West Africa's first hybrid power plant demonstrates successful mix of solar and hydropower

Ghana has made remarkable progress in providing access to electricity. Currently, 43% of the total population in sub-Saharan Africa lacks electricity, but Ghana is on course to achieve full access within 18 months.

The country is on track to achieve its goal of universal access to electricity by 2025, with the successful implementation of the Bui Hydro-Solar PV Hybrid (HSH) system. Ghanaian Minister for Energy, Dr. Matthew Opoku Prempeh, said the groundbreaking project, developed by the Bui Power Authority (BPA), which uses Huawei inverters, transformers, and an energy storage system, marks a major milestone in Ghana, and for that matter, Africa's clean energy transition.

He said: 'Bringing the Bui Hydro-Solar PV Hybrid system online enables us to connect more customers to achieve our universal access target of 90% by 2024, way ahead of the UN Sustainable Development Goal of universal access to electricity by 2030. It also contributes to delivering on the promise in our National Energy plan to increase the renewable energy installed capacity in our energy mix to 10% by 2030.'

Variable renewable energy strategy

The Bui HSH project is an important provider of variable renewable energy as Ghana seeks to diversify its energy mix. Construction of the solar plants began in October 2019, and the initial 50 MWp solar PV facility began operating in November 2020. The BPA has also commissioned a 5 MW floating solar plant, the first of its kind in the sub-region. This strategy complements and reinforces

the hydro power, by ensuring the sustainable utilization of its reservoir.

The Bui hydroelectric dam utilises three 133 MW generators at the site, giving a total output of 404 MW as at June 2023. An additional 50 MW of power is generated from the solar installations on site, with the total renewable power output contributing around 6 to 7% of the total power generated in-country and is expected to reduce greenhouse gas emissions by more than 47,000 tons per year.

The BPA has led discussions on locating additional solar plant substations in the northern part of the country. Officials are also keen to take advantage of the reservoir created by the construction of Bui Dam to promote fishing and the irrigation of over 30,000 hectares of land for crops including maize, cashew, and sugar cane. Developing the local farming industry is expected to boost employment and bring financial, environmental and social benefits to the region, thus improving the lives of local people.

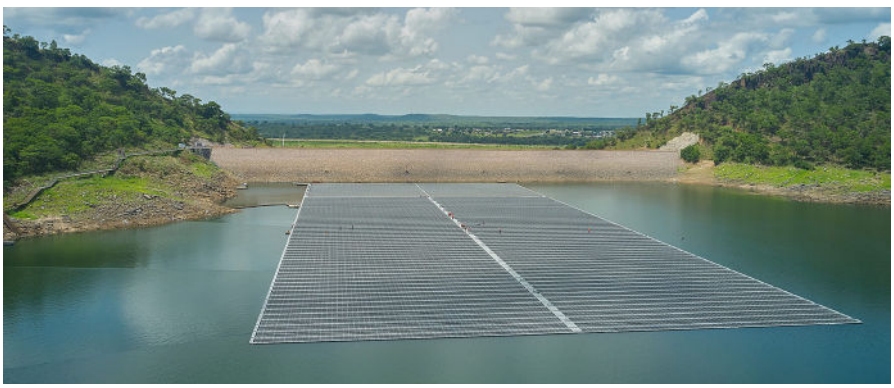
A reliable and stable electricity supply

To help provide a continuous supply of electricity from the hydro dam, even when water levels are low in the dry season, the BPA added the solar element to the existing hydropower plant, harnessing the country's abundant solar resources to generate clean power for Ghana's national grid.

The combination of hydro and solar power, alongside a Battery Energy Storage System enables the plant to provide a stable supply of power to the grid day and night. This is important for the energy security of Ghana.

Energy storage system

To keep the electrical grid operating correctly, supply and demand must be perfectly balanced at all times. When they are not, voltage changes can cause power outages and malfunctions, which can damage or destroy electrical equipment. A Battery Energy Storage System (BESS) is used for peak regulation, enabling seamless supply and smooth output of power.



When renewable electricity generation surges, such as during hours of peak sunshine, the batteries in the storage system charge by drawing the excess power. Power is injected back into the grid during drops in output from the dam or solar plants to smooth out fluctuations. Smart digital technology connecting these networks makes these processes seamless.

The reliability of the inverters, a key component responsible for converting the DC power generated by solar power plants into AC power transmitted over the grid, is of pivotal importance. According to a report issued by TÜV in March 2022, Huawei's Smart PV Solution has achieved a 99.999% availability based on the operation data of the 2.2 GW project in Qinghai, China. Huawei's Smart PV Solution is designed to withstand harsh environmental conditions, providing safe and cost-effective power supply and consumption for decades.

In addition, Huawei's energy storage solution (ESS) delivers easy maintenance, secure and safe performance and uses high-density lithium batteries, which saves 40% of the floor space.

The successful implementation of the Bui Hydro-Solar Hybrid (HSH) system represents a significant milestone for Ghana and West Africa as a whole. By embracing renewable energy and adopting innovative digital solutions, Ghana is leading the way towards a sustainable and prosperous future. The Bui HSH project demonstrates the immense potential of clean energy to drive economic development, improve livelihoods, and combat climate change in Africa.

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