

# Batoka Gorge Hydro Electric Scheme (BGHES)

## Project Background

The Batoka Gorge Hydro Electric Scheme (BGHES) is a hydropower project being undertaken by the Zambezi River Authority, an organization equitably owned by the governments of Zambia and Zimbabwe, to develop, operate, monitor and maintain hydropower projects along the Zambezi River common to the two Southern African countries.

Several studies and analyses were conducted in 1981, 1992-93, 1998 and 2015 which established the BGHES as the most economically viable option for immediate development because it offered the lowest specific generation cost and minimal negative environmental impacts.

In February 2012, a Memorandum of Understanding was signed by Zambia and Zimbabwe, paving way for the development of the BGHES Project.

## Project Location

The proposed Batoka Hydro-electric Scheme (HES) is located on the Zambezi River approximately 54 km downstream of the Victoria Falls. The project site is located across the boundary between Zambia and Zimbabwe.

## Project Description

The current technical configuration under consideration for the BGHES project now comprises:

- 181m high RCC Gravity Arch dam
- Radial gated crest type spillway
- Two surface power plants, one each on North Bank and South Bank of the Zambezi River
- Capacity of 1200MW each, with a combined capacity of 2400MW.
- Annual energy (P50) production of 10,215 GWh/y
- Four intakes in the reservoir will take the water through 4.2km of tunnels to the two power plants

<b>Reservoir</b>	
Catchment Area	508,000km <sup>2</sup>
Capacity	1,680 x 10 <sup>9</sup> m <sup>3</sup>
Full Supply Level	(FSL) 763 m
Surface Area	At FSL 25.6 km <sup>2</sup>
<b>Dam</b>	
Dam Type	181m, RCC Gravity Arch
RCC Volume	4.08 x 10 <sup>6</sup> m <sup>3</sup>
<b>Spillway</b>	
Type	Crest Overflow with radial gates
No. of Gates	12
Width and height	14m wide x 13m high
<b>Power Stations</b>	
Type	Two surface power plants (One North & South Bank)
Installed Capacity	A combined capacity of 2,400MW

## Planned Power Evacuation Transmission

Zambia - 2 x 330kV transmission lines. The 1<sup>st</sup> line terminating at a new 330kV substation that ZESCO is constructing in Livingstone, while the 2<sup>nd</sup> line will terminate at Muzuma Substation in Choma.

Zimbabwe - The 1<sup>st</sup> line 1 x 70Km, 400kV terminating at Hwange Substation and another 2 x 400km, 400kV transmission lines from Batoka terminating at Chakari Substation.

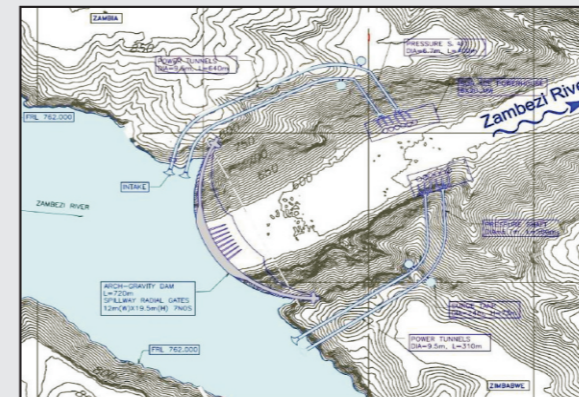
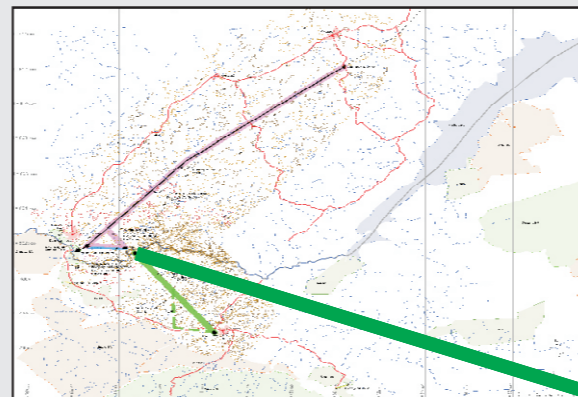
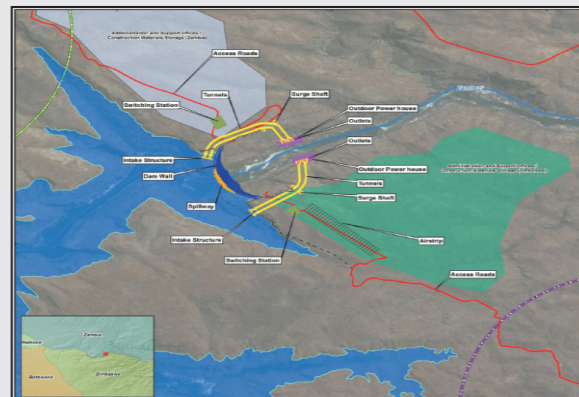
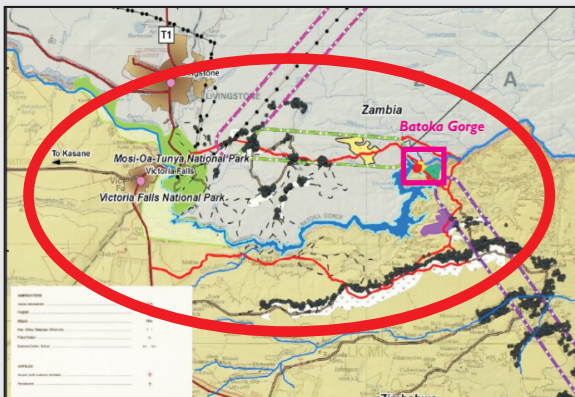
The project will also have all weather access roads, residential housing and social amenities.

## Environmental Sustainability

- The reservoir will be fully contained in the gorge.
- There will be no displacements or resettlement arising from the creation of a reservoir.
- Selection of reservoir operational regime to accommodate other river users.
- Reducing the reservoir level during low flows.
- The on-going planning follows a process of Integrated Environmental Management.

## BGHES Project Benefits

- The BGHES project will provide a reliable source of power for Zambia and Zimbabwe's domestic demand a combined capacity of 2,400MW.
- The BGHES will contribute significantly to the Southern African Power Pool (SAPP). Currently, hydro-power remains an under-represented contributor to the SAPP accounting for c. 21% of the overall generation capacity.
- Batoka puts both nations in a stable and resilient position with regard to the following:
  - Improved power supplies and reserves
  - Competitive cost of electricity
  - Security and reliability of supplies
  - Availability of electricity for new and energy intensive investments e.g. smelters
- BGHES unlocks the Kariba Dam Reservoir functionality and operational flexibility with significant savings on operational costs that could not be realised when Kariba is operating as Base Load.



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- Conjunctive operation of BGHES with Kariba Dam and other power plants would result in significant reduction of the cost of operating the power system due to significantly lower costs of keeping system reserves and response.
- BGHES takes the renewable energy sources in electricity from 42% to 80%, thereby moving Zambia and Zimbabwe towards a carbon emission compliance position.
- The BGHES project will use sustainable renewable hydro-power energy which does not emit carbon dioxide and other environmentally toxic gases and waste which is in line with the greener world theme of the anti-global warming and pollution campaign.
- The BGHES will reduce dependency on coal fired power plants, thereby reducing the associated carbon dioxide (CO<sub>2</sub>) emissions
- The BGHES will provide an alternative link between Zambia and Zimbabwe across the Zambezi River.

## Project Status

### Legal and Financial Transaction Advisory (LFTA) Services

The Authority has appointed a consortium of Ernst & Young Advisory Services (Pty) Ltd, South Africa, Tata Consulting Engineers and Webber Wentzel to provide transaction, financial and legal advisory service for the development of the Project. The services expected to be completed by the second quarter of 2017.

### Updating of the Engineering Feasibility Studies (EFS).

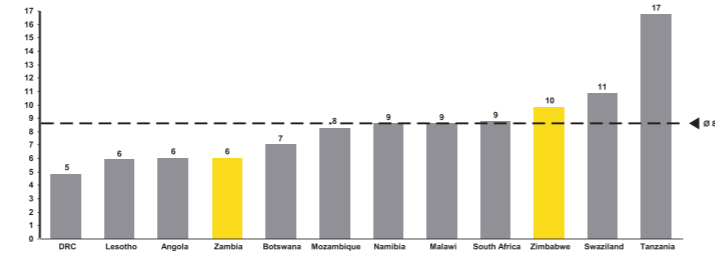
The review and updating of the Engineering Feasibility Studies, being undertaken by Studio Pietrangeli Ing, Italy, is expected to be completed by the first quarter of 2017. These studies involve the review and updating of the 1993 Engineering Feasibility Studies of the proposed Scheme.

### Environmental and Social Impact Assessment (ESIA) Studies

The assessment of the environmental and social impacts of the proposed scheme and development of strategies to mitigate any identified negative impacts and enhancement of identified positive impacts is in progress. The studies are being undertaken by Environmental Resources Management (Pty) Ltd, South Africa, and are expected to be completed by the first quarter of 2017.

## Why Invest in BGHES

- The levelized cost of energy of the Batoka Project is expected to be highly competitive in the region. The average bulk exchange tariff in the SAPP in 2014/2015 was 8.45 US\$/Kwh as presented in the chart below (SAPP 2015 Annual Report). Interim indicative modelling of the Batoka Project indicates that the project will be highly competitive in the region.



- The Project is centrally located in the Southern African Power Pool (SAPP) and will have easy access to the existing market.
- The Project has in place a robust risk analysis framework. This framework allocates risks to those parties and players in the project that are best placed to manage those risks.
- The proposed mode of development for the project;
  - Creates efficient and productive working relationships between the public and private sector through introduction of private sector discipline, commercial attitudes, technology and innovations,
  - Provides for injection of private sector expertise to deliver the project within time and budget,
  - Will enhance development of local private sector businesses through joint-venture/partnerships
  - Has the ability to enhance Project value through innovation in financing, design, construction and operations & maintenance
- Financeability – High chances of successfully funding the investments at best value for money.

## Demand Forecast

The current installed generation capacity in Zambia is c.2,350MW, made up of predominantly hydroelectric generation facilities with Zambia's peak demand forecast to grow from 1,911MW in 2015 to 5,508MW in 2035. The current installed generation capacity in Zimbabwe is c.1,960MW made up by a range of generation facilities.

Zimbabwe's peak demand is forecast to grow from 2,116MW in 2015, to 5,301MW in 2035.

The introduction of new generation such as the BGHES Project will be critical to meeting the increased demand in the two nations.

## Mobilization of funds

The preparatory activities will be followed by mobilisation of funds and procurement of developers and contractors. Thereafter, construction works will commence leading to commissioning of the project, which is targeted for 2024.



The Zambian delegation (top right) and the Zimbabwean delegation (right) signing the Memorandum of Understanding to pave way for the implementation of the BGHES in February 2012.



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Zambezi River Authority is a statutory body which was constituted in 1987 through parallel Acts of Parliament in Zambia and Zimbabwe (the Contracting States). The Authority is a non-profit making organization with a business approach to the management of its affairs for the benefit of the Contracting States.