Grand Ethiopian Renaissance Dam on the Blue Nile in Ethiopia. Islet: Saddle dam being built for the project. Images courtesy of Salini Impregilo.

A number of key projects are under development across Africa.

**African Hydro developments**

Energy poverty is a way of life in Africa, with over half of the continent’s population lacking access to electricity – and rapid population growth looks set to strain the existing services even further. As a result, countries in the region are looking to exploit their vast, untapped hydropower potential, making it a key market for hydropower and dam developers.

Ethiopia

Ethiopia’s energy policy is an important driver in the country’s development by exploiting its most precious natural resource – water.

About 85% of the energy produced comes from hydropower and the country’s hydropower potential is estimated to be 410,000MW of energy by 2035 by taking advantage of the big rivers that cross its territory. The government’s 2010–2020 Growth and Transformation Plan, which is being executed in two phases, aims to use the country’s natural resources to transform Ethiopia into a renewable energy hub for the entire eastern region of Africa.

A number of major hydropower schemes are currently in the construction or development stage in Ethiopia. Most notably is the Grand Ethiopian Renaissance Dam, a project that has recently seen its capacity increase to 6,600MW, with further upgrades.

Initially designed to generate 5250MW, the dam will hold 19,000m³ of water, have a crest length of 630 metres, and is the tallest of its kind in the world. Its volume of concrete used to build the dam holds 15 billion m³, equal to half the volume of Lake Tahoe, the largest in the USA. The benefits of the project were already evident during its construction, contributing enormously to the local economy. It created jobs for a combined total of 26,000 Ethiopians during the various phases of its construction. Its complexity also called for the greatest expertise in the field, involving people from 32 countries.

Lechwe

This year, Multiconstruct announced it was building on its long history in Lesotho with a new award. The company said it will undertake feasibility studies for suggested hydropower and pumped-storage schemes in Lesotho – a project which is part of the Phase II of the Lesotho Highlands Water Project, financed by the World Bank.

Lesotho Highlands Development Authority appointed Multiconstruct UK and Multiconstruct Norway, in a Joint Venture with EdF (France) and GENB Risø (South Africa), to prepare feasibility studies of hydropower potential including a pumped storage scheme for Phase II of the Lesotho Highlands Water Project.

The contract was awarded late autumn 2016 and signed in January 2017. The study constitutes all relevant technical, economic, environmental and social issues related to pumped storage schemes as well as conventional hydropower from screening level (multiple projects) down to the feasibility of the most bankable candidates.

“We are very proud to be working with EdF and Risø on this landmark project. The numerous benefits realised by this project will benefit both Lesotho and South Africa and bring much needed renewable energy to the area. This commission once again highlights how our extensive expertise in hydropower engineering and environmental and social management is very well received by clients,” says Knut Nilsen, Managing Director of Multiconstruct UK.

The Lesotho Highlands Water Project (LHWP), commenced in the mid-eighties and continues four development phases overall. It is one of the most monumental water transfer schemes in the world, where the primary purpose is to transfer water from the Lesotho highlands to the water thirsty Gauteng Region (Johannesburg, Pretoria, in South Africa), and secondly to provide renewable energy from hydropower in Lesotho.

Multiconstruct has worked in the energy sector in Lesotho and the Southern African region for more than 35 years.

“One of our very first hydropower projects was in fact in Lesotho in the early 90’s. We carried out feasibility studies, detailed design and construction supervision of the Mantshantsane and Simelongon small-scale hydropower projects for the Lesotho Highlands Water Projects Unit. We have since then participated in numerous energy-related projects in the region and it is therefore with great excitement that we embark on this new era of hydropower development in Lesotho,” says Tom Ødegaard, Senior Vice President for Market and Raise Renewable Energy.

Bunrudi, Rwanda and Tanzania

On March 28, 2017, the groundbreaking ceremony was held for the 80MW Regional Falls hydropower project, at the project site on the Kapasi River. The event was witnessed by Minister of Energy and Water Resources from the three countries that will benefit from the project – Bunrudi, Rwanda and Tanzania – as well as Board Members of Bunruiu Power Company Limited from the respective shareholder countries, representatives of the World Bank and the African Development Bank, and other key stakeholders.

Construction of the plant has been financed by the World Bank at a cost of US$50 million, and the transmission lines that will connect the power plant to the national grid in the three countries is financed by the African Development Bank (AfDB) at a cost of US$121 million.

Among the numerous benefits, the project will provide an additional 30 MWp to each of the beneficiary Member States and strengthen the energy matrix in the region, and it is therefore with great excitement that we embark on this new era of hydropower development in Lesotho.”

President of Bunruiu Power Company Limited.
The regional power interconnection between the countries. It will improve livelihoods of the 7000 households in the beneficiary districts under the local area development program and another 188 households directly affected by the projects through livelihood sensitization program. This is in addition to providing job opportunities for over 500 skilled, non-skilled and casual workers from the three beneficiary countries.

Construction of the power plant is expected to last three years, until 2020. CCICCC Group Ltd – Jiangsu Water & Hydropower Construction Company Ltd Joint Venture (CCICCC – JNWHC JV) of P.R. China will execute the O&M Work/Supply and installation of hydraulic and mechanical equipment, while the Consortium Rusumo Falls Andritz Hydro GmbH (Andritz) and Andritz Hydro PVT Ltd – Jiangxi Water & Hydropower Construction Company Ltd Joint Venture (CGCOC - JWHC JV) will supply and install the plant’s electro-mechanical equipment.

It will include a concrete gated dam with a height of 12m and a spillway structure with three water passages. The passages will be equipped with three radial gates, each measuring 9m-wide and 12m-high. A two-lane road will be built on top of the dam. The water intakes and headrace tunnel of the plant will be 11m-wide and 14m-high and a surge chamber with a diameter of 8m and a storage capacity of 1.7 billion m³. The project is of a multipurpose scheme to reinforce agriculture production and generate much needed electricity. It was partly funded by a USD10 million concessional loan from the Abu Dhabi Fund for Development (ADFD).

The dam creates the Upper Rusumo Reservoir with a total storage volume of 3.688 million m³ at Maximum Operating Level (MOL)=521.00 m and an active storage volume of 2,569 million m³. Through this impoundment a maximum gross head of 41.4m is created.

For flood control and protection of the embankment dams from overtopping large reinforced concrete spillway structures; one at the Rusumo dam and one at the Buzunara dam, supplemented the construction works. Both spillways are equipped with gated bottom outlet and gated surface sluices for a maximum discharge of 6,150m³/sec (Rusumo) and 9,810m³/sec (Buzunara) at the Maximum Operating Level (MOL)=521.00 m.

During the releases of water from the Upper Rusumo Reservoir to the New Halls irrigation scheme via the Karuma II Chita Reservoir the existing head is utilised for power generation.

started by preparing axes on the right bank. In advance, the company planned the plating of rock and leaving rock as well as the need for reconditioned materials for final closure, all of which was continuously transported for formation of the core/can body closing the river. Around 2000m³ of soil was used for river closure, with the total volume of core/can body piling equal to 61,000m³.

Sudan

In February, the Upper Atbara and Bahr el Temsim Dam Complex’s 200MW (4x50MW) hydropower plant was officially inaugurated in Eastern Sudan. In a ceremony attended by Sudanese President, His Excellency Omar Hassan Al Bashir. The USD 9 billion complex consists of the Rusuma Dam on the Upper Atbara River and Bahr el Temsim Dam on the Setit River. The twin dams hold a storage capacity of 1.7 billion m³. The project is a Run-of-River Development Scheme with a normal operating water level of 1320m above mean sea level. The Run of River Development Scheme was selected by the beneficiary governments because it maintains the natural flow of the river and does not significantly modify the natural environment; it minimizes environmental and social impacts of the project and provides for the least cost implementation for environmental management and resettlement.

Equatorial Guinea

Due to be completed in 2019 is the 200MW Sendjo hydroelectric plant in Equatorial Guinea. On February 20, 2012, Duglas Alliance Ltd together with the Head of the State of the Republic of Equatorial Guinea – H.E. Mr. Teodoro Obiang Nguema Mbasogo laid the corner stone in the foundation of the future power plant, which is constructed by Duglas Alliance Ltd on a turnkey basis. The project is funded entirely by the Government of the Republic of Equatorial Guinea. The Rusumo Falls was identified as a potential scheme via the Kashm el Girba Reservoir the MOL of 521.00 m.

An irrigation outlet structure is constructed for a future irrigation canal to be connected to the Upper Atbara Reservoir at the Rusuma site (100m³/sec). The power station is located on the right bank of the Upper Atbara River and comprises a power intake, four surface penstocks and a power station which will house four generating sets driven by vertical axis Kaplan turbines, each of 50MW capacity.

The Rusuma Dam on the Setit River. The twin dams hold a storage capacity of 2.7 billion m³. Burdana Dam on the Setit River. The twin dams hold a storage capacity of 2.7 billion m³.

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Africa

Hydropower advisory services for the 600MW Karuma Hydropower Project.

Located in northern Uganda, the Karuma Hydropower Project includes a 314m long diversion weir fitted with radial gates, six shafts and associated power tunnels leading to an underground power house containing six 100MW Francis turbines and two 8.6km long tailrace tunnels.

When completed, it will be the largest power station in the country.

PowerChina Huadong is the lead designer for the project and sister-company SinoHydro, the engineering, procurement and construction contractor. Entura will assist PowerChina Huadong with managing a range of project stakeholders, undertaking design reviews, and advising on compliance with international standards.

“We’re pleased to welcome Entura to the Karuma project team,” said Mr Wu Haifeng, PowerChina Huadong’s Deputy Design Project Manager for the Karuma Hydropower Project. “Entura brings a wealth of expertise in hydropower design and international standards, which will make an invaluable contribution to the delivery of this landmark project for the people of Uganda.”

Commenting on the appointment, Entura’s Managing Director Tammy Chu said: “We’re delighted to be partnering with PowerChina Huadong on this significant and complex project.”

“We’re confident that our hydropower design expertise and knowledge of international standards, built up through the delivery of our own designs and review of other international projects, will improve the efficiency of the design approval process.”

The Karuma Hydropower Project is expected to be completed by the end of 2018.

As part of Hydro Tasmania, Australia’s largest renewable energy producer and water manager, Entura draws on more than 100 years of experience of planning, building, managing and maintaining the many assets of Tasmania’s hydroelectric power system.

The firm has been working with clients around the globe, undertaking the design of a number of international hydropower projects over the past decade, including Dordi Khola in Nepal, Nam Pha Gnai in Laos, and Neuheug in South Africa.

Cameroon

Renewable energy developer and operator Joule Africa has recently signed, alongside Cameroon’s Minister of Water Resources and Energy, H.E. Basille Atangana Kouna and the CEO of ENEO, Joel Nana Kontchou, a Letter of Intent to take the Kpep Hydropower project in Cameroon to the next stage in its development.

As part of the agreement, Joule Africa will undertake comprehensive feasibility studies to build on the pre-feasibility study it commissioned in 2012, which highlighted the potential for creating 485MW of installed capacity.

Commenting on this announcement, Mark Green, President of Joule Africa, said: “Kpep has the opportunity to transform the economic landscape in the North of Cameroon. It should provide up to 3000 jobs during the construction phase; create significant direct and indirect employment once operational; benefit the local communities; and go a long way towards satisfying the country’s ever-increasing demand for energy by boosting Cameroon’s current energy capacity by up to 40%.”

“It is also a significant milestone for Joule Africa as we look to develop other power projects alongside the Bumbuna II hydro project in Sierra Leone.”

The Kpep Hydropower project is the initial site to be developed as part of a cascade of five sites on the Katsina Ala River in North West Cameroon. The full feasibility studies will include topographical surveys, geotechnical investigation works, preliminary engineering design and a full internationally-compliant environmental and social impact assessment. It is estimated that the feasibility study will take two years with a further four years of construction in order to commission the plant during 2023. ■