Spotlight on Africa

Africa has great hydropower potential but the continent still has one of the lowest utilisation rates. IWP&DC invited representatives from hydro companies working in the region to discuss the opportunites for, and barriers to, future hydro development. Here we hear from Gauff, SMEC and MWH of their experiences in African hydropower.

IWP&DC: Which countries in Africa are you active in, and where do you see the most potential?

MWH: MWH is currently working in several African countries, including: Ethiopia, Uganda, Tanzania, Mozambique, Lesotho, Zambia and Malawi. We recently opened our African headquarters in Addis Ababa, Ethiopia. We see the greatest potential for growth in both Ethiopia and the southern region of Africa.

GAUFF Engineering: We are presently involved in the supervision and in technical assistance of the Grand Poubara Hydro Power Plant and in some pre-qualifications of hydro plants in Benin, Ivory Coast, Mozambique and Angola. In our experience we consider DRC, Ethiopia, Cameroon and Nigeria as countries with the largest hydro potential generation in Africa. But we also shouldn`t neglect the above-mentioned countries as well as South Africa and Madagascar.

SMEC: We are active in Lesotho, South Africa, Mozambique, Botswana, Swaziland, Zambia, Malawi, Tanzania, Kenya, Uganda, Ethiopia, Republic of Sudan, South Sudan, Sierra Leone, Nigeria, Namibia and Ghana. There is potential in all the African countries, although in terms of project size, Ethiopia and Zambia have the greatest potential.

What barriers do you see to hydro development across the continent? How could these be overcome?

MWH: We see the greatest barriers to be:

- Available funding (both domestic and international).
- Uncertainty around political stability in some regions/countries. Democratic Republic of Congo is demonstrating all the key factors for the development of hydro schemes, but has issues surrounding funding and investment largely associated with the political uncertainty of the country. Madagascar is another example where the military coup of 2009 and current political issues have significantly impeded the country's growth, and hydropower program.
- Lack of certainty around grid inter-connectivity across the continent and fluctuating markets in natural resources and minerals.

To resolve many of the barriers to hydropower growth, a more cohesive continental strategy is needed to address issues such as: anticipated population changes, increased power demand, climate change, hydropower viability, grid interconnectivity and political stability.

GAUFF: From the point of view of electrical engineering the greatest barriers are the following:

- The lack of capacity of the distribution network and the absence of interconnections.
- Excessive distances in transmission. Solutions like HVDC transmission are new to African countries.
- Insufficient number of maintenance personnel.
- Unclear operational policies.

From GAUFF Mechanical Engineering's point of view we have recognized the following barriers in hydro development:

- Properties of power/water capacities of cross border rivers.
- Environmental impact.
- Natural impact of rivers changing from dynamic flow to almost static flow.

The first steps have been made to overcome these barriers – countries are merging together in associations like WAPP, CAPP, EAPP and SAPP.

In the next step, master plans should be made for each country along with reconstruction of the existing facilities. Then, plans and projects for the smaller areas with concrete solutions should be put in place.

Parallel to the implementation of new projects, the African clients should insist on wide ranging formation programs. All of this is time consuming, but possible and in many African countries is already in motion.

As always, financing of all these steps represents a significant problem which can be solved on many levels quite successfully. For example, market input from SinoHydro Corporation and China Exim Bank represent a great partnership with plans to build over 30 new hydropower plants in Africa.

SMEC: Currently the key barrier to hydro development is financing. Hydro projects have large upfront costs and many African countries do not have the up-front capital required to support their initial development.

Is there likely to be more cross border cooperation in developing hydro in the future?

MWH: Yes, we have started to see recent examples of this concept including increase in both hydropower scheme development on river-border locations and grid inter-connections across borders.

Trans-border interconnections play a significant role in the development of hydropower, the secured sale of electricity to neighbouring countries is a primary driver to secured funding streams for the development of hydro and water supply. A few examples include: Grand Renaissance Dam (Ethiopia); Cahora Bassa north bank extension, Mphanda Nkuwa (Mozambique); and Lesotho Highlands Water Project, (Lesotho & RSA).

The Rusoma Falls is a 60MW hydropower project under joint development by Burundi, Rwanda and Tanzania as part of the Nile Basin initiative. The project is gaining considerable momentum, but is still under assessment.

Other joint development projects in the southern Africa region include the 500MW Baynes project on the border of Namibia and Angola and the 1200MW Batoka Gorge project on the border of Zambia and Zimbabwe.

There are a number of other hydro schemes in the pipeline however progress is often slow-moving due to the deliberation between governments and the mechanism used to finance such projects.

GAUFF: Cross border is essential. No country can have system stability alone.

SMEC: There are a number of cross border initiatives already in place, including the World Bank funded Nile Basin initiative (focused on projects within the Nile Basin) and the Zambezi

Basin project (focused on countries in the Zambezi river basin). These Governments are learning that there is a lot of potential for mutual benefits.

There is still a lot of undeveloped potential for hydro and as there are significant benefits for the Governments involved, I anticipate that in the future there will be a lot more cross border cooperation.

What is the market like for small hydro? Is this sector likely to grow or will large hydro dominate?

MWH: Small hydropower schemes have been in place for many decades across Africa and there are a number of countries with a dedicated small hydro program. Madagascar has focused its attentions to the development of small hydropower and commissioned two schemes during 2010, however due to political issues the development of other projects has stagnated.

The Government of Angola is currently reinstating an existing scheme which became defunct during the civil war and intends to implement a further 46 schemes in the next three years with a combined power output totaling 180MW. Other countries with a small hydro program include Lesotho and DRC amongst others.

Whilst large hydropower has a clear dominance, many countries are continuing to implement small hydropower schemes across Africa and this is set to continue for at least the next decade.

GAUFF: Large hydro plants will dominate from the political and technical reasons and will do so in the future. Small hydro plants will be in the second row waiting for a distribution network to develop. Smaller plants are not easy to finance although electrical energy is desperately needed in economically underdeveloped regions.

For that very reason we need small hydro as stand-alone solutions which can be integrated into the network later on.

SMEC: In many countries in Africa there is good potential for small hydro to meet the needs of local communities, particularly communities in remote locations away from national transmission lines.

As small hydro uses renewable energy, this market is likely to grow as the impact on the environment is minimal.

What do you think are the most important projects being developed at the moment?

MWH: There are a number of factors which drive the development of dams and hydropower; two key factors in Africa are power stability and water supply.

Electricity shortages are stifling the economic growth of many African countries and resulting in the need for expensive fuel imports. Liberia is one example of a country heavily reliant on expensive fuel imports and has recently expedited the reinstatement of the existing 80MW Mount Coffee facility. Ethiopia has recognized that economic progress will depend on the development of hydropower and has implemented a 5 year growth plan for a number of hydro projects. Zimbabwe, Zambia, DRC amongst other countries have a number of schemes in the pipeline to secure energy demands and to strengthen their economic stability which is strongly driven by the mining sector. The global recession in 2008 severely impacted the mining and manufacturing industry across most of

Africa. Many African governments are focusing their attention on the development of hydropower schemes to support the recovery of these sectors which are seen to be vital to growth.

Historically and in many current examples water supply is the primary driver for dam construction, in such circumstances hydropower tends to be an add-on; a good example of this is the Lesotho Highlands Water Project (LHWP). The LHWP is a multipurpose project designed to develop the water resources of the Highlands region of Lesotho using a series of dams and tunnels.

Several developments have already taken place consisting of the Katse Dam (phase 1A) and the Mohale Dam (Phase 1B) which are used for power generation and to direct a portion of the surplus water toward the central Guteng province in RSA where the majority of industrial and mining activity occurs in South Africa. The advance of Phase 2 is expected to occur during 2013 – 2014, Phase 2 will augment the existing LHWP supply of water to the Vaal River in RSA. An attributed component of the project should also see the development of a 1000MW hydro pumped storage scheme to support the electricity demands of Lesotho. This is one of many examples across Africa.

GAUFF: Some of the biggest hydro power projects in Africa are the following: Democratic Republic of Congo - Inga III, Grand Inga; Mozambique - Mphanda Nkuwa, Cahora Bassa North ; Angola – Camambe, Lauca and Calculo Cabaça; Ethiopia - Grand-Ethiopian-Renaissance-hydro dam with 15 Francis turbines each 350MW; and Uganda – Bujagli Hydro Plant 250MW.

SMEC: The 'most important' hydro projects in Africa are the Nile basin projects in Ethiopia, Uganda, South Sudan and Republic of Sudan as they have the potential to significantly grow local economies.

Are we likely to see increasing investment in uprating and refurbishment of existing facilities?

MWH: Yes, we have started to see this already, examples include:

- The Ruzizi III project consists of the construction of a 147MW hydropower plant on the Ruzizi River bordering DRC and Rwanda. The Ruzizi III will be the third hydropower development on the river following Ruzizi I and II.
- The Kariba Power Plant is an existing cross border scheme between Zambia and Zimbabwe currently being considered for expansion of two 120MW turbines on the Zambezi River.

Two other contracts are currently under execution for the 120MW Ithezi-Thezi hydro power plant in Zambia, and the retrofit of the 712MW Inga 2A hydro power plant in DRC. These are only a few examples and we expect the market will increase in the years ahead.

Who's who in the roundtable

GAUFF GmbH & Co. Engineering KG represented by Mr. Uwe Gauff, Managing Partner.

Mr Gauff has been in charge of the company's trade activities, in particular of the establishment and extension of client relations, since 1984 as managing director. He was initially based in Gabon from where he also was in charge of the neighbouring countries Congo and Dem. Rep. of Congo. Afterwards he extended his network of contacts in further countries like Angola, Kenya, Tanzania and Uganda. From 1999 until 2002 he was also in charge of work in Iraq.

Since 2005 Mr Gauff has extended the business fields in Africa and taken over GAUFF GmbH & Co. Engineering KG in view of management and partnership.

www.gauff.net

SMEC represented by Hossein Sabet, Regional Director for Africa

Dr Sabet holds a doctoral degree in Water Resources Planning from University of California in the US. He has lived and worked in Africa for over 20 years. He has been involved in hydro and dam projects in Lesotho, Malawi, Mozambique, Zambia, Tanzania, Kenya, Sudan, and Ethiopia.

His interest and capability covers water resources, hydrology, in-stream-flow requirements, engineering economics and optimization techniques in water resources. He has some 30 publications in the above areas.

www.smec.com

MWH Global represented by Craig McMaster and Marc Sheikh

Craig McMaster is Marketing Director for MWH Europe/Africa and has over 20 years of engineering experience. Marc Sheikh is a Project Manager & Hydropower Engineer with nine years of experience.

Both are based in England with a focus on MWH growth in the Dams & Hydropower sector in Europe & Africa.

www.mwhglobal.com

GAUFF: Rehabilitation of hydropower plants which supply electricity for many years should be the first step in developing an electrical distribution system. From an economical point of view existing African countries should focus more on rehabilitation of already existing hydro plants and keep them well maintained. Unfortunately and due to lack of maintenance and operation capability smaller hydro plants have sometimes closed within the first decade, i.e. four hydro plants in Guinea Conacry have been in operation less than 10 years and have been cut off for a couple of years.

SMEC: A lot of work is already being done to refurbish existing facilities, whether it's raising the height of a dam or modernizing power facilities on an existing dam. I anticipate that this refurbishment will continue.

Where do you think the funding for hydro development will come from in the future will it be public or private?

MWH: Financial models for large hydropower schemes typically consist of a complex mix of loans backed by multilateral lenders, private equity and aid. Examples of funding mechanisms have ranged between 30/70 to 45/55 equity to debt ratio with input from: large loans from international funders to public bodies and state governments/power bodies; international aid investment from the US and China; and private investors, international power developers and mining firms.

The investment needs of a project are dictated in context of the project drivers, and the perceived project risk. Looking to the future we do not expect to see any significant changes to the funding mechanisms with a strong reliance on the sources identified above.

GAUFF: We believe that public funding in large hydro projects will prevail over private for historical, political and economical reasons. This will involve the World Bank, African Development Bank, EU funds and one of the most important players in this area - the Exim bank of China.

SMEC: In the future I expect that funding for hydro development will continue to come from the public sector.

To date, the private sector has not shown a lot of interest for two reasons; firstly, the upfront costs are very large; and secondly the duration of a project is very long, where it typically takes 10 years for a 600MW project to go from feasibility to completion. ■