 17% have been harnessed so far. Since the government clearly sees the advantages of hydro electricity as a non-polluting and secure form of energy that, contrary to thermal generation, is virtually unsusceptible to price fluctuations, it has given high priority to the development of hydro power projects. Plans have been drafted to accelerate the exploitation of the vast untapped hydro potential and expand the hydro share to 40%.

Decisive role of public corporations

Major hydro power projects targeted for development are concentrated in the Northern and Northeastern regions of the Indian subcontinent. Almost two thirds of India's new hydro projects, totalling 21,000 MW of capacity addition, shall be undertaken by public corporations of the Central Sector (federal government) until 2012. The remaining share of planned capacity addition will be divided almost equally among private companies and corporations of the respective state governments. Furthermore, the Ministry of Power has included 67 rehabilitation, modernization and upgrade schemes with an aggregate capacity of over 10,000 MW in the 10th five-year plan (2002 to 2007).



Voith Siemens Hydro in India

Last October, Voith Siemens Hydro's Indian subsidiary started its business operations as a private limited company in New Delhi. This step has definitely brought the company much closer to its customers. Moreover, it has facilitated the important transfer of Voith Siemens Hydro expertise considerably. Under the leadership of Vijaynagar Prahlada Rao, Managing Director, the Indian team can now follow up the different projects from the Indian capital.

Establishing a local unit, thus guaranteeing easy access to local resources and know-how, has been consistent with the continuous intensification of Voith Siemens Hydro's activities in India.

Voith Siemens Hydro Office in Delhi



Vijaynagar Prahlada Rao, Managing Director

Voith Siemens Hydro India team



Market highlight

The company has been involved in several key projects on the subcontinent:

Baglihar

The first 450 MW stage of the 900 MW Baglihar hydro power plant is currently being set up in the Northern Indian state of Jammu and Kashmir. Voith Siemens Hydro is the leader of the consortium responsible for the turnkey execution of the electrical and mechanical works. Erection of embedded parts and development of the infrastructure as well as civil works are already under way. The first stage of the project, consisting of three 150 MW units, is due for commissioning by the end of December, 2004. The remaining units of the second stage shall be put into operation two years thereafter.

Baglihar area



Hirakud

Two units of 24 MW each of the Hirakud hydro power plant are now being renovated and uprated to 32 MW each. Voith Siemens Hydro is the turnkey contractor and has been entrusted with the complete responsibility for all mechanical/electrical and associated civil works for this project. Commissioning of the uprated units is planned for the end of October, 2004.

Baspa Stage II

Voith Siemens Hydro has supplied the generators and the associated electrical equipment for the Baspa Stage II 300 MW project. The project is due for commissioning early in 2003. Baspa II is a good example of developing a project together with a private promoter, Jaiprakash Industries Ltd., who also executes all the civil works.

Hirakud contract signing



Ghatgar

Voith Siemens Hydro is charged with the electrical and mechanical works for the two Ghatgar 125 MW pumped storage units in Maharashtra state.

Nathpa Jhakri

The 1,500 MW Nathpa Jhakri hydro electric project is an underground power station consisting of six units of 250 MW each. Voith Siemens Hydro is a member of the EUCONA consortium group, which is responsible for the electrical and mechanical works of the project.

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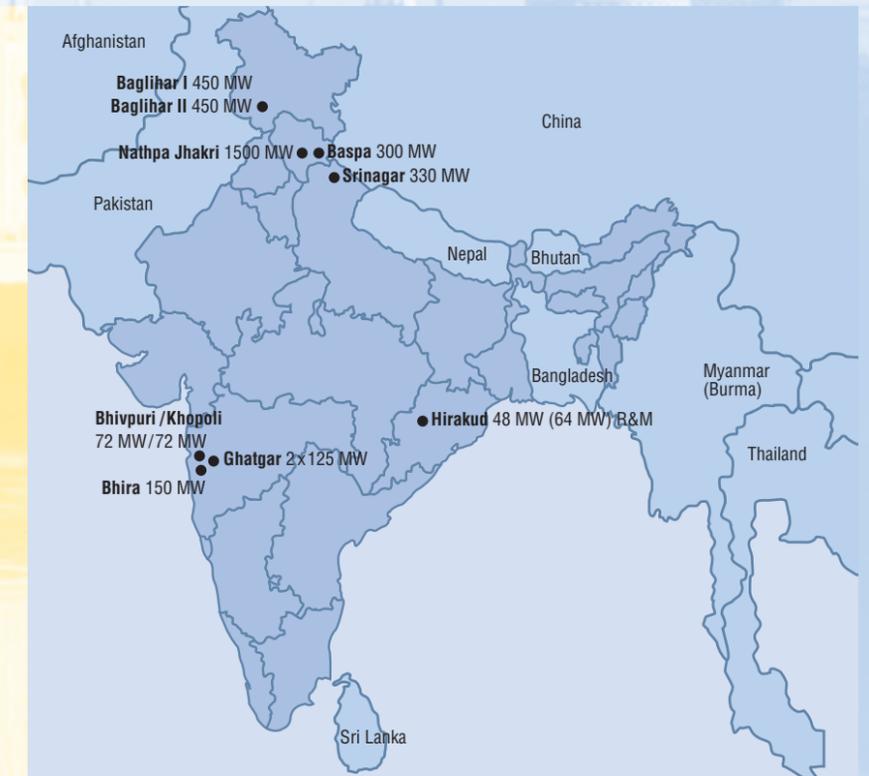
Bhira site erection



Burla machine view



Bhivpuri inside view



NHPC: Growth and accomplishments

In its over 27 years of existence, the National Hydroelectric Power Corporation (NHPC) has become the single largest organization for hydro power development in India, with the capacity to undertake all of the activities involved in administering hydro projects, from conceptualization to commissioning. NHPC, a public limited corporation, ranks among the top ten companies in the country in terms of investments. It has been granted ISO-9001 and ISO-14000 certifications.

To date, NHPC has added 2,175 MW of generating capacity to the country's power system, and is supplying power to 23 beneficiary federal states and union territories, in addition to neighboring countries like Nepal and Bhutan. During the years 2001-2002, NHPC achieved 96.86% machine availability in the plants it operates: the highest level ever reached in the corporation's history.

Yogendra Prasad,
Chairman of National Hydro
Power Corporation (NHPC)
Faridabad, Haryana, India



Important steps during the last 5 years which have raised NHPC to the top of its field

Elimination of time and cost overrun: NHPC eliminates time & cost overrun in the implementation of hydro power projects through the use of effective contract management & project monitoring. As a result, all of NHPC's ongoing projects are running on schedule or ahead of schedule.

Expansion Plan:

NHPC has undertaken a large number of medium, large and mega size projects for investigation & construction. During the Xth Plan (2002-2007) it plans to complete 11 projects with a yield of 4,357 MW, during the XIth Plan (2007-2012), 14 projects with a yield of 11,194 MW, and during XIIth plan (2012-2017), it plans to add 13,000 MW.

Aggressive project monitoring:

A professionally managed MIS has been put into place for the pro-active

monitoring of program implementation, resulting in on-time decision making.

Emphasis on information, technology, and communication:

Major emphasis has been placed on the use of state-of-the-art information technology solutions in NHPC's projects to achieve a smooth, uninterrupted and faster flow of information. Since NHPC's projects are situated in remote, hilly areas, this has done wonders for project implementation and crisis resolution.

Human Resource Development:

Special emphasis is being given to the field of human resource development. The officers and staff of NHPC are regularly sent to various training programs and seminars, both within the country and abroad, to keep them up to date on the latest technologies on the market.

Expansion through joint ventures:

NHPC has started subsidiary companies under its joint venture plan, in cooperation with state governments, for the development of hydro & pumped storage projects in Madhya Pradesh and West Bengal, which were on hold due to a lack of available funds and of necessary expertise from state executive agencies.

Basin-centered development:

In order to coordinate time & efforts, NHPC has been implementing basin-centered development in areas such as the Ravi basin, the Parbati basin, the Chenab basin, the Teesta basin and the Siang & Subansiri basins.

The corporation currently has six projects under construction, with a capacity of 2,280 MW. In addition, two projects are being constructed as joint ventures, with a capacity of 1,520 MW, and two projects on a deposit/turnkey basis with a capacity of 65,25 MW.

NHPC has drawn up a massive capacity addition plan for the hydro sector, extending up to 2017:

Projects to be completed in X plan (2002-2007)

Sl. No	Project (state)	Total Capacity (MW)
1	Dulhasti (J & K)	390
2	Chamera – II (HP)	300
3	Dhauliganga – I (UP)	280
4	Teesta – V (Sikkim)	510
5	Sewa – II (J & K)	120
6	Bav – II (Maharashtra)	37
7	Indira sagar (NHDC) (M.P.)*	1,000
8	Teesta low dam stage – III (WB)	132
9	Omkareshwar (NHDC) (M.P.)*	520
10	Purulia pss (W.B.)*	900
11	Teesta low dam stage – IV (WB)	168
Total		4,357

* Joint Venture

Initiatives & Suggestions

Some of the initiatives taken by NHPC for hydropower development in the country:

NHPC has taken advance action to create a range of bankable DPR's for a number of viable hydro projects, which will help in the projects' early phases.

Conducting a survey & investigation of mega projects in Dihang & Subansiri Basin in Arunachal Pradesh, which will have an installed capacity of more than 20,000 MW.

NHPC has started subsidiary companies under its joint venture plan in cooperation with state governments for the development of hydro & pumped storage projects in M.P and West Bengal, which were on hold due to a lack of available funds and of necessary expertise from state executive agencies.

NHPC has taken up projects which had long been pending due to inter-state disputes. These include four projects in the Cauvery basin with a capacity of 1,150 MW, and the Upper Krishna projects with a capacity of 810 MW in Karnataka.

NHPC commissioned the first hydroelectric project in the A & N Islands in August 2001.

NHPC is eliminating time & cost overrun in the implementation of hydro power projects through the use of effective contract management & project monitoring.

This sends a positive signal to policy- & decision-makers that hydro projects can be completed within a fixed time frame.

Professionally-managed MIS has been instituted for the pro-active monitoring of program implementation.

The general atmosphere of the corporation has been made conducive to faster decision-making, with a professional approach which will move things in right direction. Empowering employees with latest technologies in their respective fields has also helped in dealing with the unique problems associated with hydro projects.

High ranking visitors at the construction site of Baglihar in India

Projects to be completed in XI plan (2007-2012)		
Sl. No	Project (state)	Total Capacity (MW)
1	Parbati – II (H.P)	800
2	Parbati – III (H.P)	520
3	Chamera – III	231
4	Siang middle site (Arunachal Pradesh)	1,000
5	Siang lower site (Arunachal Pradesh)	1,700
6	Subansiri middle (Arunachal Pradesh)	1,600
7	Pakal dul (J & K)	1,000
8	Bursur (J & K)	1,020
9	Subansiri lower (Arunachal Pradesh)	2,000
10	Loktak D/S (Manipur)	90
11	Uri – II (J & K)	280
12	Bav – I (Maharashtra)	18
13	Farakka Barrage (WB)	125
14	Upper Krishna projects (Karnataka)	810
Total		11,194

Projects to be completed in XII plan (2012-2017) Tentative		
Sl. No	Project (state)	Total Capacity (MW)
1	Siang upper site (Arunachal Pradesh)	11,000
2	Subansiri upper site (Arunachal Pradesh)	2,000
Total		13,000

In order to ensure that the maximum capacity of hydro power is added to the national power system, NHPC suggests:

Fixing a strict time frame for various agencies involved in granting approval/clearance, and at the same time reducing the time limit for all such approvals.

Adopting a three-stage clearance procedure for hydro project clearance.

Making dedicated funding available in agreed-upon installments.

Implementing a national policy for the settlement of R&R plans.

Shifting security costs, especially in ultra-infested areas, to central and state governments, rather than adding them to the project costs and ultimately to the tariff.

Simplifying land acquisition procedures.

Challenges facing India's hydro sector

'State of the art' technology is now required in place of conventional technology in order to accomplish better site investigation & to deal with geological surprises.

Better desilting arrangements are needed, as well as erosion-resistant material for the underwater portions of turbines.

A high voltage network connected to the national grid to bring emergency power to power-starved regions is to be taken up on priority basis.

Standardization of features & equipment for hydro projects is not possible.

The young Himalayas are very unstable mountains. Underground facilities in these mountains require the highest level of expertise and the courage to face all challenges.

Silt-laden river water flows out of young Himalayan rivers.

Transmission problems occur from the northeastern region due to Chicken Neck.

In spite of the above challenges, the development of hydro power is a technical necessity for attaining the ideal hydro:thermal mix of 40:60 for providing quality power. Now, with the shift in focus towards hydro power, NHPC is prepared to harness the vast untapped hydro potential of India.

Recently the Chief Minister of Jammu and Kashmir, Mufti Mohammed Sayeed and the Chairman, Coordination Committee Ghulam Nabi Azad, paid a visit to the construction site of India's Baglihar hydro power station. He was accompanied by the Deputy Chief Minister Mangat Ram Sharma and the Minister for Power Development Mohammed Sharief Niaz as well as further governmental representatives. Voith Siemens Hydro participated with Juergen Sehnbruch, Member of the Board of Management, and Karl-Heinz Schmidt, Project Manager for Baglihar.

The Chief Minister, while inspecting the execution of work, expressed his satisfaction over the pace of execution. This 900 MW hydro power station will be built in two stages: 450 MW should be commissioned by end of 2005, while the second phase will be completed by end of 2007. The construction site also provides jobs in the region: nearly 4000 employees are locals.

After the commissioning of Baglihar, the State of Jammu and Kashmir will be self sufficient in power and become an ideal place for setting up industries as the State has an attractive package of incentives, both from the State and the Central Governments. The Indian State of Jammu and Kashmir has a hydro power potential of 20,000 MW out of which only 1,500 MW have been tapped.

Voith Siemens Hydro Power Generation, as consortium leader, signed contracts on 17th of July 2002, for supply of the electro-mechanical works for the second stage. Once commissioned this will be the largest power station set up in the Indian State of Jammu and Kashmir and therefore gives a considerably contribution to the power generation for the total State of India.

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Baglihar site view



Dignitaries visiting Baglihar hydro electric project

Recovering the Georgian hydro power sector

Until the mid 1990s, Georgia had one of the fastest growing economies among the former Soviet Republics and nearly 5,000 MW of installed power generation capacity, about 60% of it hydro electric. However, political disturbances in the Caucasian state have led to serious economic problems. Due to these difficulties, fuel for thermal power plants has become increasingly hard to afford and hydro power stations have started to produce an even larger share of the total electric energy. The CIA World Factbook for the year 2000 indicates an annual gross generation of 7,404 GWh, whereby 21% is thermal and 79% hydro. Regardless, service and maintenance have been neglected for years.

As a result, Georgia's hydro power generation facilities invariably require rehabilitation. The five largest plants account for more than two thirds of the country's total hydro power capacity. The largest of them is located in the western province of Abkhazia on the Enguri River, which is fed by the glaciers of the southern Caucasus. This underground hydro power station has the world's largest arch concrete dam.

Voith Siemens Hydro modernizes Georgia's largest hydro plant
The Enguri hydro power plant will now undergo extensive modernization work in three of its five units, which have an output of 306 MVA each. Modernization work includes design, supervision, erection and commissioning of electro-mechanical equipment, such as new water-cooled generator stator windings, stator core, re-insulation and cooler, as well as digital and hydraulic governors and the inlet valve control systems. The voltage regulator and excitation, the generator circuit breaker and discon-

nect, as well as the systems for medium and low voltage switchgear, the battery, and the compressed air and drainage systems will also be upgraded. Furthermore, plant employees will be trained "on the job" for optimized operation and control of the units. Unit 3, which was dismantled in 1991 and has been out of order ever since, will be the first unit to be completed. Its completion is scheduled for early in the second half of 2004.

Inside view of power house cavern with unit 3 already dismantled



Modernization contract for the Bistrica hydro power station

Voith Siemens Hydro Power Generation, St. Poelten, Austria, in consortium with Siemens, Greece, recently received a modernization contract for the hydro power stations Bistrica 1 and 2. The total volume of order is 18 million Euro.

Within a period of 26 months the scope of supply for Voith Siemens Hydro Power Generation covers the modernization of the equipment of Bistrica 1, including hydraulic steel structure, penstocks with butterfly valves, three Francis turbines with an output of 8 MW each, generators, turbine governors, automation and control as well as mechanical and electrical auxiliary equipment.

Voith Siemens Hydro is the consortium leader. Apart from the modernization, the establishment of a 110 kV transmission line, substations in the

South Albanian cities Sarande and Gjirokaster, as well as modernization of the distribution network in Sarande were assigned to the consortium. The plants are operated by the Albanian power supplier Korporata Elektroenergjetike Shqiptare.

The modernization of the hydro power station enables future reliable electricity supply to approximately 300,000 inhabitants in the surrounding area of Sarande.

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The modernization of the Georgian plant by order of the state-run company Engurihesi Ltd. is financed by the European Bank for Reconstruction and Development, with co-financing from the European Union. The execution will be managed by the Enguri Rehabilitation Project Implementation Unit (PIU), established by the Bank, and supervised by the French Electricité de France as the Independent Engineer. It will essentially contribute to the stability of the electricity supply in Georgia.

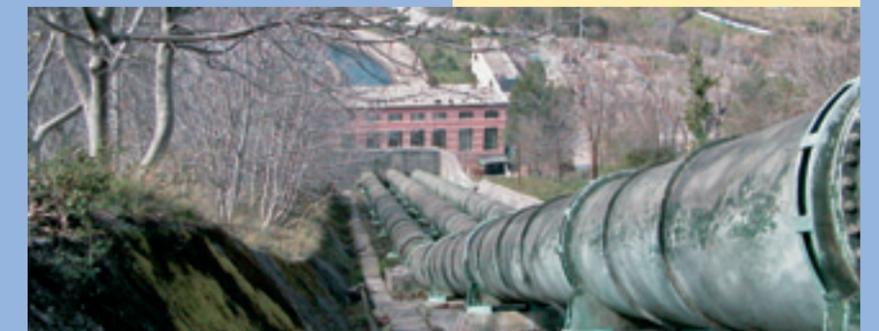
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Levan Mebonia handing over the signed contract to Claus Schmitt, Voith Siemens Hydro, under applause of David Mirtskhulava

David Mirtskhulava, Minister of Energy, in TV interview

Levan Mebonia, Director of Engurihesi Ltd. signing contract



China: The world's highest level of hydro power development activity



Contract signing Taian

With a total installed capacity that reached 319 GW in 2000 and an electricity production of 1350 TWh, the Chinese power sector is the second largest in the world, right after the United States. Currently, hydro power in China accounts for roughly 16% of the generated electricity. This share of the total power mix may seem small when compared to the prominent role hydro power is playing in countries like Brazil, Canada or Norway. And actually, the portion of hydro electric power in China was as high as 20% in 1980. But the Chinese power sector has more than quadrupled its capacity since then.

Considering this breathtaking pace, hardly any country has increased its hydro power generation capacity faster. Still today, only one fifth of China's vast feasible hydro power potential is being utilized. As air pollution worsens due to the traditionally overwhelming share of coal-fired power plants in the electricity production, environmental awareness is on the rise. The Chinese government therefore plans to increase the hydro power sector by 8% annually.

Efforts to significantly expand the generation of emission-free hydro electricity are already under way. There are several major hydro electric projects presently under construction. The biggest of them is the Three Gorges plant on the Yangtze River

with its foreseen world record output of 18,200 MW. When fully commissioned in 2009, it will supply more than 100 million people and industry in the coastal areas of South-east China.

Voith Siemens Hydro deeply involved Through its Chinese joint venture company Shanghai Hydro-Power Equipment Company Ltd. (SHEC), Voith Siemens Hydro is deeply involved in this project, delivering the largest turbine runners and stator frames ever manufactured. Three Gorges will spare the environment 100 million tons of carbon dioxide and 2 million tons of sulphur dioxide, which would be released annually if the corresponding energy were to be produced from coal.

The Taian pumped storage plant Voith Siemens Hydro's most recent project in China is the Taian pumped-storage plant in the province of Shandong in cooperation with Japan's Marubeni Corporation. This plant will be equipped with four Francis-type reversible units, each with a capacity of 250 MW. Voith Siemens Hydro will supply the pump-turbines, motor-generators and a computer supervisory and control system.

With financing provided by the Japan Bank for International Cooperation, and following a public bidding opening on June 12, 2002, the contract was awarded to Marubeni Corporation of Japan as prime contractor and Voith Siemens Hydro Power Generation as the manufacturer of the four sets of complete units for this important project.

At the official contract signing ceremony on Nov. 29, 2002, in Beijing, Voith Siemens Hydro was represented by Voith Fuji Hydro of Kawasaki, Japan – supplier of the electrical portion –, Voith Siemens Hydro of Shanghai, China – supplier of the mechanical portion – and the company's German business unit – supplier of the Computer Supervisory Control System.

The first unit is planned to be commissioned in the beginning of 2007.

This most recent cooperation between Voith Siemens Hydro and Marubeni Corporation confirms the importance of the company's Japanese unit, Voith Fuji Hydro in Kawasaki, Japan and follows a number of earlier successes of Voith Siemens Hydro in large international hydro projects in Asia.

Negotiations Longtan



Voith Siemens Hydro turbines for 4,900 MW Hydro Project Longtan in China Voith Siemens Hydro Power Generation, in a consortium led by Dong Fang Electrical Machinery Company, has been selected to supply the seven 700 MW, 140 m head Francis turbines for the Longtan hydro-electric project in Guangxi Province, China.

The turbine contract, which was signed on January 22, 2003 by representatives of Voith Siemens Hydro – Shanghai and Dong Fang, has an order volume of US\$ 81 million, with the two consortium partners having approximately equal shares.

Voith Siemens Hydro as part of its scope in this project will provide the design, supply part of the turbines from its Shanghai facility, and will manage the site-manufacture of five

of the seven runners. Since the size of these 8 m turbine runners exceeds the transport limitations to the project location, they will be manufactured in a specially erected facility at the project site.

Dong Fang will manufacture the balance of the equipment.

The Longtan project, located on Hongshui River, a tributary of the Pearl River, will be among the world's largest hydro-power projects. The project is internally financed in China.

Following start of generation at Longtan in 2007 the energy from this project will be transmitted to Guangdong, Hong Kong and to Guangxi.

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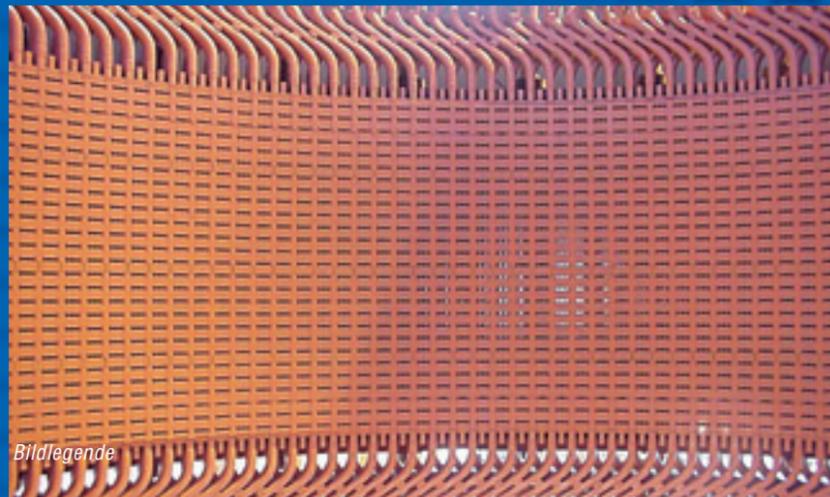
The Longtan project team of Voith Siemens Hydro: Huang Qing, Fu Huawei, Goetz Pfaefflin and Tang Xu.

Longtan area



New high voltage insulation will make hydro generators more efficient

When it comes to high voltage hydro generators, there is a constantly growing demand for higher power outputs. At the same time, machines of reduced weight and size are increasingly called for. Developing smaller and lighter generators that nevertheless offer the same or even a higher power output is quite an engineering challenge. With the development of an advanced high performance insulation system based on the highly-rated MICALASTIC standard, Voith Siemens Hydro has found a way to substantially enhance the power-per-weight and the power-per-size ratio while leaving the total power output unchanged.



Bildlegende

The most important insulated component of a high voltage machine is the stator winding, particularly its bars and coils. Even under normal operating conditions, the mechanical and thermal stress on the insulated parts is quite high. Vibrations and disparate expansion rates of the copper and the insulating material due to power output changes require an insulation system with high resistance qualities. This is especially true for combined motor-generators in pumped storage plants where turbine and pump modes change frequently. Moreover, the intra-winding current during failures can cause extraordinarily high magnetic forces, and possible machine overloads place high demands on thermal resistance.



Effective insulation is of vital importance for the stator bars and coils, and for the functioning of the whole generator unit. For decades, MICALASTIC, a bubble-free and homogeneous insulation system, has guaranteed a long life to the winding components with its high 1-minute breakdown voltage of about 30 kV/mm. After 2 years of development work, Voith Siemens Hydro engineers have improved the MICALASTIC production process and optimized the materials used, thus significantly increasing the supportable dielectric strength. As a result, the ground wall thickness of this new MICALASTIC Advanced insulation can be reduced by 15% while maintaining the high breakdown strength of the traditional system.

The other outstanding characteristics of MICALASTIC, such as a life expectancy of about 40 years under real operating conditions, a low dissipation factor, and thermal resistance meeting the standards of IEC 34 class F, remain unchanged as well.

New MICALASTIC Advanced has already proven to be a key factor in the production of smaller and more efficient machines. In a case study, Voith Siemens Hydro engineers compared the performance of two basically identical generators, one equipped with the traditional system, one with MICALASTIC Advanced. The findings were more than promising: While all performance parameters, including efficiency and power output, proved

to be the same, the generator designed using the new insulation is about 8% lighter. Furthermore, the respective costs have been reduced by 7% compared to the traditionally equipped machine.

MICALASTIC Advanced is the first step towards a whole new generation of high tech insulation systems. The prospects for this high performance insulator are bright. Combined with modern basic designs for hydro generators, it will make possible the production of smaller and more efficient machines. MICALASTIC Advanced will be officially released soon.

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Sophisticated automation even for small hydro power plants



The successful modernization of the German hydro power plant at Donaustetten marks the first result of the cooperation between SWU Energie GmbH and Voith Siemens Hydro. The partners are thus taking a new path in project planning and realization: engineering is done by the contractor; installation work is carried out by the customer. This also allows to equip smaller power plants with modern control system technology for an optimized and cost-efficient operation.

Power house Donaustetten

Modern technology for smaller power plants

The SWU Energie contract includes the installation of a new control system in one further hydro power plant as well as the option for two further plants on the Danube and the Iller canal. A contract of this sort is almost unprecedented. Up to now it was thought unprofitable to fit small and medium sized hydro power plants with sophisticated automation systems that include modules for optimized operation and interfacing to remote control systems. The Voith Siemens Hydro Control System now makes it possible to operate even

small plants in a fully automated way including optimization modules like they are known for large hydro power plants only. Furthermore, Voith Siemens Hydro through a close cooperation in partnership with SWU Energie GmbH, has found a way to reduce the installation costs effectively. After a joint, precise planning phase the complete installation of the control system was carried out by qualified power plant staff. Moreover, under the guidance of the Voith Siemens engineers the staff members could gain profound knowledge of the system.

A challenge for the specialists

The pre-requisites for this project at the Donaustetten power plant were anything but ideal. The technical equipment for instance the roller pump was not immediately suitable for conversion to a modern, digital control system. They had to be fitted with two Voith Siemens moving coils with integrated servomotors. The existing governor system also caused problems in speed control mode since the time needed from unit start up until closing of the circuit breaker was quite long. Furthermore, the curves for the gate blade relationship were not available and had to be initially measured from the running machinery using a special measuring method.



Georg Schneider, Head of Section Power Plants of SWU Energie in front of new automation unit

Regulating unit after renovation

Using Voith Siemens Hydro know-how to reach a solution

To control the existing machinery each machine was equipped with an automation system including a digital governor. The automation system is constantly exchanging data with a common control unit. This unit controls the common functions of the plant: for instance the interfacing to a telecontrol center which provides the common control unit of the power plant with required setpoints for the level and the flow. This information is processed in the common unit with the joint control function which calculates the number of machines

necessary to realize the demanded flow or level. The output of start and stop commands to each machine is also carried out by the joint control module. Moreover, a new monitoring system is installed. All analogue values are stored and their behaviour as a function of time can be displayed. All event and alarm messages are stored, can be displayed and reports can be generated. Furthermore this monitoring system enables faster reactions in the event of problems because remote diagnosis and operation can be carried out by modem via this unit.

Results and future prospects

Even shortly after the initial start-up of the new control system in Donaustetten positive results can be seen. The common control system not only processes the instructions of the telecontrol center but also calculates both the most favorable load partitioning among the automated units and the most efficient relationship between blade and gate using its optimization modules. These optimization measures enable constant operation within the optimum efficiency range and thus result in a significantly increased annual output.

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First pump-turbine unit of one of the most modern European pumped storage plants connected to the grid

The first of four pump-turbine units with an output of 265 MW each of the Goldisthal pumped-storage plant in Thuringia has started commercial operation. Numerous guests from public authorities and from industry witnessed Thuringia's Minister of Economy, Franz Schuster, starting the 600 ton machine with a push of button. After five years of manufacture and installation and a series of function tests during commissioning, the most efficient and most modern pumped-storage plant in Europe was activated.



A consortium, in which Voith Siemens Hydro Power Generation is responsible particularly for the hydraulic design and the complete control system, including the technology of variable-speed turbine regulation in two of four machines, supplied the hydro-electric machines. Technologically speaking, Goldisthal sets new international state-of-the-art standards in several aspects. The gigantic machines can be synchronized to the grid from standstill to full power in record time in world comparison.

A novelty for European pumped-storage plants: Two of the four machines accomplish so-called "variable-speed" operation and for this reason variations in the electrical grid are by far better to balance than with former pump-turbine units.



Voith Siemens Hydro is more than pleased with the operation: "Our machine runs as quietly as a sewing machine" said Managing Director Arno Hoepner, "certain operating mode conditions are so quietly passed through that you can hardly hear the change". Voith Siemens Hydro also provides latest state-of-the-art technology in control and automation: The Goldisthal control centre is the most modern one in the world's hydro power stations.

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Goldisthal installation

One of the largest turbine runners in the world now being installed



A giant turbine runner manufactured at SHEC, the joint venture of Voith Siemens Hydro in China, is currently being installed at the Three Gorges construction site on the Chinese Yangtze River. After a 10-day trek that started at the manufacturing facility in Shanghai, the runner arrived at the site on December 11th. It has a maximum diameter of 10.07 meters and weighs 416 tons – the same weight as 381 Volkswagen Golf cars. The energy that the Three Gorges hydro power plant will produce after completion in 2009 will equal the output of approximately 15 nuclear power stations.



Dr. Roth, President of SHEC speaking at the runner delivery ceremony



Distinguished guests attending the ceremony



Revealing ceremony

The runner in all its magnificence together with SHEC employees

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Three Gorges runner

上海电气
SHANGHAI ELECTRIC

VOITH SIEMENS
HYDRO POWER GENERATION

希科
SHEC

庆贺全球最大的三峡水电转轮出厂 The Great Three Gorges Runner Delivery Ceremony



Records and more

Expansion of the world's biggest operating hydro power plant

Almost 19 years ago, on May 5th, 1984, the first of the 18 initially planned generation units was synchronized: Itaipu hydro power plant, located on the Paraná river on the Brazilian-Paraguayan border, started operation. When the 18th unit was commissioned in April 1991, Itaipu's installed capacity totalled 12,600 MW, which made it the largest hydroelectric power plant in the world. It still is today. Nevertheless, expansion works are under way to install another two turbines and raise the total capacity to 14,000 MW. Voith Siemens Hydro, which already supplied more than 50% of the original equipment, will also supply these two additional 700 MW machines.

The new turbine runners are currently being manufactured at Voith Siemens Hydro in Brazil. They will be delivered in the first half of this year and have the same characteristics as those installed at the beginning of the plant's construction. The Voith-manufactured machines already installed at the plant have made an essential contribution to the plant's outstanding operational performance. Itaipu's indexes of availability, forced unavailability and the low failure rates of its generator units are international reference points. It didn't come as a surprise that the bi-national plant owner demanded similar machines not only for reasons of standardization.



Itaipu runner transportation

When the two new generator units enter operation, in February and May 2004, the power plant will have sufficient energy available to supply a city of three million inhabitants. Though, when fully erected in 2009, the Chinese Three Gorges project on the Yangtze will surpass Itaipu in terms of total installed capacity, the

South American power station will remain unrivaled in its annual energy production. Expectations are that, with all 20 machines in operation and favorable hydrological conditions, Itaipu can attain an annual production of almost 100 million MWh compared to the estimated 84 million MWh considered possible for Three Gorges.

More intense support and interesting financial terms and conditions in Latin America



Voith Siemens Hydro in São Paulo, Brazil

Voith Siemens Hydro representatives of Latin America

During the past fiscal year, Voith Siemens Hydro remained the market leader in Brazil, the largest South American water-power market. Now, the company will be increasing its activities in the other Latin American countries, too.

Consulting and support

Already in the pre-project phases, the customers will profit from distinctly more comprehensive project consulting and support. Seminars, workshops, and presentations can thus be specifically tailored to the existing demands. Also in smaller countries, where Voith Siemens Hydro does not yet have a local branch, this new standard is to be guaranteed through cooperation with the individual Siemens companies in each country.

Excellent financial terms and conditions

In addition, it was possible to gain support for Voith Siemens Hydro projects throughout all of Latin America from the Brazilian state development bank BNDES (Banco Nacional de Desenvolvimento Econômico e Social), and from the credit insurer SBCE (Seguradora Brasileira de Crédito à Exportação). Specifically for the Latin American customers, the financial possibilities are thus extremely

attractive. Voith Siemens Hydro was able to announce this piece of good news last November in São Paulo, during a 4-day conference of its representatives from all Latin American countries. The conference served to reflect on the progress of customer support and analyze the specific needs of clients in Latin America. It will now take place annually.

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Voith Siemens Hydro São Paulo now rendering plant operation and maintenance services

The first plant operation and maintenance contract has just been signed for the Jauru hydro power plant, located in the Brazilian state of Mato Grosso. The plant, equipped with Voith Siemens Hydro technology, has three generating units with a total capacity of 118 MW.



Jauru hydro power plant

With the outsourcing of the operation and maintenance services, the plant owner directly benefits from the valuable know how and the technological expertise of Voith Siemens Hydro, the company that has developed and manufactured the respective machines. There is no one else who knows the plant as intimately. Voith Siemens Hydro's operation and service team consists of highly experienced personnel. The service team located in the power plant, will constantly be in contact with the engineering staff in São Paulo that will

support them in determining the plant's ideal operation parameters and optimizing maintenance.

The client can be completely sure of optimum operation and ideal machine maintenance, which will keep the costs for unscheduled service repairs low and the plant's life expectancy high.

Delivery of giant runner for Tucuruí expansion

At the end of 2002, Voith Siemens Hydro delivered the runner of Unit 15 for the Brazilian Tucuruí power station. With its impressive weight of 250 tons, it is the second heaviest runner ever manufactured by the company.

Excellent teamwork and new technologies used in the manufacturing process insured the runner's extraordinary quality. The fully milled buckets guarantee perfect erection and homology between the model and the prototype. A porosity index of virtually zero was achieved through the removal of the surface region that is always more susceptible to pores. In addition to the superior quality, the application of these new manufacturing technologies resulted in shorter manufacturing cycles and lower costs.

The 4,240 MW Tucuruí hydro power plant is currently being expanded. Located on the Tocantins River in the Brazilian state of Pará, the power station utilizes a reservoir 80% bigger than that of the world's biggest operating plant, Itaipu. In this phase, Voith Siemens Hydro is responsible for the supply of three runner/shaft sets. The other two sets will be delivered in November 2003 and 2004, respectively.

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Tucuruí's runner transportation



Tucuruí hydro power plant

12th International Seminar on Hydro Power Plants, Vienna: Voith Siemens Hydro presents new developments

The 12th International Seminar on Hydro Power Plants took place at the Technische Universität in Vienna on November 27-29 of this past year. The event's coordinators welcomed a total of 150 delegates from 14 nations to the conference, which offered a two-day forum for exchanging information and ideas in various fields of hydro power.

In his paper, Helmut Buchmaier of Voith Siemens Hydro presented the latest developments relating to the conference's main theme, "Safety and Risks of Hydro Power Plants". He highlighted considerations relating to the typical run-away speed behavior of Kaplan turbines. Based on the information which he provided, it is possible to apply more differentiated criteria to the dimensioning of the rotating parts of generator-turbine units, rather than simply using the maximum possible speed without taking its influence on the total load into consideration.



A focal point of interest at China's largest electricity and technology exhibitions



Night scenery of the entrance to Beijing's forbidden city



SHEC booth view

In November 2002, China hosted two large electrical apparatus and expertise exhibitions – the 9th International Exhibition of Electrical Power Equipment and Technology (EP China 2002) and the 2nd International Exhibition of Electrical Engineering, Electrical Equipment and Contractors' Supplies (Electrical China 2002). Voith Siemens Hydro presented its newest developments and projects alongside other internationally leading companies in Beijing's China International Exhibition Center.

Along with the increasing significance of environmentally-relevant subjects in recent times, interest in corresponding solutions has been growing as well. Consequently, Voith Siemens Hydro's information regarding the Three Gorges Project attracted the interest of several hundred delegates, including the senior executives of State Power, one of the major sponsors of the exhibition. All told, the Voith Siemens Hydro booth in the German pavilion offered an excellent platform for the exchange of technical knowledge.

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Events 2003



2003 Annual Conference
6-9 April, 2003
National Hydro
Association
Washington, USA



Montreal 2003,
ICOLD
16-20 June, 2003
Montreal, Canada
Peninsula 213/312

Waterpower XIII

Waterpower in Buffalo, N.Y., USA
29-31 July, 2003
Booth 810



Hydro 2003 Dubrovnik,
Croatia
3-6 November, 2003
Booth 54-55

Facility upgrade at North American headquarters

York, PA location celebrates 125 years of innovations in hydro power in the U.S.



Upgrade work on the facilities at the North American headquarters in York, Pennsylvania, USA are well underway. Voith Siemens Hydro's commitment to the North American market is reflected in the continuation of the upgrade and renovation project which began when the Voith company purchased the facilities in 1986. The current modernization of the buildings will not only improve their overall appearance, it will also create a more energy-efficient environment for the almost 400 employees who work there.

As an environmentally sensitive company, Voith Siemens Hydro wants to substantially increase the insulation of the factory walls, which will greatly reduce the amount of natural gas consumed in heating the factory, and conserve natural resources. The final phase will be completed soon. On your next visit to York, please stop in and provide your comments on our project.

In October 2002, Voith Siemens Hydro celebrated the 125th anniversary of its York-based U.S. subsidiary with a open house for its employees and invited guests. For more than a century, this company based in Pennsylvania has stood for ground breaking developments in turbine and generator design. This drive for innovation has helped it to become one of North America's largest engineering and manufacturing centers devoted to the production of hydroelectric equipment.

The York facility, which serves as Voith Siemens Hydro's North American headquarters, is the only turbine specialist in the U.S. with a center for continued hydroelectric research. It has spearheaded hydro power projects around the world and North America, including work with the Robert Moses/Niagara Project and the Bonneville Dam Project on the Columbia River.

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Building site 1952

Building frame 1952

Building 1953

York, PA



Voith Siemens Hydro and Czech Brush SEM decide to cooperate

At the end of last year Voith Siemens Hydro and FKI Energy Technology decided to cooperate in the hydro-generation sector. The contract brings together the top-level competence of Voith Siemens Hydro in Engineering and Design with the experience of Brush SEM in the production of hydro-generators. Brush SEM is a Czech company of international FKI Group. Thus Voith Siemens Hydro's medium-sized hydro generators will be produced together with the Czech company up to maximum output of 150 MVA.

The production of competitive generators, both in terms of price and quality, will form the focus of the cooperation. This development is, however, only the starting point for further projects. Besides the founding of a Voith Siemens Hydro company in the Czech Republic emphasis will also be put on modernization projects and high-quality after-sales services.

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Signing of cooperation agreement



Identical quality standards of all products and services throughout the worldwide organization of a full-lining supplier are an essential aspect in customer relationships and part of customers' expectations all over the globe.

Voith Siemens Hydro management has, therefore, implemented an internal management system that guarantees the control of identical quality standards and their certification worldwide at all locations. Representatives of TÜV (Technischer Überwachungsverein, the major auditing enterprise in Germany) of South Germany and Rhineland, Berlin and Brandenburg, had audited the headquarters and each of 15 Voith Siemens Hydro locations around the world in November and December of last year.

TÜV has now come up with the results: the Voith Siemens Hydro headquarters as well as all operating units of the group have been certified according to the new ISO 9001:2000 standard.



Voith Siemens Hydro achieves international ISO 9001:2000 group certification



Dr. Lienhard, President and CEO of Voith Siemens Hydro Power Generation and Member of the Board of Voith AG, where he holds the responsibility for the corporation's quality management, highlights the excellent cooperation with the TÜV auditors:

"I know, preparation for the simultaneous group certification was definitely a challenge to the local management in the operating units, but in today's market situation, it is exactly what we owe our customers."

Voith Siemens Hydro's current plans aim at including the newly founded locations in India and the Czech Republic into this system in the course of this year.

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Proof has been furnished that the requirements according to

DIN EN ISO 9001:2000

India – with Tradition into the Modern Age



India has many faces. On the one hand this huge subcontinent is on the threshold of becoming an industrialized nation. But on the other, the country has been shaped by numerous ancient civilizations with different religious roots.

Hardly a city or town – even the very smallest – is without its temple. Such temples influence many aspects of the country’s day-to-day life and culture. Animals that are among the oldest on Earth play an important part: one cannot imagine a temple festival – these are noted for high spirituality and genuine joie de vivre – without lavishly adorned elephants.

The dutiful Mahouts who look after and guide the elephants treat them in a profoundly kind, gentle way. Elephants, contrary to the general assumption and despite their proverbial thick skin, are in fact distinctly

sensitive to the many parasites that live in the folds of their skin. A daily bath and an extensive washing ritual by the elephants’ keepers are therefore among the most important measures in elephant care.

The elephants repay the Mahouts’ kindness by offering them a copious shower later on! Elephants have a proverbial good memory and are definitely able to register and recall kindly or threatening gestures. Regardless of the more modern methods that prevail in many regions of India, they work hard and without complaining.

This situation is related to the country’s difficult climatic and geographical conditions. Since heavy machinery is difficult to maintain because of the high temperatures and extreme humidity, elephants can still ensure their owners a profitable income, for example in the timber industry.

Despite all its traditions, this multicultural country is on the verge of becoming a highly industrialized economic zone. 3,287,263 square kilometers in size, India is the world’s fifth largest country. With approximately one and a half billion inhabitants –over 7 million people live in the capital city of New Delhi alone – it has long since caught up with the Western World in many industrial sectors. Whether in software programming, telecommunications, the textile industry or the mining of natural resources, modern India has established itself as a competent and efficient partner. This applies to member states of the European Community in particular, which are among



India’s main trading partners. Germany alone imports goods valued at about 3 billion Euro every year.

The agricultural sector, which accounts for one third of India’s gross domestic product, has of course been industrialized in many areas too. Otherwise it would not be possible to satisfy the immensely high daily demand for food. More than 100 million people earn their living in the agricultural sector. India’s farmers mainly grow rice, wheat, corn, potatoes, sugar cane, cotton and tea.

All those activities would not function without an efficient energy supply. This industrial sector is therefore of great importance with regard to the country’s modernization. The respon-

sible people in India have long since discovered the advantages of hydroelectric systems.

Four large religions shape the country’s spiritual world. Hinduism, Buddhism, Jainism and Sikhism also influence India’s everyday life, day-to-day culture and the fine arts. Elephants have a major part to play here as well. These gigantic animals are worshipped here – the god Ganesh had appeared in this guise and is still respected in modern India. And as we have seen, in many regions of India these giants are still essential to cultivate this fertile country.