LAHMEYER INTERNATIONAL

# aktuell

Information on the Lahmeyer International Group, No. 53 / March 2009

Algeria:
Integrated Solar Combined Cycle

Qatar:
220-kV Submarine Cable Project in Doha

Luxembourg:
Pumped Storage Plant Vianden – Extension

Greece:
Athens Metro – Extension

# Contents



## Cover

Merowe Dam in Sudan

With an investment of Euro 1.3 billion, the Merowe Dam hydropower plant is currently the largest infrastructure project in Africa. This multipurpose project will provide electricity, store water for irrigation purposes and will serve as flood protection. After six years of construction the first two turbines, each with a capacity of 125 MW, have started commercial operation. The commissioning of the remaining eight turbines will follow in 2009.
The spillway shown on the cover is designed for a peak flood of 20,000 $m^3/s$.

## Masthead


Publisher: Lahmeyer International GmbH, Bad Vilbel, Germany

Design and Lithography: SaarRepro, Ottweiler, Germany

Print: Ottweiler Druckerei und Verlag GmbH, Ottweiler, Germany

Photographic Evidence: Lahmeyer International's Photo Archive; Page 15: NASA Modis Satellite

QATAR

# 220 kV Submarine Cable Project in the Bay of Doha


Map of Qatar.

Qatar is one of the fast developing Emirates in the Middle East (picture 1). The capital Doha has about 450,000 habitants out of which 80 % are foreigners. North of Doha a new area of the town called West Bay is fast developing, consisting of numerous high rise buildings, artificial islands, sport and leisure complexes, exhibition-, bank and municipality facilities. The required infrastructure is enormous and very similar to those of Dubai or Abu Dhabi.

In order to meet the energy demand 220 kV energy cables are leading into the centre of the new town. In order to meet Power quality requirements LI has got the order to develop and issue a new 220 kV cable tender by the local Electricity Authority Kharamaa. This new cable connection shall be able to transmit a steady Power of 2x 512 MVA. Since there was no any further land route possible, is was required to tender a submarine cable connection. In the course of tender preparation it was therefore required to investigate the sea bed by sonic test procedures and to coordinate the planning with the municipalities and the harbour planning department. The low tide in the Doha bay (1 to 6 m only) is a special challenge for the laying and the burial of the sea cable. Conventional cable laying ships as well as burial machines can not be used here due to the low water levels.

The selection of the cable route (Picture 2) was also a special task, due to the limited areas for cable landing onshore.

The coastal area is far developed, there exists a coastal promenade and in parallel there is cornice road with 2 x 4 lanes. This coastal area cannot be changed or touched. Conventional cable transposition joints are therefore not feasible due to space constraints. The coastal area must be crossed by means of HDD (horizontal drilling device). The channel openings are located in a depth of one meter below water level. For the transition joints it is planned to use a special submarine transition joint (offshore).

An alternative could be to pull the marine cable through the HDD drillings and maintain a transition joint onshore. This alternative however must be further investigated in order to consider the low heat coefficient of the soil.

For the specification of the land cable trenches, the low thermal conductivity of the soil had to be considered as well, this has influenced directly the design of cable trenches and special backfill.

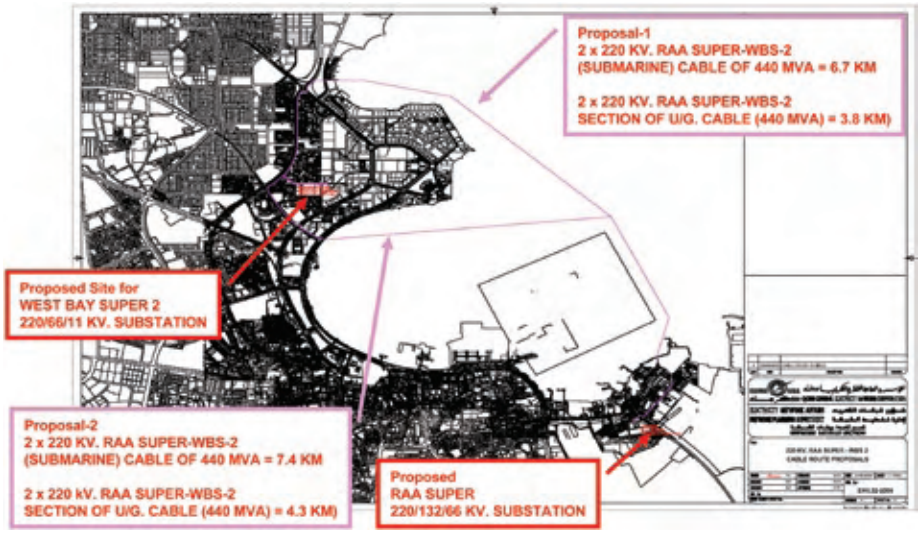
Existing installations for remote air conditioning, water and waste water pipes, data cables and power distribution cables had to be considered as well and were limiting the available space for cable trenches. Special measures had to be specified to minimise the cable heat and several cable trench designs have been proposed.

The temperature of the cables is permanently supervised by fibre optical systems. The communication of the cable protection systems is maintained via optical submarine cables.

After the evaluation of the offers received, the order for the works and supply was placed by end of the year 2008.

The work on site has started and is supervised by LI during construction until handover to the Client.

Klaus Achtelik




Cable routes.

TANZANIA

# Ubungo 100 MW and Tegeta 45 MW Gas Engine Power Plants

Ubungo 100 MW Gas Engine Power Plant.

High Voltage connection with 220 kV hybrid gas-insulated switchgear.

During the years 2003 through 2005 Tanzania experienced unusual long dry periods all over the country. The rain seasons did not bring enough water for running the installed hydropower plants than the years before. Due to hydropower shortage in the country several projects were implemented under an emergency scheme. The Government of Tanzania committed sufficient financial resources for the emergency power generation plants supplied on turnkey basis under an EPC contract.

The new power plants are based on the natural gas resources from Songo Songo Island which had been explored during the years before.

The state-owned utility Tanzania Electric Supply Company Ltd (TANESCO) commissioned Lahmeyer International GmbH to provide technical consultancy services for the procurement, implementation and operation of new gas-based RIC engine power plants at Ubungo and Tegeta in Dar es Salaam.

### Ubungo 100 MW Power Plant

The Ubungo Power Plant features twelve high efficient spark-ignited gas engines. Its modular design allowed for a short construction period. The EPC scope included also the gas pressure reduction station and metering facilities.

The power plant is interconnected via two 65 MVA, 220/11 kV step-up transformers, a high voltage air-insulated switchgear (AIS) and a high voltage cable connection to the existing 220 kV Ubungo substation. The substation was extended by one 220 kV hybrid gas-insulated feeder.

TANESCO started to operate its first own thermal power plant of such size and challenging technology during the initial term under an Operation & Maintenance contract with a third party operator. TANESCO's operators and maintenance crew were fully engaged from the beginning with the prospect of increasingly taking over responsibility and operating the plant on its own.

The Ubungo power plant started commercial operation on August 1st, 2008 and was officially inaugurated by the President of the United Republic of Tanzania – Mr. Jakaya Mrisho Kikwete on November 4th, 2008.

Almost in parallel to the construction of the 100 MW Ubungo Power Plant TANESCO signed a new contract with Wärtsilä to build another 45 MW Gas Engine Power Plant at Tegeta. Due to the good and fruitful co-operation experienced during the implementation of the 100 MW Ubungo Gas Engine Power Plant TANESCO decided to engage Lahmeyer for the Tegeta 45 MW Power Plant project as well.

### Tegeta 45 MW Power Plant

The Tegeta Power Plant consists of five high efficient spark-ignited gas engines similar to Ubungo. The power plant will be interconnected via a 50 MVA,

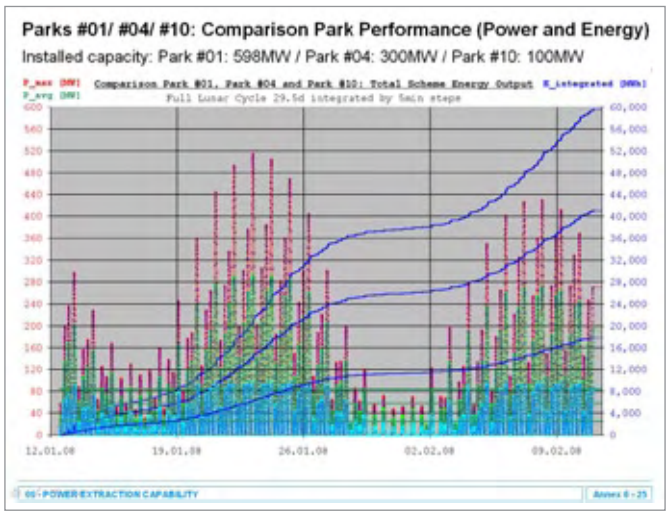
Gas Engine Hall.

132/11 kV step-up transformer, a high voltage air-insulated switchgear (AIS) and a high voltage cable connection to the adjacent 132 kV Kunduchi substation. Commercial operation is expected to start in summer 2009.

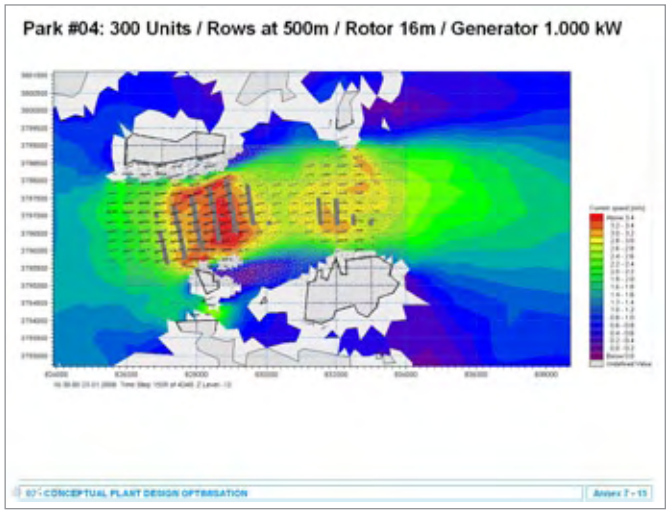
The new gas-based power plants at Dar es Salaam contribute considerably to Tanzania's diversity and capacity of power generation. Now the power generation in Tanzania is based approximately 45 % on thermal power plants and 55 % on hydropower plants. The total installed capacity of the country is approx 1100 MW. The peak load in 2008 was 695 MW. With its new gas-based power plants TANESCO is now in an enhanced position being more flexible and reliable in the power supply to its customers. But still there is an enormous growth in power demand in the country. In the near future several new power plants as well as transmission and distribution projects are in TANESCO's pipeline to face the demand growth of 8 to 10 % per year.

Harald Neff, Klaus-Uwe Huhnke

# 3D Tidal Regime Modelling and Energy Yield Calculation for a Tidal Stream Scheme




Load behaviour and monthly energy yield.




Optimised marine turbines unit placement.

The exploitation of non-traditional energy resources requires the use of latest technology and innovative project assessment concepts.

One form of marine renewable energy – tidal stream power – represents a variable but predictable source of energy governed by the gravitational forces of the moon and the sun.

One of the essential factors for the techno-economic feasibility of a tidal stream plant is the reliable quantification of the expectable energy generation capability. Due to the complex marine environment, a detailed analysis of the tidal regime and its accurate representation in a 3D numerical flow model over a complete lunar cycle is indispensable.

In the framework of Lahmeyer International's (LI) business development project 'Marine Energy' is an energy yield assessment for a tidal park planned in Korea with an installed capacity of several hundred megawatts.

The analysis of the tidal regime for an area of 2,800 km² and its realistic representation in a 3D flow model formed the basis for power output calculations. The detailed determination of the load characteristics with a time resolution of only 5 minutes over a period of 29.5 days provided fundamental insights into the performance of large-scale tidal stream parks. These results were used to optimise the unit arrangement and to identify economically favourable conceptual park layouts.

By the application of latest machinery prototype data within state-of-the-art flow simulation software a reliable calculation of the power output behaviour and the long term energy yield was achieved.

The iterative improvement of the park arrangement and machinery basic design data was realised by a systematic optimisation process identifying best-performing individual turbines based on their average monthly energy output.

The elaborated optimisation methods focused on placing the units in high energy zones to increase the capacity factors of the units as well as the park.

The optimised design of a tidal stream park is a complex task. A great number and variety of data

needs to be analysed, processed, interrelated and optimised. In order to achieve reliable results by the simulation on which investment decisions can be based, extensive tidal regime modelling and a validation process with oceanographic measurement data are indispensable.

The main findings and results by the numerical modelling process and the subsequent evaluation phase were:

- For the techno-economic assessment of a potential tidal stream site a reliable 3D numerical flow model over a complete lunar cycle is required;
- The energy yield is directly dependant on the tidal regime and the spatial flow field distribution;
- The machinery design shall follow project- and site-specific conditions and shall be optimised for a high hydraulic efficiency under average flow velocities;
- Within an environmental impact assessment study the effects on the marine ecosystems must be studied.

With the successful conclusion of the present study, LI is capable of presenting conclusive optimisation routines leading to comprehensive assessments of the energy yield of large-scale tidal stream parks.

The experience and results gained during the elaboration of the study have been presented at various international conferences, among them the 'World Future Energy Summit 2009' in Abu Dhabi.

Ralf Bucher

## Sri Lanka

# Kerawalapitiy – Kotugoda Transmission Project

(Power Sector Restructuring Project)

245 kV Indoor Gas-Insulated Substation at Kerawalapitiya and 245 kV Outdoor Grid Station at Kotugoda.

In the year 2003, the Transmission Division of the Ceylon Electricity Board (CEB) awarded the Consultancy Services Contract for the Kerawalapitiya – Kotugoda Transmission Project to the Consortium Nippon Koei Consulting Engineers, Japan and Lahmeyer International.

Since the Project is being financed with a loan by the JBIC of Japan, Nippon Koei is leading the Consultant's Consortium.

The scope of works for Lahmeyer International covers the entire project management for the 245 kV Indoor GIS, the Outdoor 245 kV Grid Substation and all related gantry foundation and main structure works.

Nippon Koei is responsible for the over head line project and all contractual matters with the Client.

The General Contractor for the execution of the Substation Projects and related gantries is SIEMENS AG Energy Sector – Power and Transmission Division, together with its subsidiary SIEMENS Ltd., India.

Mr. Ernesto Martínez Telo, GE2 next to pile-driving equipment.

After an extended delay in the actual start-up and project execution, the official ground breaking ceremony at Kerawalapitiy took place on February 14th 2008.

In the presence of CEB, the Consultant's Consortium and the Contractor's representatives, the official ceremony was conducted by a Buddhist monk anticipating a successful and timely completion of the project by the end of 2008.

## SPAIN / PORTUGAL

# LI advises E.ON on the Acquisition of Wind Farms

On 7th August 2007 E.ON acquired Energi E2 Renovables Ibéricas from Dong Energy – a Danish utility – at a price of 722 Million Euro. Lahmeyer International accompanied the acquisition of a portfolio of 16 operating wind farms, along with a project development pipeline of 24 projects in Spain and Portugal with an installed capacity of 550 MW and 946 MW respectively, through a project portfolio assessment study and consulting services during the selling process.

For Wulf Bernotat, CEO of E.ON, this acquisition of the wind farms was an important step for E.ON to achieve a leading position within the wind energy market.

Inspection of wind turbines – San Juan de Bargas Site.

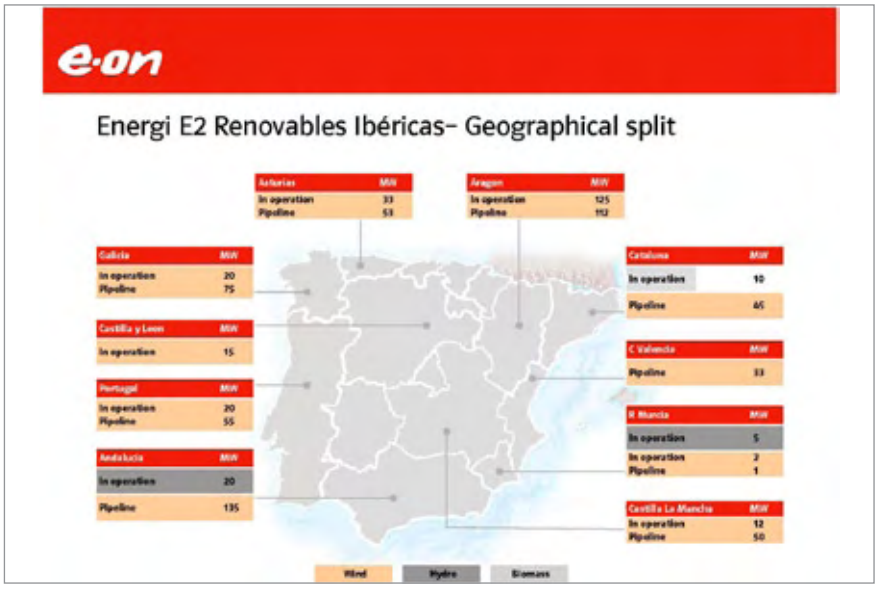
By taking over Energi E2 Renovables Ibéricas, the German power market leader quickly acted, following its announcement from 31st July 2007, where E.ON stated, that it will invest 3 billion Euros in the renewable energy sector by 2010.

The Due Diligence Study, conducted by Lahmeyer International, consisted of:

- yield estimation for the different sites,
- examination of contracts and permits,
- consulting services during the selling process,
- analysis of the Spanish and Portuguese compensation system (essential for the development of the financial model).

The successful accomplishment of these complex tasks within a short period of time was an interesting challenge for the involved team of experts.

During the assessment, the team analysed production data of the operating wind farms, reassessed existing and evaluated wind studies were in respect of their plausibility and up-to-dateness. Furthermore the available contracts and permits, as well as the technical concept of the wind farm were compiled and assessed. During a site mission Lahmeyer inspected various turbine types in respect of their technical condition and recommended appropriate measures where necessary. Within the selling process Lahmeyer International accompanied the coordination with the seller and his consultants, in cooperation with the E.ON Energy Projects staff members, in telephone conferences and with questionnaires. Lahmeyer has accompanied Deutsche Bank during financial modelling and the determination of the purchase price from a technical point of view. Innovations within the Spanish and Portuguese compensation system for wind energy have been assessed and integrated into the estimation.



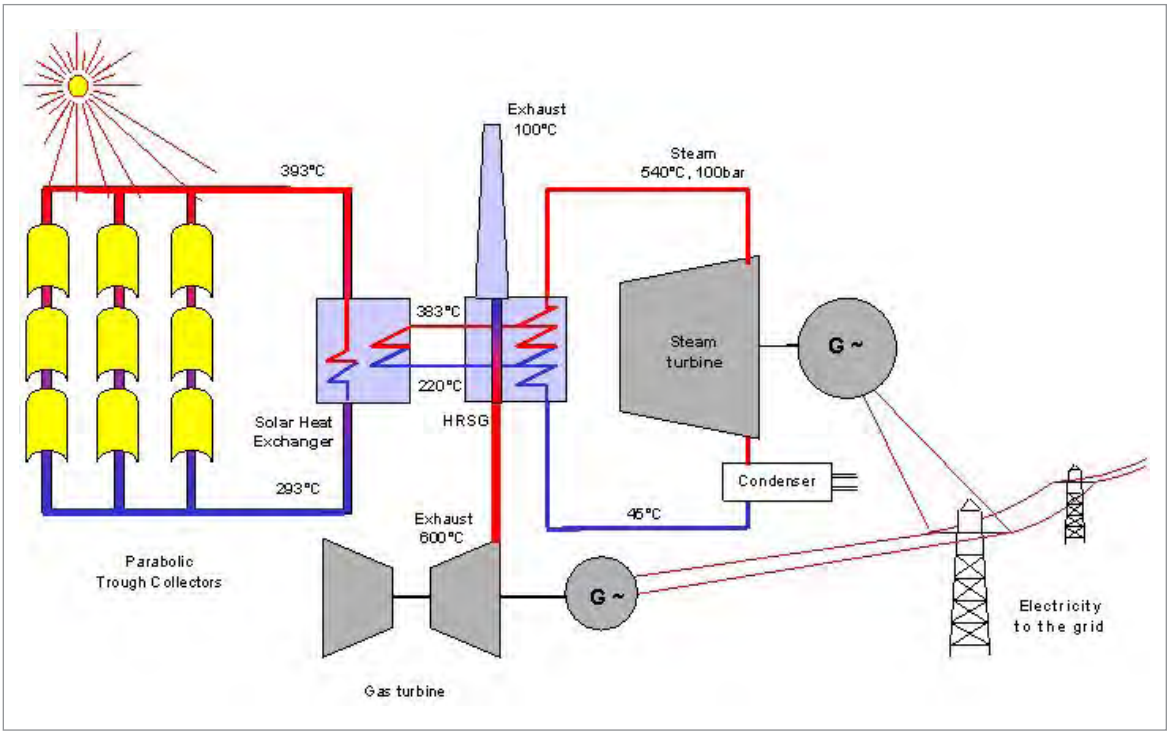

Geographic distribution of wind farms owned by Energi E2 Renovables Ibéricas.

Due to the short-term and flexible assignment of the project team, consisting of 20 Lahmeyer experts, the project has been completed successfully to the full contentment of the client. It paved the way for a follow-up order – a portfolio assessment of the French project developer “La Compagnie du Vent”, whose share of 50.1 % has been taken over by Electrabel (Suez Group) on 16th November 2007.

Matthias Hermann,
Sandra Castano-Gonzalez

ALGERIA

# Integrated Solar Combined Cycle in Algeria




Flow sheme of an Integrated Solar Cobined Cycle.

The Algerian Sustainable Energy Development Plan is the national program for promotion of renewable energy. One of the main targets is to increase renewable electricity production to 5 % of total production until 2010. Because Algeria owns a large amount of the fossil fuels petroleum and natural gas, but also has great potential for the utilisation of solar energy, Integrated Solar Combined Cycle (ISCC) Power Plants shall contribute significantly to achieve these goals.

The project was initiated by the developer New Energy Algeria (NEAL), Algeria's renewable energy agency, established by the Algerian government.

The objective of the project is to develop the first ISCC in the world. NEAL has contracted the Spanish company Abengoa to install the ISCC Power Plant in Algeria as an Independent Power Producer (IPP) project. This power plant ought to be the first one of several plants of this type to be installed in the desert regions of Algeria.

The main principle of a Solar Thermal Power Plant: focussing solar radiation onto a heat transfer fluid and by this means produce superheated steam in a heat exchanger. The steam drives a steam turbine generator and a generator producing electricity.

An ISCC Power Plant does not only use the solar radiation, but uses the steam generated by solar energy as support for the steam generated in the HRSG in a combined cycle (CC).

The steam turbine is supported by steam from the solar field during daytime with up to 50 % of its energy input. At night it works as a regular CC plant. The advantage of an ISCC is the efficiency increase in the use of fossil fuels. Solar energy boosts up the power of the steam turbine at the same time when the power of the gas turbine decreases due to high ambient temperatures. The solar share can be maximal 25 % of the total energy input. The annual average solar share reaches approx. 6 % to 7 %. The figure above shows a flow scheme of an Integrated Solar Combined Cycle.

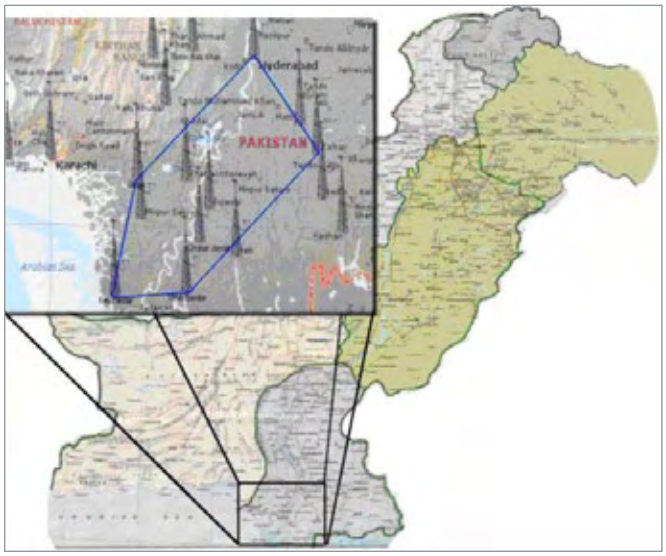
The site selected provides an amount of Direct Normal Irradiation (DNI), around 2400 kWh/m² per year which is equivalent to 240 litres oil/m² per year. The solar ISCC plant is located directly on a gas field to benefit from gas supply and power grid access. The total installed power will be approx. 150 MWel with a solar share of about 35 MWel. This requires an aperture area for the solar field of about 180,000 m². In hybrid operation with a solar share of 5 %, the levelised electricity cost (LEC) will be around 4 €-cents/kWh.

Lahmeyer International GmbH carried out a due diligence for the financing institute Banque Extérieure d'Algérie (BEA) in 2006 in order to evaluate the risks of the investment. This due diligence yielded encouraging outcomes for the construction of the power plant. Therefore the project company (SPP1) has appointed Lahmeyer International for the technical assistance during the construction and commissioning. This includes the construction supervision as well as the evaluation and review of monthly progress reports. Further to this the consultancy support includes the verification of the mechanical completion, the performance and the connection to the grid.

Florian Remann,
Kuno Schallenberg

PAKISTAN

# 50 MW Wind Farm




1) Wind corridor in the South of Pakistan.


2) Location of FFC wind farm Jhimpir located between Karachi and Hyderabad.

The Government of Pakistan (GoP) has clearly articulated its support for the development of renewable energies. In 2003 it has established an autonomous body called Alternative Energy Development Board (AEDB) to act as a central agency for development, promotion and facilitation of renewable energy technologies in Pakistan.

Due to the fact that the use of wind energy is actually – besides hydropower – at favourable locations the most economical one among the renewable energy production techniques, the focus is on supporting the development of wind farms.

The Gharo – Keti Bander – Hyderabad wind corridor, located in the Southern region of Pakistan (see figure 1) is identified by the AEDB as a resource of high wind regimes with a potential of wind power generation of more than 40,000 MW.

Fauji Fertilizer Company (FFC), one of the largest companies in Pakistan, is entering the wind energy market by developing a 50 MW wind farm (see figure 2). FFC has engaged Lahmeyer International GmbH (LI) as Consultant for the entire project progress, divided in separate work packages. In the first step LI has elaborated the feasibility study and supervising the wind measurements initiated by FFC (see figure 3).

After presenting the feasibility study to the board of FFC, LI received the follow-up order to prepare the conceptual design of the wind farm as well as to elaborate the complete tender documents. The tender was separated in three lots: wind turbine supply, electrical works and equipment supply and civil works.

The tender was submitted to a shortlist of bidders beginning of 2008. Due to the worldwide huge demand of wind turbines and the political unstable situation end of 2007/beginning of 2008, high efforts were necessary to convince the manufacturers placing their offer. After all, three manufacturers have done so and rounds of negotiations will start middle of 2008.

3) FFC-wind-met-mast and Landscape of the Site.

The next steps of the project foresee accompanying the client in the progress of applying for the generation license, tariff determination, energy purchase agreement and implementation agreement. After these administrational works and the financial close, LI will conduct the construction supervision covering civil works, electrical works and wind turbine installation. The last work package of the project foresees supervision of O&M in the first year of operation.

Due to promising numbers of the wind measurements and the supporting measures of the Pakistani administration, many IPPs have issued their letter of interest to apply for land allocations. Even FFC has applied for more land to ramp up the installed capacity to 150 MW and asked LI for similar services like in the current project. Other IPPs also requested LI's proposal for consulting services, which shows that the Pakistani wind energy market is lucrative also for consultants.

Manfred Gose

TURKEY

# Bankable Feasibility Study for the Saray Thermal Power Plant, Turkey

In November 2007 Basat Electric Energy Producing Inc. Co awarded Lahmeyer International GmbH (LI) together with DMT GmbH & Co KG a contract for the preparation of one bankable feasibility study for the exploitation of lignite deposits located near the city of Saray, in the European part of Turkey and for one thermal power plant of 2 x 150 MWel.

In the beginning of this century Basat Electric, a subsidiary of the construction firm TASYAPI, managed to secure the rights to exploit the existing lignite deposits 'Tedirdag Saray' comprising the deposits in Edirköy, Kücükyoncali and Safaalan. The total volume of lignite deposits was estimated at 129 mil tons.

In mid 2006 the Turkish consultant MSC Danismanlik, Ankara, presented a prefeasibility study that recommended the construction of one lignite-fired 2 x 150 MWel thermal power plant and the operation for a period of around 25 years. In October 2006 LI was contracted by Basat Electric to review the power plant portion of this prefeasibility study. LI tabled the respective report to Basat Electric by the end of 2006. The main statements have been:

- For the available fuel and the envisaged output of the power plant the utilization of the circulating fluidized bed (CFB) boiler technology would be advisable
- The method of cooling the plant condensers should be optimised according to the available water resources
- The technical details of the connection of the power plant to the grid need to be clarified and the respective costs estimated
- Vital data and information of the project such as: reliable fuel analysis, fuel costs, power plant efficiency and total power plant investment costs are to be generated in a continuative study to proof the feasibility of this project

Li is responsible for the power plant portion of the bankable feasibility study. The following major tasks will be carried out within the contracted scope until the beginning of 2009:

- Review of the existing studies
- Collection and review of fuel data
- Collection and review of site data
- Collection and review of cooling water data
- Collection and review of electric grid data
- Assessment of the applicable environmental criteria
- Assessment of the main parameters and technical boundaries of the power plant
- Definition of key requirements of the power plant
- Establishing the technical concept of the power plant
- Preparation of a design report
- Estimation of the project investment costs and O&M expenses
- Economical analysis and calculation of the cost of one unit of generated electricity
- Preparation of the bankable feasibility study report

Ulrich Lange

MALTA

# Development of the Energy Supply System

The relevance of energy to Europe's growth and competitiveness is steadily increasing. Reliable energy services at acceptable prices for both industrial and household users continue to be a key factor in social and economic development.

The Government of Malta aims to supplement and enhance the existing power supply infrastructure on the island in order to secure reliable energy supplies for the next decades. Among the various projects under consideration, a new cable interconnection between Malta and Sicily receives special attention. Further options to enhance energy supplies in the long run include capacity add-ons in thermal power generation based on fuel-oil and/or natural gas brought to the island either via a new pipeline, liquefied natural gas (LNG) or compressed natural gas (CNG).

In 2007, Lahmeyer International (LI) was mandated by the Maltese Resources Authority (MRA) to structure the wide variety of long-term energy supply options into an adequate infrastructure expansion plan.

The established development plan complies with all important system planning constraints that are characteristic for an island system such as the Maltese system,

Thermal Power Plant Delimara: mid-term capacity addition by some 260 MW.

in terms of security of supply and least-cost solutions. Due to its rather recent accession in the European Union in 2004, Malta's energy sector has to face additional obligations arising from the European energy and environmental policy objectives.

Among others LI's experts provided the following services: (i) the establishment of demand forecast scenarios giving special weight to the Energy Efficiency Action Plan (EEAP); (ii) the screening of most promising local power generation technologies as well as sub-marine power transmission solutions; and (iii) the simulation and optimisation of the future operation of the supply system.

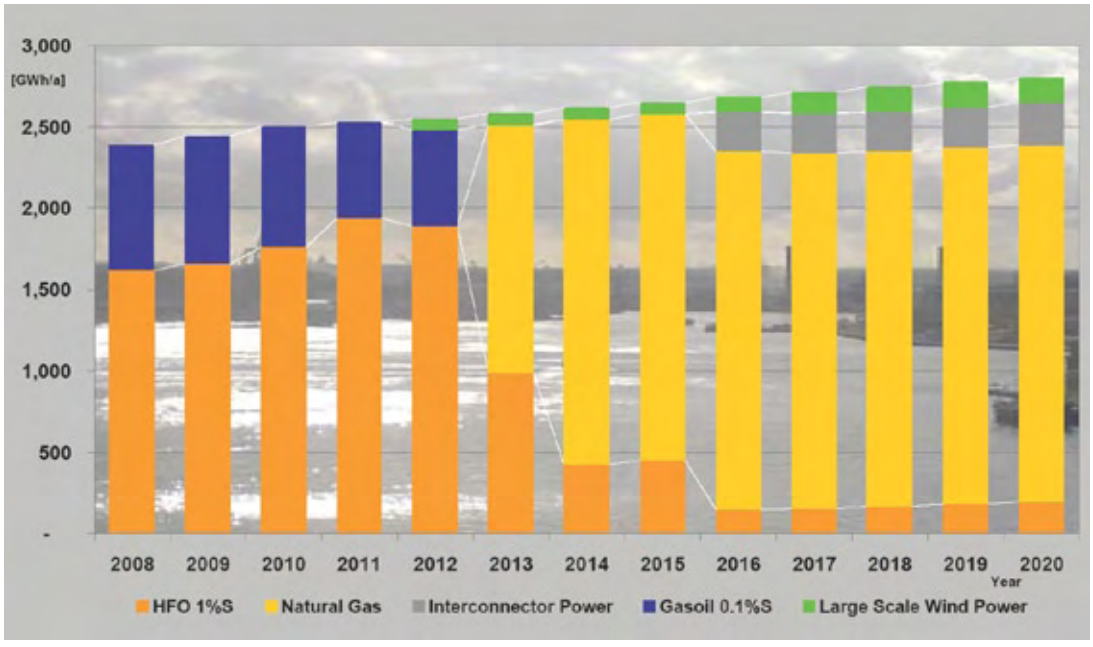
In line with the elaboration of an adequate system expansion plan, it should always be assured that the suggested implementation of expansion stages is consistent with the valid legislation and regulation. On the one hand, the legislative and regulatory framework may impose certain constraints on the choice of the appropriate expansion candidates and their respective scheduling, on the other hand, changes in regulation may be required to enhance the functioning of the energy sector in line with the realisation of the proposed development plan.

A series of EU Directives affects the energy sector of each of the European Member States. They are transposed into national law, addressing mainly aspects such as emission reductions, promotion of renewable energies and energy efficiency as well as the opening of the internal market for electricity.

Being currently a small isolated system, Malta experiences difficulties to establish an internal market for electricity. It is thus granted derogation under the respective EU Directive regarding the unbundling of the network operators, third party access and market opening.

Moreover, especially in markets which may not fully comply with the envisaged framework conditions of an internal market for electricity as envisaged within the EU, appropriate regulation for a transparent and non-discriminatory energy sector is crucial. LI has thus developed a regulatory roadmap for its client MRA which defines the major necessary measures to implement, e.g. permitting procedures, required changes in regulation. The roadmap indicates as well the duration of the measures, their timing, and responsible entities involved, and shall serve as guideline to enhance a successful realisation of the elaborated power supply system expansion in Malta.

Dr. Alexis Bonneschky,
Julia Höpp




Future annual power supply and breakdown of energy sources (Scenario: Energy Efficiency Action Plan).

EGYPT

# Award of Consultancy Services for the New Assiut Barrage and Hydropower Plant

The Government of Egypt intends to replace the existing Nile barrage in the town centre of Assiut (Fig. 1) with a new structure incorporating a hydropower plant (Fig. 2). German development bank KfW is contributing significantly to financing of the project, based on a loan agreement concluded earlier this year. The project owner is the Reservoirs and Grand Barrages Sector (RGBS) of the Ministry of Water Resources and Irrigation. On 29 January 2008, the Assiut Barrage Development Consultants (ABDC), formed by Lahmeyer International as lead firm, Sogreah and RMD Consult ware awarded the Consulting Contract for the preparation of the tender design and documents and for construction supervision of this outstanding project. Construction is scheduled to begin in 2010 and will last five years.

At Assiut, construction of the existing barrage and adjacent canal head regulator began in June 1898 and was completed in March 1902; extensive rehabilitation works were carried out between 1934 and 1938. The main purpose of the barrage is to secure the irrigation water supply of up to 440 m³/s for the command area (700 000 ha) of the 400 km long Ibrahimia Canal reaching up to Giza/Cairo. The barrage was designed as an arched viaduct founded on a concrete basement,

View from downstream of the existing Assiut Barrage on the Nile, with its 111 sluices of 5 m width each.

with a 16 m wide navigation lock located on the left bank. The overall length of the structure is 820 m between abutment faces, and it comprises 111 sluices of 5 m width. The adjacent Ibrahimia Canal head regulator was of similar design to the barrage except having only nine sluices, and a 9 m wide navigation lock.

Between 2000 and 2005 a feasibility study was prepared, which proposed several layouts for the construction of a new barrage downstream of the existing barrage. ABDC are responsible for the selection of the preferred layout and for the supervision of the associated hydraulic model tests.

The new barrage will be constructed a few hundreds meters downstream of the existing barrage and includes:

- a sluiceway with 8 sluice gates of 17 m width each,
- a double chamber navigation lock, with a usable chamber length of 156 m and 17 m chamber width,
- a powerhouse with 4 bulb turbine units of 8 MW each and a rated discharge of about 230 m³/s,
- a closure dam with plastic concrete cutoff wall as main sealing element,
- a four-lane road crossing of the Nile.

Besides the electricity production of about 250 GWh annually, the new barrage will substantially improve navigation and flow regulation. (The 111 sluices of the old barrage are not equipped with individual drives, but are operated by gantry cranes, which does not allow efficient operation.)

For mitigation of project-related environmental and social impacts, the owner has set up an Environmental Group (EG) which is responsible for the implementation of measures to predict, monitor and mitigate or avoid construction and operation impacts. Construction impacts will mainly result from the temporary and permanent land acquisition and associated impacts on people's life. During operation, the headpond will be raised by about 0.5 m compared to current summer levels. Predicted impacts include a rise in groundwater levels, which may adversely affect agricultural production, sanitation systems, public health and buildings. To ensure the social and environmental sustainability of the project, ABDC are providing technical assistance to the EG on environmental issues during all phases of the Project.

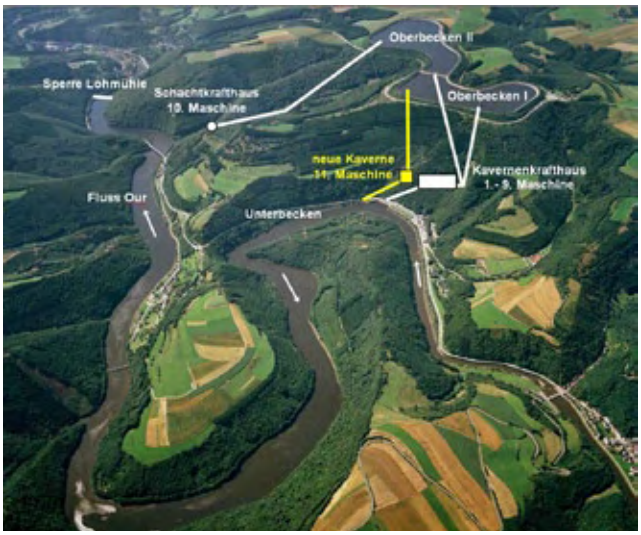
Satellite view onto Assiut existing and new barrages with (from right to left): double chamber navigation lock, sluiceway, powerhouse, closure dam.

Dr. Roland Schmidt,
Klaus Köhnlein

LUXEMBOURG

# Extension of Vianden Hydropower Pumped Storage Plant

Geotechnical investigations for Unit 11, drilling work in the new exploration gallery (March 2008).




Vianden Pumped Storage Plant, overall view.

The 30 m high Lohmühle gravity dam on the river Our, which over long stretches marks the border between the Grand-Duchy of Luxembourg and Germany, creates the lower reservoir of the Vianden Hydropower Pumped Storage Plant. The nearby top of Mount St. Nicolas, some 300 m high, and completely on the territory of Luxembourg, accommodates two hydraulically connected upper reservoirs. The present configuration consists of nine horizontal-shaft units with separate pumps and turbines in a cavern powerhouse and an additional pump-turbine in a shaft powerhouse. Today the plant provides a pump/turbine capacity of 850/1100 MW. Owner of the plant is the Société Électrique de l'Our S.A. (SEO). The principal shareholders, each with 40 %, are the Grand-Duchy of Luxembourg and the German RWE Group.

The engineering services for the initial planning for Units 1 to 9, which started in 1956, were provided by our company, which at that time was still called "Elektrizitäts-Actien-Gesellschaft, vorm. W. Lahmeyer & Co.". The Vianden Scheme was the first large project undertaking after World War II. With the Herdecke Pumped Storage Plant (1927–1929) and the Schluchsee Cascade (1929–1953), sufficient technical project experience was at hand. But until then unit capacities had not exceeded 50 MW, now the request was for 100 MW units. This made high demands on the knowledge and skills of the Lahmeyer engineers. However, everything went well without major problems and after commissioning in 1963/64 the Vianden Pumped Storage Plant with its 9 units was the largest world-wide. A special State Treaty between the Grand-Duchy of Luxembourg and the German state of Rhineland-Palatinate settled the conditions for the plant's construction and operation.

As early as 1964 an extension of the scheme by the addition of Unit 10 was envisaged, again with a very advanced technology for those days, a reversible pump-turbine with a capacity of 200 MW in a shaft powerhouse, locally separate from the existing Units 1 to 9. Design and supervision of the construction for that extension was again carried out by our company, which now already appeared under its current name "Lahmeyer International". In 1974 Unit 10 was finally commissioned.

To satisfy the increasing demand for peak energy, another extension is now being considered. It should not only provide additional power capacity by the addition of Unit 11, but also increase the energy potential of the overall scheme, an objective that can only be achieved by increases in the active storage capacities in both the upper and lower reservoirs.

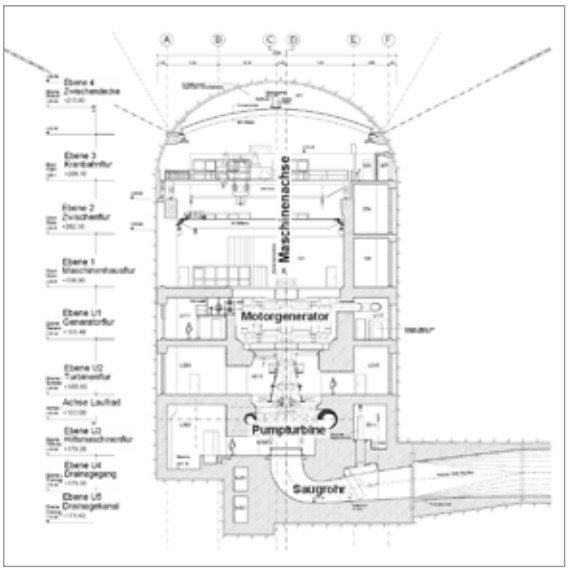
With that purpose in mind, SEO commissioned LI in March 2006 to develop a favourable project concept, which would be technically, economically and environmentally optimised. At the start of the planning process, SEO defined the principal target parameters. This included the approximate location of the new powerhouse, the capacity of Unit 11 (200 MW) and the increase in the storage volume (500,000 m³).

LI's study was submitted to SEO in October 2006 and resulted in the following findings:

- Increase of power capacity by a new pump-turbine, Unit 11, in a separate cavern near the existing Units 1 to 9 powerhouse at the narrowest location between the upper and lower reservoir. Thus parts of the existing access tunnels can also be used for the new Unit 11.
- The storage volume in the upper reservoirs could be increased by raising the maximum water level by 1 m. This implies a heightening of the ring dam crest (50 cm) and the installation of a special wave protection wall. Alternatively, lateral extensions of the reservoir were also investigated with a 3-dimensional digital terrain model, but proved to be technically extensive and uneconomic.

- The storage volume in the lower reservoir could be increased, again by raising the maximum water level. Here, due to the larger water surface, 50 cm suffice to achieve the same additional capacity as in the upper reservoirs. The existing Lohmühle Dam was originally designed for such an increase in hydrostatic pressure. New analyses by applying the finite-element-method confirmed the structural stability of the dam. The raised water level would require reconstruction work at Lohmühle Dam to provide sufficient freeboard and at the head pond weir close to the village of Stolzembourg the raising of some roads along the river bank as well as protection measures in two affected villages.

In developing the project concept for Unit 11, the highest priority was attached to the continuous operation of the existing Units 1 to 10 during the proposed future construction work. In the dewatered upper reservoir the new intake/outlet tower will be constructed in the shortest possible time to a height above the maximum water level. The drilling of the nearly 300 m deep vertical pressure shaft by raise-boring, and all other further work in the headrace waterway can then be carried out again under unrestricted operation of the reservoir, protected by the partially completed tower.




Cross section of the powerhouse cavern for the new 200 MW Unit 11 pump-turbine.

SEO agreed to the project concept developed by LI and, in February 2007, invited bids for further engineering services, namely detailed and tender design, establishment of tender documents and, optionally, supervision of the construction. The contract was awarded to LI, which is a further successful chapter in our 50 year long association with the Vianden Pumped Storage Plant.

Since June 2007, LI's project team has been working on the new tasks with support from TR-Engineering, a partner company in Luxembourg.

The required application documents for the construction and operation permit were submitted to the authorities in Luxembourg and Germany in February 2008. The geotechnical investigations program has been completed, which included the construction of an exploration gallery to the new Unit 11 powerhouse cavern, drilling work and rock-mechanical tests. The results show very favourable geological conditions for the underground excavations. The final documentation of the detailed design was handed over to SEO in April 2008. Present activities are related to the preparation of tender documents for the construction work.

The overall time schedule assumes that the construction work will begin in 2009. The new Unit 11 could thus be ready for operation in 2013.

Dr. Gerhard Eickmann

## SUDAN

# The Merowe Dam – The Impounding of the Reservoir

LI-aktuell previously reported on the Merowe Dam project. One of the early major events was the river diversion of the Nile through the partially completed spillway in December 2005. The years 2006 and 2007 were then marked by intensive construction efforts for:

- the concrete dam with the power intake, the powerhouse and the spillway,
- the two concrete face rockfill dams (CFRD),
- the two irrigation outlets,
- the earth core rockfill dam (ECRD) and plastic concrete cut-off wall,
- the two dykes at the perimeters.

The dam has a total length of 9.7 km and the reservoir will have a volume of 12 billion m³ after completion. The capital expenditure of 1.2 billion Euro makes the Merowe Dam the largest infrastructure project under execution on the African continent.

In January 2008 an international panel of experts – established by the Employer – discussed the technical requirements for the closure of the remaining bays of the spillway. The expert team decided jointly with Lahmeyer International GmbH to start impounding in the middle of April 2008.

In January 2008 the concrete work at the concrete face rockfill dam was not completed and the necessary radial gates of the 190 m

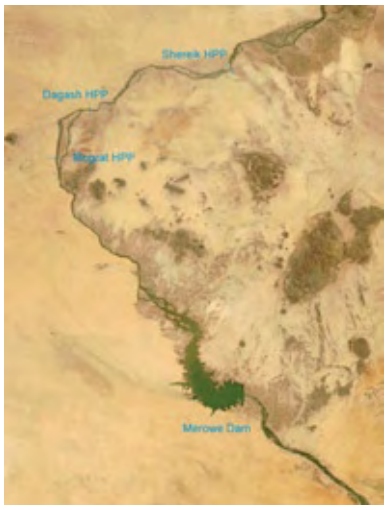
long spillway and the stop logs at the 350 m long power intake were not installed. With the decision to start with impounding a phase of intensive construction activities commenced.

The task was specially demanding for the hydro-mechanical and concrete engineers. They had to install 12 radial gates at the spillway and 10 fixed wheel gates at the power intake including the necessary built-in items such as sill beams, gate frames and the second stage concrete. All work had to be coordinated and checked up to the last detail on site.

The earthworks team had to ensure that the remaining volumes for the core materials with a total volume of 1.4 Mio. m³ for the 850 m long and 67 m high ECRD and the smaller dykes at the perimeters were exploited, processed and filled in time. Moreover, sufficient core material had to be provided for the time after the first impounding. Silts and clays which were available only in borrow areas located in the future reservoir had to be exploited in time and stockpiled downstream.

Additionally, the work at the CFRD – with a total length of 5.8 km one of the longest in the world – and all its remaining sealing elements had to be completed up to the intended impounding level.

By the middle of April 2008 the target was achieved: a most demanding work phase reached its successful completion. 90 % of the totally required 1.9 million m³ of concrete was cast and the impounding could take place at the planned date. In the 2.5 months from January to April 2008, solely for the civil contractor, 5 600 people were active on site.




Satellite image of Merowe dam taken on January 15, 2009. Source: NASA Modis Satellite.

Impounding started on 15 April 2008 with the partial closure of the remaining bay of the spillway. The 16 m wide and 23 m high stop log with a weight of 300 t was fixed 3.35 m above invert level to guarantee the minimum flow of 500 m³/s.

Within one week the water level rose by approximately 12 m to an impounding level of 267 masl. This achievement of the temporary impounding stage became only possible by releasing an additional 1.4 billion m³ from the Jebel Aulia reservoir upstream of Khartoum. After reaching this temporary impounding stage the remaining bay could be closed completely on 21 April 2008. Since that time the Nile water flows over the completed weir bodies of the spillway, which is designed for a peak flood of 20 000 m³/s. At the end of April 750 m³/s was discharged over 10 weir bodies, as shown on the cover of the present edition of LI-aktuell.

While the concrete and earthwork engineers are now engaged to complete the structures to crest level, the mechanical and electrical engineers are active with the installation of equipment. In March 2009 the first two turbine-generator sets (2 x 125 MW) were commissioned and commercial operation began. They will be followed by eight additional units, which will be completed by the end of 2009, resulting in a total installed capacity of 1 250 MW. The Merowe Dam hydropower project will not only boost the electrical energy production of the Sudan by a factor of more than two, but also provide the country with economical and environmentally clean energy. Considering future world market prices for fossil fuels, the annual savings for the Sudan will be in the range of more than 500 million US-Dollar.

The last months have demonstrated once again that intensive and constructive cooperation among all involved engineers of the contractors, the employer and the consulting engineer leads to success.

Dr. Yannick Scheid,
Thomas Richter

Merowe dam in December 2008.

## GREECE

# Athens Metro – Elliniko Extension Project


General overview – Elliniko Extension.

The public transport company, Attiko Metro S.A., after successful facilitating the 2004 summer Olympic Games, is planning to systematically expand the Athens Metro network to embrace most of the Attica region.

One of the projects is the extension of Line 2 from Agios Dimitrios to Elliniko with four new stations and one underground storage depot near its end.

The main characteristics are:

- Project length is 5.5 km, completely underground, under one of the main artery roads of the city, leading to the southern suburbs. Tunnelling will be mainly done with a 9.5 m diameter EPB (earth-pressure-method) TBM, constructing 4.8 km length of double-track tunnel.
- There will be four new stations, each 110 m long, built by the cut-and-cover method, sharing a similar architecture with three levels, one for the platforms, one for the concourse and one for electro-mechanical installations.
- A 275 m long underground storage depot with 4 tracks, each long enough to hold 2 trains, facilitating the holding of a total of 8 trains, will be constructed by the cut-and-cover method near the end of the extension of this line. It is designed to be fully automated and operated without staff. A 210 m long single-track tunnel will connect the storage facility with the main tunnel, which will be constructed by the NATM.
- A 250 m long transition tunnel, with a rectangular cross section varying from triple-track to double-track, will connect the extension with the existing triple-track Line 2 forestation.
- There are 6 vertical shafts along the alignment, intended for tunnel ventilation and providing emergency exits for passengers.
- The vertical shaft at the end of the extension is designed large enough to allow the assembly and the starting operation of the TBM. One part of that shaft will be lined with concrete as a permanent ventilation and pumping shaft, while the remaining part will be backfilled. The removal of the backfill will be possible if a new TBM has to be assembled for a future southern extension.
- Tunnel ventilation, emergency ventilation, and station HVAC are maintained through various systems and equipment installed in the stations or shafts, and are supervised and operated from central control facilities. Station public areas are not cooled, but provision has been made for the installation of future cooling systems. The staff rooms and some of the technical rooms are air-conditioned, while other technical rooms are only ventilated.
- Traction power is by means of a third rail – 750 V DC – designed for continuous operation with train headways of 150 seconds, or 100 seconds for periods of up to 2 hours. Signalling is fully automated, both for the line and the holding depot, and is designed for 90 seconds train headways.

Earth-pressure tunnel boring machine.

In particular, LI supported Attiko Metro in the following areas:

- Civil works, electro-mechanical and railway system engineering equipment;
- organisation, co-ordination and supervision of construction and installations;
- testing and commissioning of the electro-mechanical and railway equipment;
- quality assurance, control and safety.

The Elliniko extension is planned to start operation at the beginning of 2010 with a total project duration of 46 months. The project is 66 % funded by the E.U. Cohesion Fund, with the remaining 34 % covered by the Greek Government. Total project budget is € 400 million.

The consulting services were awarded by Attiko Metro in April 2006 to a German/Greek joint venture, whereby Lahmeyer International was appointed leader of the consulting team.

Coung Le Van
Asdollah Amiri-Naini
Roland Albert

IRAN

# Teheran Metro Extension, Line No. 3

Tehran, the political and economic capital of Iran, has a population of 12 million and is the largest city in the country. The increasing population has worsened the traffic problems. In spite of a good road and motorway network, during peak times all main and secondary routes are full and often blocked.

Due to the long traffic jams, the mainly older cars in use and the location of the city at an elevation of 1,000 metres at the foot of the Elbrus Mountains, there is an air pollution problem and a danger of smog developing.

A closely meshed urban transport system can effectively help to solve this problem. Three of the nine lines proposed in the 1970's master plan are already in operation. Four further lines, No. 3, No. 4, No. 6 and No. 7, should now be realized.

Lahmeyer International has been active with a local partner since 2003 and has already prepared the documentation for an EPC (Engineering, Procurement and Construction) contract for Rail Transportation Industries Co. (RTI). Their client, Tehran Urban and Suburban Company (TURSC), awarded RTI a further turnkey contract for the construction of line No. 3 in March 2005. RTI in turn awarded the joint venture Lahmeyer International – Moshanir the contract for the preparation of tender documents for subcontractors and suppliers in the spring of 2006.

Line No. 3 is 36 km long and runs north-south through the city. A total of 24 km has to be excavated underground in complex geological conditions. The double-track tunnel will be driven concurrently by two tunnel boring machines. The New Austrian Tunnelling Method will be used for 10 % of the line. The underground stations will be partly constructed using the cut-and-cover method. This line has 23 underground and 8 above ground stations, a depot and holding tracks. In addition, 20 metro trains, each with 8 wagons, the complete mechanical and electrical equipment, the power supply and signal equipment will be purchased.

Lahmeyer International provides the following services during the first phase of this project:

- Project management and administration
- Preparation of documents, including:
  - Collection and checking of existing documents
  - Supplementation of investigations and studies
  - Optimisation and amendment of designs
- Supplementation of the design and planning
- Preparation of tender documents for:
  - Civil construction
  - Electrical and mechanical equipment
  - Rolling stock, power supply, signalling and communication equipment
  - Remaining work
- Quality management

The services were started in the middle of June 2006. The draft tender documents were completed by the end of April 2007, and the final version is expected for the middle of 2008. An option exists for continuation of services for the next phases.

Günter Borunsky


Metro Teheran Network Plan.

GERMANY

# Tunnel Kreuzstraße in Tuttlingen

The main traffic routes in Southwest Germany is determined by the structure of the low range mountains, the Black Forest and the Swabia Alb. The two busiest east-west traffic routes lie one to the north and one to the south of this area, separated by about 200 km.

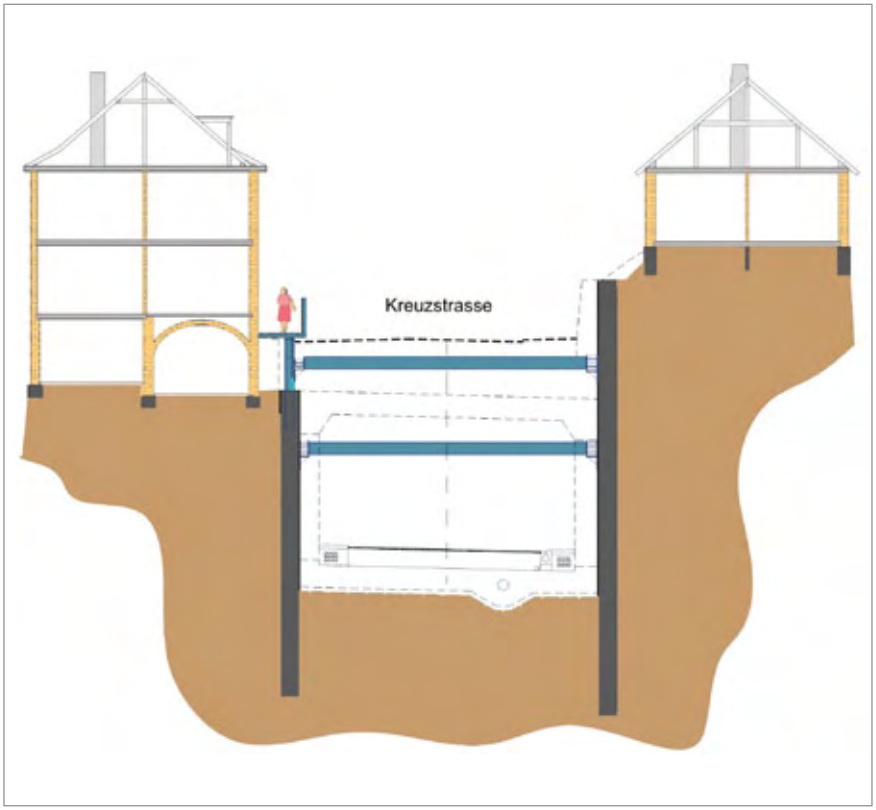
As part of the regional road network, the west-east connection in Tuttlingen will be developed. The national routes B14 and B311 will be jointly routed in the city. To improve the quality of life in this urban area, the junction will be built underground in a tunnel. Extensive ring roads or bored tunnel constructions were dismissed for economical reasons at an early planning stage.

A preliminary design was completed in 1987 and in 1994 the planning approval process was concluded. Building permission was granted in 2003 after additional changes had been made to the design.

Lahmeyer International (LI) were commissioned by the regional authority in Freiburg for different aspects of the planning between 1996 and 2006, mainly the engineering geology, the preliminary and construction designs, an emissions report, the planning of the technical equipment and the preparation of the tender documents.

The tunnel has a total length of 948 m, which contains two lanes of traffic bordered by two escape paths in a rectangular tunnel. There are five emergency exits, two breakdown areas and an administration building, where the control and operational equipment is housed.

The tunnel, which is up to 12 m deep, will be built using the cut-and-cover method. The local geological conditions, with 33 % Danube clay and 66 % limestone calls for the use of bored pile wall on both sides of the construction area for one third of the construction and anchored shotcrete for two thirds of the construction.




Cross-section of the construction pit with a bored pile wall.

Due to the very restricted urban site, a large number of cross-sections were prepared. Land survey measurements and an examination of the over 100 years old building documents were carried out.

Already prior to the beginning of the construction works, all utility lines and pipes were moved to a 1.5 m wide strip between the tunnel and the walls of the existing buildings. This eliminated the need to lay temporary utilities and allowed the local buildings to be serviced through the construction period. However, this calls for a high degree of care and precision during the tunnel construction period.

The risk of adverse ground conditions in this very built-up urban area was minimised by detailed planning and intensive coordination between utility authorities, the local residents and the project team. Nevertheless, a three story ice cellar was discovered beneath the base of the tunnel just before the completion of the tender documents.

The tunnel Kreuzstraße was tendered throughout Europe at the end of October 2006 by the regional government in Freiburg. Construction should start by the autumn of 2007 and be completed by the year 2010.

Wolfgang Schumacher

GERMANY

# LEED-Certification: An US-American Product – for German Real Estate

Sustainability and $CO_2$-economization are becoming more and more salient since several years. Beside their present mission – satisfying today's needs without endangering the needs of upcoming generations – especially the sustainability developed an increasing economic significance.

If the decision stands between "green" or "conventional", especially the economic aspects of real estate become key factors. These two aspects – environmentalism by persuasion and by economic cognition – provide a positive way of reciprocal influence and are good to combine.

Today it is common knowledge that energy saving real estate also saves money during its long-term lifecycle, satisfying both, the economical perspective and the anti-pollution perspective. But, why do we need a Green Certificate Label? Why do we need a badge from the USA? At this point it is nearest to explain what LEED principally means:

LEED stands for "Leadership in Energy and Environmental Design". It is a Green Certificate Label for real estate projects, which certifies that the construction was processed following particular criteria and benchmarks of environmental protection. LEED is an internationally recognized standard for planning, construction and operation of ecologically efficient buildings.

The agreement upon an international standard provides the ability for worldwide valid equation bases. The sky scraper in New York City has to meet the same conditions as its equivalent in Frankfurt/Main. Based on experience it can be said that the transposition of LEED criteria to the German market is basically possible, although some LEED criteria were rather designed to meet the needs of the US-Market.

LEED enables the building owner and the operator to gain direct and measurable influence on the capability and the efficiency of their real estate.

LEED contemplates the entire real estate in its lifecycle, subdividing its performance into five aspects of humanely and environmental-oriented benefits:
- Sustainability during the construction process
- Water efficiency
- Energy optimization
- Material selection
- Indoor air quality

LEED provides the framework and the guideline for reliable measuring and documenting the efficiency of every building type. LEED rating systems are available for:
- New construction and major renovation
- Commercial interiors
- Core and shell
- Homes
- Neighborhood development
- Multiple buildings/campuses
- Schools
- Retail

Initiator and certification centre of LEED is the US Green Building Council (USGBC).

The USGBC currently develops programs for healthcare and laboratory projects.

Basically it can be postulated that the application of LEED leads to:
- increased efficiency and profitability,
- reduced operational costs,
- increased value of the asset,
- creation of a healthy and very productive environment for occupants,
- enhanced recycling,
- minimization of greenhouse gas,
- commitment to sustainability and ecology, responsibility and social agreeableness,
- optimization of the corporate image.

Lahmeyer Rhein-Main GmbH has successfully accompanied the first real estate project in Germany which followed the criteria of LEED and is currently working on further major projects.

Carsten Schulte

GERMANY

# Virtual Project Rooms: Success in Practice is based on a Structured Initial Phase

Today "Virtual Project rooms" are a main constituent of project management. Advocates praise them as basis to allow structured, organised and transparent functioning, work to be free of redundancy and always up-to-date. Nonetheless there are still some opponents to those virtual rooms who criticise among other aspects the additional work and costs involved, combined with difficulties met with systems. Are they right? How could we avoid bad experiences?

Five years ago a virtual project room has been used typically for the handling of singular construction projects, the structured filing of documents being in the centre of focus. Documentation had to be transferred to the awarding authority after completion. Meanwhile experience with the systems showed that they offer a much greater benefit: In addition to avoiding any redundancies, all information is up-to-date and access to this information is possible irrespective of any constraints in time or location. This offers incredible possibilities in regard to meeting deadlines. Up to now documents had to be printed, approved, copied and sent (sometimes by mail) to the different parties involved. Now the system offers the possibility of an integrated release procedure. The documents can be made available to all relevant project partners per data protected transfer.

Even decision making processes are made easier for management, any involvement possible in a save and easy way. That way any monitoring of the process within a team or company can be executed in an optimal way, no matter the regional distances.

Especially companies in the energy or automobile industry have identified these additional benefits for themselves some time ago. For years they are using virtual project rooms as a network solution to organize construction projects, specific internal automated processes or any other processes where larger teams have to be involved. The effort to implement those virtual rooms for larger projects is obviously bigger than for single construction projects, but the mode of operation doesn't really differ fundamentally.

To reach a high degree of efficiency and gain effectiveness in using a virtual project room all systems have to be adapted to the existing systems and coordinated with the processes internally used. Processes of doing business and projects therefore might have to be adjusted. And obviously mapping of a complete company structure is much more complex than for a single project.

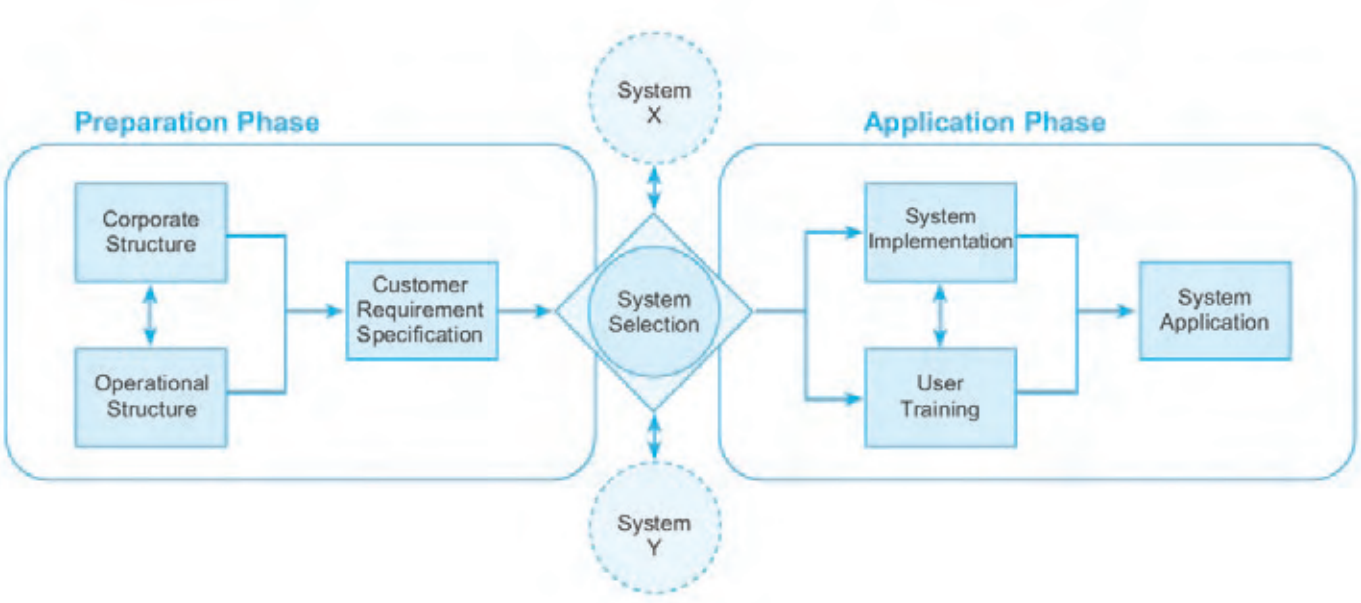
The implementation of a company network system should therefore start with a pilot project.

As the project leader typically doesn't have the necessary experience and time to implement the virtual project room for the project, and as the systems provider only offers systems according to the requests delivered by the company, the possible gain in efficiency or effectiveness the system could offer might not be reached. The improvement of the processes fall by the wayside if nobody feels responsible. The success of the project and especially the benefit the system is therefore in peril right from the start.

We therefore highly recommend for the implementation of the system to rely on independent consultants, as mediator between system provider and user. Lahmeyer Rhein-Main is offering a broad expertise about all current systems on the market today. We analyze your processes objectively and make proposals on improvements. We actively support the coordination and organization of the project by transferring and structuring relevant information between the system provider and the users with the overall objective in mind. We are confident to provide within short time all training necessary for the operators.

Such a smooth introduction will assure broad acceptance by the users as well as ensure the gain in efficiency and effectiveness for the project, and therefore the company and its objectives in general.

Heike Pitz,
Charlotte Baumann-Lotz




Steps to the proper system (Grafics LRM).

Austria

# Flood Control Concept for the Wien, Kleine Tulln and Wolfsgraben Watercourses in Lower Austria

The consortium formed by ILF, HPI and Büro Angst was awarded a contract for performing a comprehensive run-off analysis for the Wien, Kleine Tulln and Wolfsgraben watercourses in Lower Austria as part of a flood control program run by the State of Lower Austria. These watercourses are situated immediately to the west of Vienna, Austria. The length of the river reaches covered by this investigation amounts to a total of approx. 28 km for a catchment area with a surface of approximately 181 km².

A two-dimensional hydrodynamical flow model was set up and calibrated for examining the flow situation. Prior to model preparation, terrestrial surveying was performed in order to determine the geometry of the main section of the river, covering water body cross-sections measured at regular intervals along the river reaches, in addition to all transverse structures relevant to modelling. A digital terrain model was created on the basis of a recent lidar scan survey for mapping terrain levels in the floodplain areas.

Available water level ratios were checked, and the hydrological longitudinal profile was refined for hydraulic modelling during the editing of hydrological data. The corresponding flood zones were determined with reference to model simulations for 30-year flood, 100-year flood, and 300-year flood. Then, a risk estimate was made depending on flow depth and on the susceptibility to damage of the property affected.

Calculated 100-year flood areas according to existing conditions along the Kleine Tulln watercourse at Sieghartskirchen.

Based on the knowledge obtained in this way, an action concept was prepared for flood control in close cooperation with the communities concerned. The effectiveness of the action proposed was tested by simulations according to the planned condition, and the residual risk which would remain after implementing those measures was indicated. The results obtained during this study were presented and discussed together with competent public authorities at several information events organised in the corresponding communities.

To accompany the flow modelling, an extensive GIS project was created, containing all input data and all results and information generated in the course of this model investigation. This investigation was completed after two years of work in January 2008.

Dr. Roberto Kohane,
RB West – Bad Vilbel

Wien river near Purkersdorf in the Wienerwald forest.

Germany

# Project Management
# Remediation Project Rositz (Thuringia)

The areal view shows the extent of the damage caused by the “tar lake”.

By order of the Thuringian Ministry for Agriculture, Nature Conservation and Environment Lahmeyer Berlin was entrusted with the Project Management of remediation and ecological redevelopment measures in the Rositz major project.

In 1916/1917 a tar converting plant was built by Deutsche Erdöl AG with the objective of fabricating fuel from local resources. Until 1990 about 17.5 mill. tons of brown coal tar, approximately 9.23 mill. tons of crude oil as well as 620.000 tons of other basic materials, including 210.000 tons of sulphuric acid, caustic soda and caustic potash were converted in according plants into fuel, tar oils, paraffin and bitumen. The products were temporarily stored on the area.

As a result of the over 60 years long period of converting, an intensive bombing of the area in the Second World War and additional inappropriate dumping of by–products the site was considerably affected. The soil and the groundwater were in parts wide-ranging contaminated by pollutants which are typical for petroleum processing (petroleum-derived hydrocarbon, polycyclic aromatic hydrocarbon, phenol). In particular the region of a spacious „tar lake“, a dumpsite, which was established in a former brown coal open pit without any sealing of the ground, is ecologically affected in a serious extent.

The project controlling and management apply to the planning and performance of clean-up operation measures. The function is to analyse, evaluate and co-ordinate technical, administrative and financial issues. Furthermore the contracting authority gets support in the managing of contracts and the monitoring of the allocation of financial resources.

The clean-up operation of the “tar lake” began in 1996. Since that time 327.600 tons of tar products were extracted and disposed. Now the progress of the operation allows the successive backfilling of the dumpsite with soil material. Subsequent the surface of the filling will be cropped and vegetated in order to reintegrate the area into the natural scenery.

Marc Born

After the extraction of tar products the backfilling of the dumpsite is prepared.

India

# Lahmeyer International (India) Pvt. Ltd. moves to New Office


Group photograph at the reception lobby (left to right – Ms. Deepika Ahluwalia, Mr. C.K. Nath, Mr. H.P. Biswas, Mr. B.M. Das, Mr. C.N. Murty, Mr. Amit Sen Gupta, Mr. Vivek Sehgal, Mr. T. Kleinschmidt, Dr. Nothdurft, Mr. S.K. Sehgal, Mr. B.D. Banerjee, Mr. A.K. Chakraborty, Dr. A.K. Jha and Ms. Rabjot Johnson).

We are pleased to announce that our Indian subsidiary Lahmeyer International (India) Pvt. Ltd. has moved to a new office. The office was inaugurated by Dr. Henning Nothdurft on 15th September, 2008. Mr. Thomas Kleinschmidt, Executive Director, was also present during this auspicious occasion. A traditional Indian inauguration ceremony like lighting of lamp & garlanding of guests was performed and Dr. Nothdurft cut the ribbon and declared the new office open.

LI India now has over 200 employees, who were earlier located in 6 different places in Gurgaon and all have now moved into the new office building. The new office building has state-of-art working facilities and has capacity to accommodate further expansion.

Vivek Sehgal


Outside view of Lahmeyer India.

Lahmeyer International GmbH
Friedberger Str. 173
61118 Bad Vilbel
Germany

Tel.: +49 (61 01) 55-0
Fax: +49 (61 01) 55-22 22
E-mail: info@lahmeyer.de
Internet: www.lahmeyer.de