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Driving Eskom's R18 billion energy infrastructure project

Designed to meet South Africa's power demand in a way that will see maximum power generation efficiency, GIBB has led the design of Eskom's Ingula Pumped Storage Scheme in the Little Drakensberg.

THE PROJECT IS in line with meeting the government's sustainability commitments.

The power supply crisis has accelerated the need to diversify Eskom's energy mix and its move towards alternative energy sources, such as nuclear power, natural gas and alternatives to fossil fuel-based energy sources. In a national response to South Africa's electricity shortages, the government and Eskom are working to bring the country's electricity supply and distribution system back into balance. The plan includes work on the country's electricity distribution structure and the fast-tracking of electricity projects by independent power producers.

GIBB was brought on board for its expertise in designing and developing major infrastructure projects in South Africa and, increasingly, beyond borders, such as the recently signed R750 million Metolong Dam Project in Lesotho. Given the scale of Ingula, GIBB sourced additional partners to design elements that made up its overall design of the pumped storage scheme.

Consisting of an upper and lower dam, a combined turbine pump system allows water to be released from the upper dam to the lower dam through the turbines to generate power. When the demand cycle falls, water is then pumped through the same system in reverse to the upper dam. Ingula's total generation capacity will be 1 333 MW, making it the largest hydro-electric power source in South Africa.

"We decided to go with this option in our design because the demand cycle can be better tracked with a minimal loss in power generation efficiency. Coal-fired power stations, on the other hand, cannot simply be switched off and on again to meet demand when the cycle peaks. With the pumped storage scheme, we have this flexibility," says Colin Logan, divisional manager: Dams, Hydropower and Underground Works at GIBB.

ABOVE A view of the Bramhoek Dam wall taken from a helicopter over the right bank

"In a sense this creates a battery where we can store power when the demand cycle comes off. We have the skills and know-how on implementing this technology; it was a case of sourcing the correct supplier to meet our specifications," says Logan.

The $3 billion (R21 billion) project has seen the largest caverns in mud rock in the world dug out to make way for the machine hall, which will house four turbine pumps that will generate 333 MW each, and the transformer hall.

South Africa currently produces 40 000 MW from its existing assets and needs to increase energy generation capacity to meet demand. "While demand for power is part and parcel of a larger economy that is developing, demand has been bolstered by a successful electrification programme. Areas throughout South Africa previously without access to electricity now have it," explains Logan.

From a sustainability perspective, the Ingula Pumped Storage Scheme includes technology that enables sustainability and environmental targets to be met, particularly where carbon emissions are concerned. It is a closed system, meaning that the water used in the dams is reused, requiring little additional water to supplement power generation. While there is a continuous inflow of fresh water from the Braamhoek Spruit and Wilge rivers, contingency is only made for evaporation, making this system a sustainable resource in a country where water supply is not abundant.

"Once Ingula is commissioned for operation, the first three years will see the dams being filled. This closed system allows for only evaporated water to be replaced," says Logan. The project, including pre-feasibility, commenced in 2004 and will be completed in 2015.