LAHMEYER INTERNATIONAL

aktuell

Information on the Lahmeyer International Group, No. 52 / December 2007

Egypt
Multi-purpose project Naga Hammadi

United Arab Emirates:
400-kV Network extension
Taweelah–Bahiya–Sadiyat–Abu Dhabi

Cyprus:
Expansion Planning for Power Plants

Germany:
Pumped Storage Plant Waldeck 1

Contents

Cover

Gangwon Wind Park, Korea

The Gangwon wind park is Korea's first wind farm and the largest in East Asia. In September 2006 it went into operation. The site at the Daegwallyeong mountain range is similar to Alpine mountain ranges (1100 m height) and the conditions are optimal for the 49 wind turbines with totally 98 MW capacity.
In the course of the development of this facility Korea was drawn to the idea of renewable energy. The energy requirement in 2020 will most probably be twice the amount it is today.

Masthead

Publisher: Lahmeyer International GmbH, Bad Vilbel, Germany

Editorial Office: Jutta Kaufmann, Business Development

Design and Lithography: SaarRepro, Ottweiler, Germany

Print: Ottweiler Druckerei und Verlag GmbH, Ottweiler, Germany

Photographic Evidence: Lahmeyer International's Photo Archive

NIGERIA

National Energy Project – Doubling of Electricity Production

Location of the new power plants, overhead lines and substations.

Nigeria's population as well as the country's economic growth is suffering from poor energy supply with frequent blackouts and severe lack of supply capacity. On the other side, Nigeria is one of the largest oil exporting countries in the world. Especially the Niger Delta is the national centre for oil and gas production, and export, unfortunately so far the gas is simply burnt without further utilisation. To enhance the electricity supply the National Economic Council approved the National Integrated Power Project (NIPP) in the beginning of 2005. This project will substantially contribute to the development of the entire infrastructure of Nigeria.

Up to 2008 the installed power capacity will be supplemented by an additional 2,400 MW through the installation of 7 new gas turbine power plants, including fuel supply and transmission and distribution facilities. Project financing is secured through a dedicated crude-oil fund that is fed by revenue derived from crude oil sales. For the first phase of NIPP approximately 3 billion USD have been budgeted.

All new gas turbine power plants with a total of 21 gas turbines, will be commissioned as single cycle power plants. They can subsequently be converted into combined cycle power plants in Phase II. It is envisaged that the first turbine sets will enter into commercial operation by the end of 2007. The new gas turbine power plants are located in the Niger Delta adjacent to the gas sources.

Nevertheless, the existing grid must be reinforced and extended accordingly. Thus 23 new substations will be built, 38 will be upgraded and a total of 36 overhead line projects (330 kV and 132 kV) with a total length of 3,000 km will be realised.

The power supply for industrial and private consumption via 33 kV power-lines is implemented via 250 distribution projects in 11 organisational units throughout the country. Rural areas in the vicinity of the new power plants will receive a direct supply.

The natural gas fuelling the power plants originates from gas wells in the Niger Delta and will be transported to the power plants through new gas pipelines. Besides contribution to the national electricity supply, another main target of the project is to reduce the severe pollution from uncontrolled burning of gas by using DLN (Dry Low NOx) gas turbines.

Arrival of the first gas turbine in Calabar.

In August 2005 Lahmeyer International, in a joint venture with O.T. Otis Engineering (Nigeria), was awarded the contract to be the Project Design Consultant for NIPP by the Federal Ministry of Power and Steel. Our services include among others, project management and coordination, contract and claim management as well as quality, cost and time control. The joint venture is responsible for the performance of technical performance tests and for the implementation of a document management system. LI and Otis have also been awarded project consultant for telecom and network study. The scope additionally includes services during tendering – including planning, preparation of tender documents and tender evaluation. The management of contract negotiations and assistance during award of the contracts is also forming part of the consultants' scope.

The project is scheduled to be completed in 2008.

Karsten Ley

South Korea

Inauguration of the largest Wind Park in Korea

On October 26, 2006 the Gangwon wind park was officially inaugurated. Currently the largest wind park in Korea, it was jointly developed by Unison Corporation, Seoul and Lahmeyer International (LI).

In July 2001 LI had been awarded the contract as exclusive engineer for the planning services covering all project phases – starting from the development of the project through to site supervision and commissioning.

Following a long project development period, the project reached financial close in early 2005. After start of the construction phase in April 2005 the contractual commercial operation date was scheduled for October 10, 2006. By September 18, 2006 commercial operation started with 49 wind turbines with a total generation capacity of 98 MW. This early completion is especially remarkable given the rather long winters at this mountainous site and some major obstacles such as massive rainfalls that caused catastrophic damages in the region as well as blockades of the site by other land users.

Numerous members of the political sphere attended the official inauguration ceremony. During the celebrations, LI's project manager received an award for his efforts from the Korean Minister of Commerce, Industry and Energy.

Our company will also contribute to the success of the project in the coming years, since LI has been mandated a technical advisory contract for operation and maintenance.

Roland Ries

Award of LI's project manager by the Korean Minister of Energy.

Partial view of the Gangwon wind park.

UNITED ARAB EMIRATES

400-kV Network Extension Taweelah–Bahiya–Sadiyat–Abu Dhabi

Existing offshore-lines on the coastal front of Abu Dhabi.

Parts of the 400-kV transmission line network of Abu Dhabi city.

The forecasted electricity demand for Abu Dhabi is dramatically increasing due to massive development of the industrial as well as the property sector. New overhead lines and cables are required to transmit the additional required energy from the remotely located power plant sites to the future centres of electrical demand. In addition existing transmission lines on the coastal lines and some offshore islands i.e. areas that formerly were valued as unattractive properties have to be relocated since such areas are now considered as prime building land.

For the promotion of the development of the transmission line network, state-owned TRANSCO (Abu Dhabi Transmission & Despatch Co.) has awarded Lahmeyer International (LI) in December 2005 with the planning and construction supervision of the 400-kV transmission line network extension between the power plant sites of Taweelah and the city of Abu Dhabi. The project comprises also the 400-kV substation Bahyia with a 132-kV cable connection and the 400-kV seawater cable connection between the plants Sadiyat and Abu Dhabi Station.

The expansion starts with the connection of additional generation capacity of 1,250 MW at Taweelah power plant at first with two and later with four transmission line circuits each at 1,400 MVA. The subsequent two phases include the connection of the new Sadiyat and Bahiya stations. Firstly these stations have to be connected to an existing transmission line completed in 2001 under LI planning and construction supervision. During all such works at least one circuit has to remain in permanent operation.

To achieve the required transmission capacity both plants will be put into operation one after another. This will be facilitated with further, new overhead line circuits each starting from Taweelah power station (existing and new): To Sadiyat with two circuits at 1,400 MVA each and to Bahiya with 1 x 1,400 MVA and 3 x 2,000 MVA. The reason for this arrangement is the high redundancy requirement of n-2.

To avoide of major expropriations between Taweelah and Bahiya an existing 132-kV line will be decommissioned and substituted within the existing routing with a quadruple-system 400-kV transmission line. The security area required for the 400-kV line is bigger than the existing one. However the realisation is possible by making use of the adjacent water pipelines also owned by TRANSCO. The 132-kV line can only be decommissioned after the load has been taken over from the planned 400-kV substation in Bahiya.

Due to a major investment plan on one of the islands it is planned in addition to relocate the aforementioned 400-kV double circuit line into the sea. Parallel to that one also a second double-system 400-kV line shall be constructed. Construction cost for off-shore double system transmission lines are by far higher than for land based quadruple system transmission lines. The main reason are the disproportionally high costs for off shore foundations. But taking into account availability and reliability considerations TRANSCO decided to shoulder the significant excess cost. The relocation works in this section of the transmission line have to be undertaken system-wise whereas one circuit always has to remain energised. Complex temporary installations are needed. They have to be implemented in close vicinity to the existing lines being energised.

Without considering the sea water cable the project implementation phase has a duration of four years and covers 16 separate construction sections. It is the most complex project within the client's network requiring consequent planning and precise operations.

Beginning with the oil boom more than 30 years ago LI was awarded as initial consultant of the former water and electricity department with conceptual design, planning and construction supervision for the first 220-kV transmission line in the UAE from Abu Dhabi to Al Ain. Since then LI has planned and realised about 50 high voltage substations, round 3,000 kilometres of 220- and 400-kV transmission lines and ca. 450 kilometres of 132- and 220-kV cables. This is the main part of the entire high voltage network in Abu Dhabi.

Now the Emirate is facing a new boost of development arising from the booming property market that will lead to steadily increasing expansion of the entire infrastructure.

Peter Kleyersburg

BRAZIL

Light for All

Typical small housing community next to a river in Amazonia.

Training of electricians for installation of Solar-Home-Systems in Acre.

Since 2002 Brazil has implemented a new energy law which among other issues, determines the universal supply of electricity in the country. All utilities are bound by that law to provide electricity to all households that are not yet electrified. Whereas the level of electrification was 97% in 2000 it is planned to achieve a level of 100% by 2015, in time periods which are differing from region to region.

The promotion programme "Luz para Todos" (Light for All) supports the timely implementation of this obligation with investment grants and subsidised loan schemes. The majority share of the total 4.5 billion Euro utility investment programme is however financed through their clients' contributions.

By the end of 2006 approximately 1 million households, from a total of 2.5, received access through grid extension. Rural areas that can only be served as island networks have only been considered to a rather small extent.

The Amazon region is regarded as the biggest challenge for the electrification programme. Utilities with weak financial and institutional resources are facing the quest of implementing a supply scheme for very sparsely populated rural areas. The natural features of the region being rainforest, alluvial soil, periods of heavy rain, and tremendously difficult conditions for transport are causing severe technical and logistical problems.

Currently the isolated grids of Amazonia are almost completely powered by diesel generators. Only heavy subsidies of approximately 1.5 billion Euro in total or 1,000 Euro per consumer allow for consumer tariffs comparable to those under the national grid. An additional problem is the disproportionately high negative environmental impact. Isolated networks, which meet just 3% of the national Brazilian electricity demand, are responsible for more than 40% of the greenhouse gas emissions.

The electrification of Amazonia, would lead to a doubling of consumers, which if supplied by diesel engines results not only in an increased need for further subsidies but also to further increase in CO_2 emissions. On the other hand such conditions substantially favour the use of renewable energies in these isolated areas.

The utilisation of decentralised renewable energy resources such as biomass, solar energy, wind or hydropower is attractive from an economic as well as ecological point of view. Especially the use of solid biomass and local palm oil have positive impacts on incomes and the local economy.

Proven technologies for the supply of single households or small village communities that work reliably under difficult environmental and transport conditions are not sufficiently available on the Brazilian market. Additionally, the Amazon region in particular suffers a lack of competence and appropriate organisational structures.

Together with their partner Elektobrás – a governmental utility holding the largest stake in the Brazilian power supply system – Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) has been promoting renewable energy for rural electrification since 2005. Under this programme GTZ has employed Lahmeyer International to provide consultancy services to a number of utilities in the field of rural electrification.

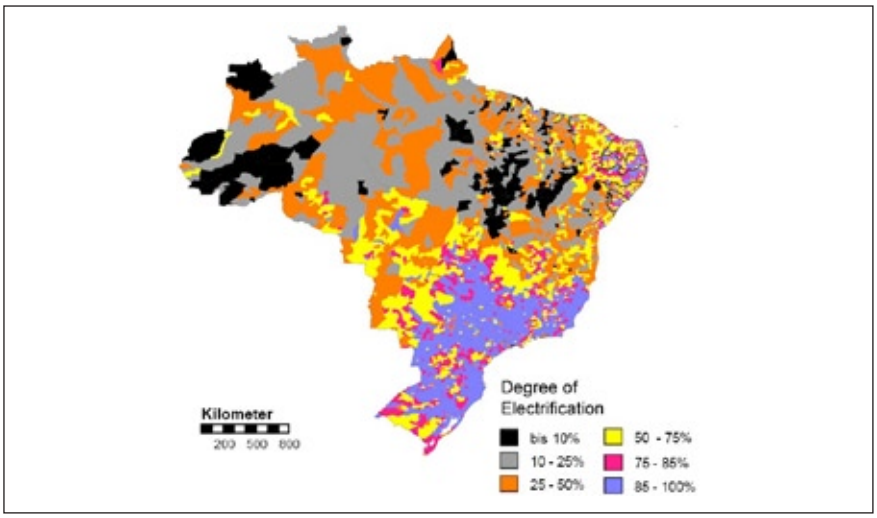
Tools for planning and decision making are being created, and models for sustainable operation of the power generation units are being developed. Besides planning of technical systems, special focus lies on the development of an operation and maintenance structure, as well as on the adaptation of business procedures within the utilities. LI supports the know-how and technology transfer that shall strengthen the local supply of appropriate renewable energy technologies.

In order to align the regulatory framework to the requirements of renewable energies, LI also provides consultancy services to the ministry of energy and the regulator. The removal of barriers and regulations that lead to cost increases, as well as the creation of a secure and profitable environment for investments for rural electrification are the main targets here.

In a first pilot project in the state of Acre, several rural areas were analysed with respect to the potential of renewable energies and the technical suitability. As a first step 100 households are being equipped with Solar-Home-Systems (SHS) with advice of LI. The SHS shall supply sufficient energy for light, radio, TV and smaller household appliances. Electroacre and other local suppliers are building up structures for installation, customer support, and maintenance for a further successful expansion of the new energy supply services with SHS.

A second pilot project is currently being initiated with the aim to develop and test standardised electricity supply systems (e.g. minigrid with a sustainable power source).

LI is analysing and optimising the operational results of the pilot projects over a period of 18 months.



The electrification of Brazil in the year 2000 shows big gaps especially in the North and remote areas of the North-East.

Proven business models for the widespread supply of Solar-Home-Systems and electrical supply systems for villages will be the results for the seven utilities of the Eletrobrás Group. By this means, the rural population of Brazil will not only achieve access to electricity but also – through this – have the ability to access modern communication systems and other forms of modern energy services.

Werner Klaus

GERMANY

Optimisation of Energy Consumption in the Stones-and-Earths-Industry

The German federal government is pursuing the goal of doubling the energy efficiency of 1990 by to 2020. For achieving this it is planned to reduce the energy consumption by end users by 10% and the primary energy consumption by 20% with simultaneous growth of the economy. Some of the central measures for achieving these goals are quantification and utilisation of potential for efficiency increase in industrial entities.

Lahmeyer International was employed by the medium sized company Märkische Kies- und Kalksandsteinwerke (MKK) to perform an energy audit. MKK belongs to the highly energy intensive stone-and-earth-industry.

The mining and processing of the natural materials such as gravel and sand is the core business of the company. The following work steps have to be performed to receive the final product:

- Gravel pit (primary production)
- Conveyor belts / pre-treatment
- Weight classification / separation of various gravel and sand categories
- Drying and sieving

In the last year more than 100,000 tons of gravel and sand have been sold. Almost 50% of the total amount has been dry sands. Electricity and natural gas are a significant cost factor in the various production stages. Identification of inefficiencies in energy utilisation and development of concrete measures for cost optimisation were the main targets of the project.

As a first step the entire energy consumption of the company is valued. Therefore LI analyses the utilities' accounts as well as the company's own data. In addition, appropriate key indicators (e.g. energy intensities, full load hours) have been developed in order to perform benchmark analyses with similar companies and to derive development trends from historical data.

Based on the results of the first global analyses more detailed

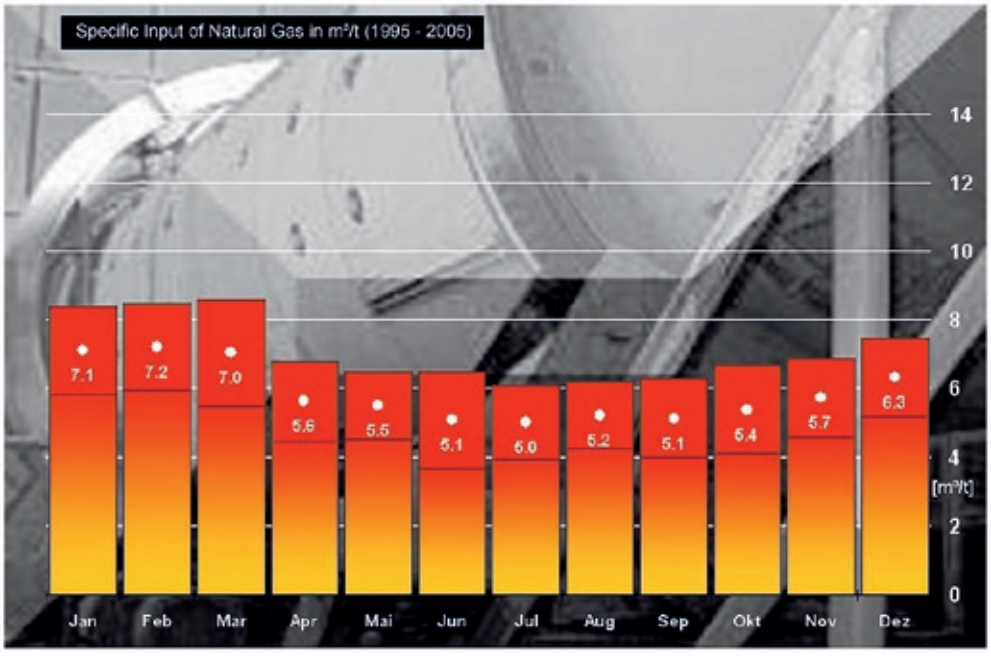
Wet classification as the “heart” of production.

analyses have been performed for those areas of production that show comparably high energy consumption. Results of single measurement have been analysed and meaningful appraisals have been elaborated. Specific highlights are:

- Daily load profiles: according to the applied measurement interval of the applicable utility (15 minutes sequencing) current load, peak load and total daily consumption have been evaluated.
- Characteristics of gas usage: total demand was broken down to monthly, daily and hourly input quantities. In addition to that concrete conclusion for optimum modes of operation of selected plants could be developed (e.g. monitoring of natural gas input in various modes of operation of a drying oven with an accuracy of one minute).
- Flow and quality of raw material: The current flow of product classes and the accumulated daily production was evaluated. Impacts of changes in the production flow (e.g. forced increase of production amount in the areas of drying and sieving) on the quality of the product (e.g. declining temperature, increasing moisture) were assessed with regard to future applicability.

From a number of suggestions based on the individual techno-economic potential a sequence of most suitable measures for cost optimisation has been developed. During the following steps of project implementation Lahmeyer International is cooperating with the institute for energy economics of the Cottbus technical university. In addition to the measurement of energy consumption, the co-operation also comprises of their influencing parameters.

Dr. Alexis Bonneschky



Development of the specific input of natural gas during drying with monthly minima, maxima and average figures from 1995 to 2005.

CYPRUS

Expansion Planning in Liberalised Power System Markets

Lahmeyer International (LI) can refer to more than 30 years professional experience in the area of expansion planning for power plants. In 1974 LI experts had already been active in this area. Since that time the conditions have materially changed substantially. On the one hand system planners can nowadays make use of (computer-based) tools simplifying the modelling of complex systems and by these means, allow the detailed system analyses. On the other hand from the beginning of the 90s new requirements for system expansion planning arose resulting from the increasing liberalisation of the markets.

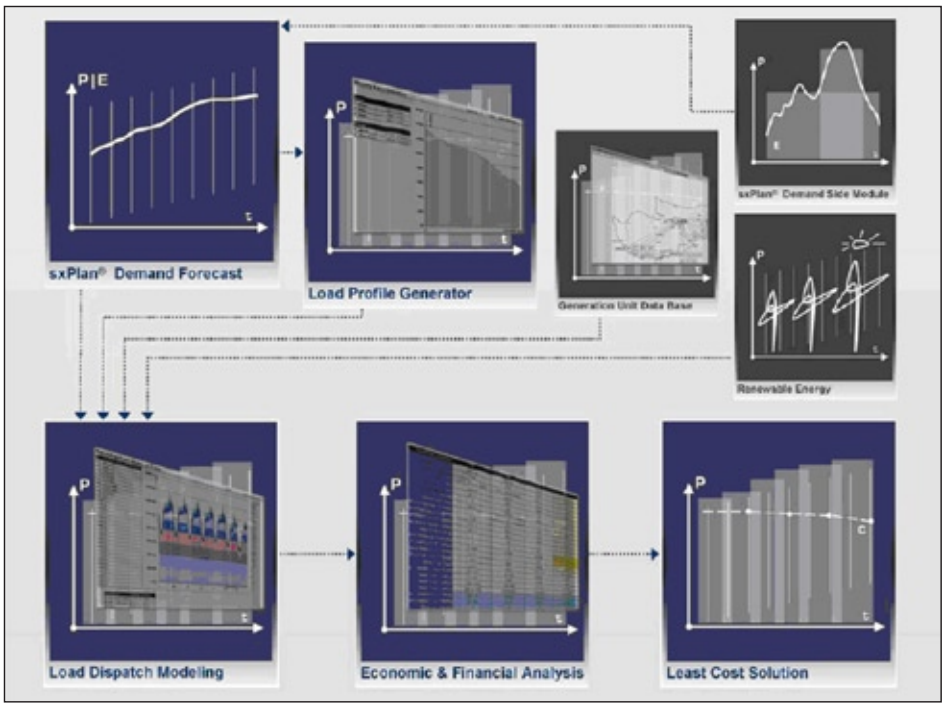
Vasilikos Power Station, Cyprus. Within the next 10 years it is envisaged to install three combined-cycle power plant units, each with a capacity of 200 MW.

The general objective of system expansion planning is to optimise energy systems technically and economically in order to adequately cater for future energy demands. The planning activities do not only comprise of any kind of capacity increase, but also rehabilitation and decommissioning of facilities. Typical planning horizons are long-term and can stretch up to 30 years.

In the beginning of 2006 LI was awarded the contract as owner's engineer services for planning, tendering and implementation of new gas fired combined cycle power plant units at Vasilikos site in Cyprus. The client is the national Cyprus utility, Electricity Authority of Cyprus (EAC).

With the introduction of market liberalisation and new power producers entering the market EAC's expansion has to be reviewed in order to assure their optimum techno-commercial position in the future liberalised electricity market. Therefore the following main tasks had been identified:

- Demand analysis for the major sectors of off-takers and a demand forecast for the period 2006 – 2025.
- Analysis of the existing power plant portfolio and identification of appropriate options for expansion under consideration of their technical and economic characteristics.
- Establishment of realistic scenarios for the development of the power sector under consideration of the general



sxPlan®: An overview of the modular structure and functional features of LI's planning software sxPlan®.

regulatory framework and the future market position of the client.
- Modelling of the generation system and determination of the least cost alternative for the individual expansion scenarios.
- Determination of concrete guidelines for the possible developments in the electricity sector.

For performance of the main tasks agreed, LI has expanded the functional features of its planning software sxPlan®. The adopted optimisation approach integrated system expansion planning with the resource planning for the power stations. The resource planning defines which operation mode at which time and to what extent it should be applied for the existing power stations to supply energy for the specific electricity demand. sxPlan® illustrates the operation of the plant and the results of variable input data (for instance fuel type, fuel price, scheduling of maintenance) on an hourly basis.

LI has successfully completed the study in November 2006. The results of the individual analyses have been integrated into a scenario matrix. Our client has now the required sound and detailed basis available for investment decisions and measures in the power generation sector.

Dr. Alexis Bonneschky

SUDAN

Energy Demand Forecast for Oil Fields at Muglad Basin

The Greater Nile Petroleum Operating Company (GNPOC) operates eight oil production fields in the Muglad Basin of Southwest Sudan, comprising a total area of 50,000 square kilometres. Approximately 360 production wells reach a daily production capacity of more than 300,000 barrels of oil. The majority of the wells are equipped with electric submersible pumps (ESP). The ESP create the bulk of the entire electrical demand of the oilfields, followed by the demand created from ancillary facilities such as working and housing areas, facilities for oil/water/mix treatment or for water injection into the oil wells. The electrical energy for the oil fields is supplied by a large number of diesel engines with capacities between 1.6 and 5.6 MW. A 33- and 66-kV distribution grid ensures the connection between the power station and the pumps and the ancillary facilities.

In order to meet the requirements of increasing production levels in the future, it was deemed necessary to consider a restructuring of energy production and distribution in the Muglad Basin. Lahmeyer International (LI) was commissioned by GNPOC in July 2006 to conduct the necessary studies and to issue tender documents.

For the assessment of the additional required energy production LI had to assess the electrical demand of ESPs and ancillary facilities. The ESPs will continue to consume the majority of energy also in the future, thus the assessment of the energy demand of the ESPs was the key issue of the study.

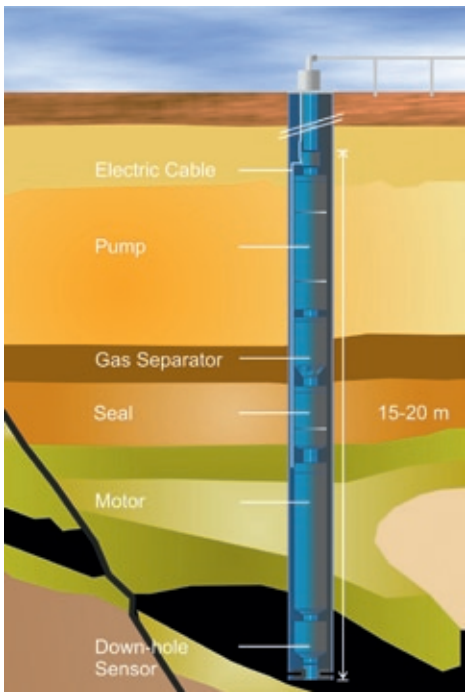


Diagram of an Electrical Submersible Pump (ESP) for pumping of oil/water/mix in oilfields.

The specific electrical power for the production capacity of an oil pump is basically determined by the characteristics of the oil well and the related oil reservoir.

The major input factors are the pressure within the reservoir, the pump's production depth and the productivity of the reservoir which is influenced by the permeability of the reservoir matrix and the viscosity of the extracted oil/water/mix. These as well as other characteristics are changing throughout the lifetime of an oil well. Whereas the water content ratio is increasing systematically up to the economic break even, the pressure within the reservoir is constantly reducing in general which leads to an increasing demand for electrical power. These factors had to be considered for the demand analysis of the ESPs.

For this forecast LI evaluated GNPOC's existing load forecasts and load models for the pumps. LI developed a methodology approach for load assessment of the ESPs and collected the necessary input data. Besides GNPOC's forecasts for the characteristics of the reservoirs, the planning of the whole future production programme was of central importance for the load forecast. The load forecast for the pumps and for the ancillary facilities was combined to a comprehensive forecast for the annual peak load.

Stefan Kronshage

GERMANY

Refurbishment of the Pumped Storage Plant Waldeck 1

Since 1932 the pumped storage plant (PSP) Waldeck 1 has been operated by E.ON Wasserkraft (EWK), Landshut. The plant is located in Hemfurth (near Kassel in the state of Hesse), a short distance downstream of the Edersee dam. With a head of approximately 297 m, the four pump turbine units have a combined turbine capacity of 140 MW. After more than 70 years the plant had reached the end of its service life.

In 2004 Lahmeyer International (LI) prepared a feasibility level design which envisaged a new shaft power station with one 70 MW pump turbine as the most economical solution. This concept integrates both the further use of the upper and lower reservoirs as well as the existing above ground high pressure conduit.

The civil works include:

- construction of the new shaft power station,
- rehabilitation of the upper reservoir and refurbishment of two of the turbines in the old plant.

The design and planning approvals were given in 2005 and final construction permission was granted by the authorities in the same year. The construction of the new power station and the rehabilitation of the upper reservoir formed the major components of the tender, and were awarded in 2005 as a lump sum contract.

Within the framework of the projected preparatory stage, LI rendered the following services:

The shaft pit in December 2006.

Construction of the outlet works with temporary site enclosure, December 2006.

- preparation and monitoring of the planning approval application,
- preparation of the tender documents and performance schedule for the refurbishing of two Francis turbines,
- assistance during the tender evaluation and award of constructing contract.

Since January 2006 LI has been supervising the construction of the new power station which is located on the bank of the lower reservoir between the workshop and power plant of the existing complex. Due to the vicinity of the new construction and existing works, a highly co-ordinated and co-operative effort between all participants was necessary. This was achieved in an excellent manner which allowed the PSP Waldeck 1 to continue operation in 2006 while, at the same time, the new construction continued unhindered.

Despite difficult geological conditions, including substratum improvement works involving an injection procedure, the timeframe was generally met. The shaft pit with a depth of approximately 40 m was completed by the end of 2006, as were the basic works on the outlet structure.

Rehabilitation for the upper reservoir will be executed in 2007 and 2008. The upper reservoir concrete gravity dam will be capped and the foundation, in places, will be treated with new bituminous concrete. The upstream face of the dam will be sealed with a synthetic sealing membrane (approximately 14,500 m²), including drainage control. This is the first time that a synthetic membrane of this size will be used in a PSP reservoir in Germany.

Commercial operation of the new installation is planned to start in the beginning of 2009.

With the new construction of the shaft power house Waldeck 1 LI has further advanced a traditional field of activity. Shaft power houses in Germany and neighbouring regions include, for example, the installation of the tenth pump turbine unit (200 MW) in the PSP at Vianden (in operation since 1976) and the construction of the 153 MW capacity PSP Herdecke (start of operation in 1989).

Rolf-Günter Köhn

EGYPT

Naga Hammadi
Multi-Purpose Project at the Nile – nearly completed

After about 4.5 years of construction Naga Hammadi Project has achieved another important milestone on schedule. Impounding of the construction pit commenced and was finished at the end of December 2006. Extensive measurements for monitoring uplift and settlements during impounding were performed for all parts of the structures.

The Project is located 120 km north of Luxor and replaces an old weir from the 1930's which serves for irrigation of 3,200 km² of fertile land for about 300,000 farmers. The project is at present the largest infrastructure project in Egypt. Lahmeyer International has since 1993 carried out extensive engineering services which started with studies for the rehabilitation of the old weir and ended with the decision to construct a new weir.

The project consists out of 3 main components:

- Hydropower Station with 4 bulb turbines and an output of 64 MW being enough to supply about 200,000 families with electric power.
- Weir with seven bays and radial gates (17 m width x 13.5 m height) for passing the design flood of 7,000 m³/s.
- Shiplock with 2 chambers (170 m length x 17 m width) which is designed for the biggest Nile cruise ships.

The sluice way with seven bays and radial gates during impounding of the construction pit in December 2006.

The Project is financed by the Egyptian Government, the German Government (by credits of the German Bank for Reconstruction, KfW) and the European Investment Bank (EIB).

More than two thirds of the 6 years construction time have now passed. In 2007 the rerouting of the Nile from the diversion canal through the new weir was achieved. The removal of the cofferdams and backfill of the diversion canal, which has served 3 years as Nile bed around the construction site, has also been completed.

The project will secure for the years to come irrigation water supply for farmland and in addition will supply to the national grid environmentally friendly hydro-power energy.

Werner Bürkler

UZBEKISTAN

Development of an Integrated Cadastre System

In a world with continuously growing economic and social challenges the relation between ownership of land property and the future economic development of a country becomes more and more important.

Customised and future-oriented land development nowadays depends on establishment of land information systems where land titles and rights are registered together with their geographical reference data. Lahmeyer International has been involved in world-wide cadastre and land administration projects for the last ten years.

The State Committee of the Republic of Uzbekistan for Land Resources, Geodesy, Cartography

and State Cadastre commissioned Lahmeyer International in mid 2004 to develop an integrated cadastre system for land resources management and property rights registration. The award was carried out through the Asian Development Bank (ADB) with the goal improving the sustainable management of the Uzbek water and land resources in the context of ADB's Country Strategy Program.

The main task was the development and testing of a comprehensive multipurpose cadastre taking account of existing modules and the integration of state-of-the-art information technology, in order to meet the needs of the Government institutions in the sectors of cadastre surveying, land registration, land use und environmental monitoring.

A method was also developed and tested which facilitates effective and low-cost cadastral surveying in rural environments. After comprehensive training, a reference control network was installed and pilot agricultural and housing areas were surveyed.

Following transfer of the existing digital data, the information gained in the pilot areas was imported to the new cadastre system and tested in a three-month pilot phase.

The pilot phase demonstrated that the developed system successfully meets international standards and addresses the requirements of the Uzbek Government regarding land registration and environmental monitoring. It is aimed to implement the system countrywide during the forthcoming years.

Seminar on Central Asian cadastre systems and its political and legal frameworks with participants from Kazakhstan, Tajikistan and Kyrgyzstan.

Consultancy in legal and institutional aspects was delivered alongside the technical services.

To strengthen the transparency and security of the legal framework, a synopsis study documented the existing land laws was carried out and proposals were prepared for appropriate improvements and amendments. These concerned in particular the integrity and streamlining of legal operations and the enhancement of security during land ownership transfers, as well as the corresponding information management.

The legal framework for the use of electronic signatures for a future internet-based land registration was investigated, and proposals based on existing general draft laws were prepared for the utilisation of the electronic signature in the Uzbek cadastre.

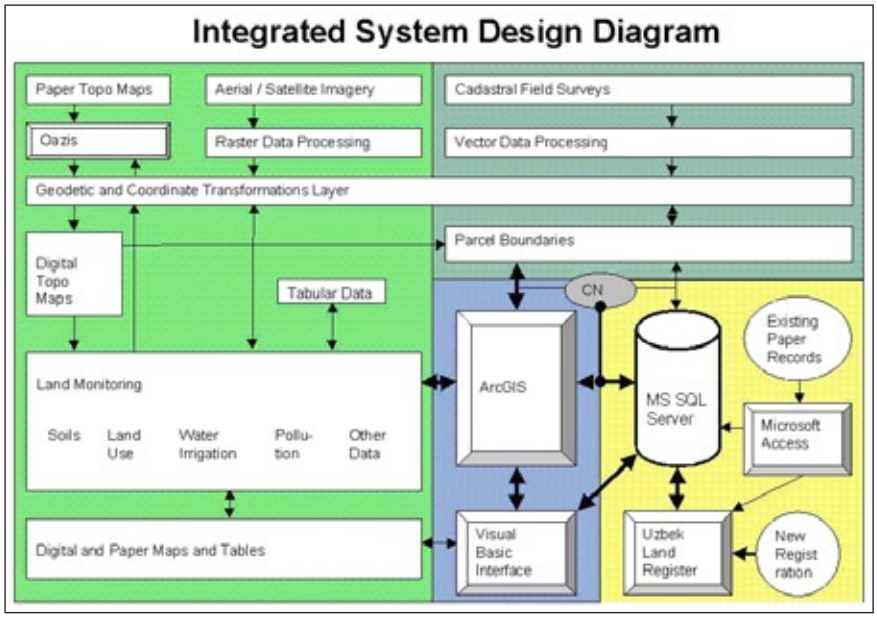
During the course of the project many seminars and workshops were held, in which technical and legal project aspects were explained and discussed.

At a large regional seminar with participants from Kazakhstan, Tajikistan and Kyrgyztan the various Central Asian cadastre systems and the associated political and legal frameworks were presented and discussed.

Finally during a study tour to Germany, Uzbek managers were informed about land privatisation and cadastre implementation in the new German states after the reunification of East and West Germany.

The project was completed in 2006.

Klaus Sponer



Schematic of the developed land information system.

MAURITANIA

Nouakchott Bulk Water Supply

In recent years Nouakchott, the capital of Mauritania, has experienced particularly rapid development. In the early 1960s the original planning of the new capital of the Islamic Republic of Mauritania catered for a population of about 30,000, but today this city is home to some 740,000. By 2030 it is forecast that Nouakchott's population will have passed the 1.2 million mark.

Currently the only source for the water supply for the city is the abstraction of groundwater by drilled wells in the area of Trarza, at a distance of some 60 km from Nouakchott. As a result of the constantly rising water demand in the city, there is now a serious risk of saltwater intrusion into the fresh water aquifer, which would eventually render this source unusable.

The only possible solution which would provide a secure water supply, other than the significantly more expensive development of seawater desalination plants, is to extract water from the River Senegal, some 200 km to the South of the city. A feasibility study confirmed this to be the preferred solution, following which the responsible authority SNDE (Societé Nationale de l'Eau) awarded a contract in early 2000 for the detailed design and preparation of tender documents for its implementation.

In June 2005 Lahmeyer International, as leader of a joint venture, was appointed to carry out the review and updating of the original designs and tender documents, to assist SNDE in the tendering and selection of contractors, and subsequently to supervise construction under the various individual contracts. The water transfer project represents a level of investment altogether of about US$ 250 million, and external financing is being provided by the Arab Fund, the Kuwait Fund, the Saudi Fund, the Islamic Development Bank, the African Development Bank and the OPEC Fund.

The bulk water pipeline starts at an intake structure on the River Senegal, near the village of Aftout, from where the water is transferred by means of three pump stations through three corresponding pipeline sections altogether 200 km to Nouakchott. The initial flow is planned to be 1.8 m^3/s, increasing ultimately to the design discharge of 2.6 m^3/s. The selected pipeline material is ductile iron, with a pipe diameter of 1,400 mm throughout its length.

Treatment of the bulk water will be carried out in two stages. A pre-treatment at Beni Nadji, about 6 km downstream from the river intake, will be followed by full treatment (at a rate of up to 150,000 m^3/d) some 20 km before the water is fed into the city distribution network. At the main treatment plant a clean water reservoir will also be constructed, with a storage capacity equivalent to a day's production.

Pipeline Alignment from Aftout to Nouakchott.

The bulk water transport and treatment system and its components will include instrumentation and control systems, linked by a SCADA system, so that overall monitoring and, if necessary, control can be exercised from a central Control Centre.

This project is to date the largest infrastructure project of any kind to be implemented in Mauritania, as well as one of the largest water supply projects being developed in Africa. Following a programmed construction period of 42 months, completion and commissioning of the bulk water supply scheme is foreseen by the end of 2009.

Albert Breuer

Raw Water Intake on River Senegal.

GERMANY

Malberg Tunnel Smoke Exhaust System

B260 Malberg Tunnel Bad Ems smoke exhaust test.

Throughout both the construction and operation of tunnels and caverns, the risk of fire has to be taken fully into consideration. Fire in a tunnel can result in the spalling and eventual collapse of sections of the tunnel lining, however poisoning from the large quantities of toxic smoke associated with many tunnel fires is the most common cause of death. It is therefore highly important that the equipment and systems installed into the underground works, as well as the safety procedures and guidelines, are kept up to date.

Early on during the planning process a range of scenarios are studied, in order to develop potential solutions on which the smoke exhaust system design can be based. Once the tunnel has actually been constructed, the assumed conditions in these scenarios can be tested in order to confirm the solutions and to complete the system details.

The Malberg Tunnel is a 1526 m long single bore road tunnel near Bad Ems, through which runs the B260 road. The road traffic is two-way, and reaches a level of 15,000 vehicles per day, a situation which can be associated with particular risk levels. In 2001 a number of smoke exhaust concepts were simulated by computer, using computational fluid dynamics (CFD), extended by further simulations of the dispersion of the smoke outside the tunnel. On this basis Lahmeyer International designed in 2002 the smoke exhaust system for the tunnel, which consisted of altogether 94 automatically controlled ventilators.

During construction the individual tunnel components were tested for heat resistance and performance, and also new concepts for early fire detection and the automatic control and regulation of the smoke extraction equipment had been developed and tested. Nevertheless at that time there was nowhere in the world another comparable smoke exhaust system in operation. As a result it was decided to conduct a real fire event experiment on 27th September 2006, with two burning cars located within the tunnel.

The test clearly demonstrated that the smoke exhaust equipment removed the smoke and fumes quickly and completely from all tunnel sections. The layering of the hot gases at the tunnel ceiling over the 100 m long extraction zone was not disturbed, remaining stable during the 30 minutes of the fire, while maintaining safe evacuation routes to the outside.

This experiment provided very convincing evidence for the high performance of the system, and helped to define new safety standards. The encouraging results were also greeted with a very positive reaction from the general public.

The following organisations observed the test:

- Federal Ministry for Transport, Building and Town Planning (BMVBS),
- Federal Roads and Traffic Bureau (BASt),
- State Roads and Traffic Bureau for Rhineland-Palatinate (LSV-RP),
- Aachen University of Technology (RWTH),
- German Automobile Club (ADAC),
- local fire services,
- local media.

Hinrich Rottmann

Fire Test in Malberg Tunnel.

LAHMEYER INTERNATIONAL

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