

Heading: Hydropower, large and small: the role, benefits and technology

Topic: Opportunities for expansion and refurbishment of existing schemes

Title: Modernization and Up-rating of Kainji HPP (Nigeria) – from 760 MW to almost 1'000 MW

Alexander Vetter

AFRY Switzerland Ltd
Herostrasse 12
8048 Zurich
Switzerland



Introduction

In 2013, Mainstream Energy Solution Ltd. (MESL) acquired the concession for the hydropower plants Kainji and Jebba in Nigeria, with a total installed capacity of 1338 MW and a yearly energy production of 5,464 GWh (2016). At the times of the acquisition the available capacity was only at around 582 MW.

MESL is carrying out rehabilitation works on the existing generating units at the one hand and intends to install in the empty pits of Kainji HPP two additional units, in order to feed power directly to the North Core Interconnection.

Extension of Kainji HPP

Kainji HPP is basically conceived to have beside the existing eight generating units four additional generating units in the available open pits, ready to accommodate the electromechanical equipment. MESL intends now, based on hydrological studies, to integrate two additional units in the available pits. In this way MESL can take profit from the important investments been done in the past, so that the additional capacity can be installed with limited costs.

The actual concession allows the two additional units to be connected to the 330 kV West African Power Pool North Core Interconnection (Nigeria – Niger – Burkina – Togo/Benin), which is planned to be built up to 2022 and providing

energy to the connected countries directly. The simulated yearly energy production of the two units is expected to be for dry and wet scenarios in the range of 1,479GWh to 1,560GWh.

Refurbishment of existing Generating Units

AFRY established for MESL a Capacity Recovery Plan (CRP) with the purpose to show and describe various realistic scenarios and approaches to at least re-establish the initial rated capacity of Kainji HPP. Subsequent to the results of the CRP, generating units 1G7 as well as 1G9 are about undergoing extensive rehabilitation works (intake gates, turbine, generator, governor, unit control, bus ducts, transformers, etc.)

Rehabilitation on relevant equipment - Spillways

For Kainji the plant safety is very much depending on the good functioning of the spillways. Since ever the spillways are intensively used during the white flood and to some extent in the black flood too. In comparison to other hydro schemes, the spillways of Kainji are operated frequently. This is partly due to the unavailability of several units at Kainji. In order to ensure the reliability of the spillways in the coming decades, last year a comprehensive spillway refurbishment program was started.

The Authors

Eng. Lamu Audu

Lamu Audu graduated in Mechanical Engineering from Kaduna Polytechnic in 1985 and from University of Maiduguri in 1994. He started his career in power sector with National Electrical Power Authority as Manager (Mechanical) 1996. He rose to Assistant General Manager (Maintenance) and CEO in Jebba Hydro Power Plant in 2009 and 2011 respectively. After the privatization of power sector in Nigeria he was appointed MD/CEO, Mainstream Energy Solutions Limited (Operators of Kainji and Jebba Hydro Power Plants) in 2013 till date. He is registered with Council for the Regulation of Engineering in Nigeria (COREN).

Eng. Lamu Audu is a Fellow of Nigerian Society of Engineers, International Hydropower Association (IHA) and Institute for Government Research Leadership.

Mainstream Energy Solutions Ltd., 6, Yedzeram Street, Off IBB Way Maitama, Abuja, Nigeria

Alexander Vetter graduated in Mechanical Engineering from the University in Metz (France) in 1994 and has more than 20 years of international experience in the field of design, project engineering, proposal management as well as project management in the area of hydro power plants. He has been involved in numerous project phases covering the entire life cycle of hydro power plants such as feasibility studies, design, installation and commissioning as well as refurbishment. Since 2015, he has been the Head of Refurbishment at AFRY Switzerland in Zürich.

AFRY Switzerland Ltd, Herostrasse 12, 8048 Zürich, Switzerland