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SELI TBM breaks through Beles multipurpose project

Five months after having completed the Gilgel Gibe II tunnel, a **SELI** double shield / earth pressure balance (EPB) tunnel boring machine completed on 8 November the last stretch of the 12 km long Beles headrace tunnel, after boring the last 7.5 metres and installing the last five segment rings. The TBM was able to cope with the different geological formations and conditions by adapting its configuration and operational mode to the ground characteristics and behaviour.

The tunnel is part of the Beles II hydropower plant located in the Amhara region, northwest of Ethiopia, and is designed to channel water coming from Lake Tana Beles into the penstock of an underground powerhouse and, finally, into the Blue Nile.

The 8.1 m diameter headrace tunnel has been lined with 30 cm thick precast concrete segments in a 6+1 ring configuration. The tunnel runs through a variety of ground formations: approx. 10 km of hard rock (350 Mpa) with local faults and then 1.8 km of loose soils, basically lake deposits, through which the machine advanced at a daily output of approx. 15-20 m/day.

Geological complexity required the use of a dual mode TBM. This machine can work in both double shield and EPB mode, depending on ground conditions. The configuration change from double shield to EPB mode requires downtime for approx. two to three weeks.

The Beles machine has a maximum cutterhead thrust of 11,440 kN and a cutterhead drive power of 2,100 kW. Finishing works are expected to be completed by January 2010. The first power generation test for the 460 MW Beles multipurpose water project will take place by late January 2010. If the testing goes successfully, the plant will begin formal operation in March 2010. From that time on, the project will serve the country for the next 25 years.

The Beles headrace tunnel is part of the Beles II multipurpose project. The contract was awarded in 2005 by the Ethiopian Electric Power Corporation (EEPCo) to Salini Construttori for a total amount of €467 million. Tunnelling work was subcontracted by Salini to SELI for a total of €48.7 million. The project's total length is 20 km completely underground and consists of a 12 km headrace tunnel, a 7.2 km tailrace tunnel, an underground powerhouse, a 270 m penstock shaft and a 90 m surge shaft. Excavation of the tailrace tunnel began in June 2007 and was completed in May 2008, after less than 12 months.

Breakthrough of the Tana Beles headrace tunnel.