Highlights on the Ulu Jelai Hydroelectric Project

WATER RESOURCES TECHNICAL DIVISION

by Ir. Zainal Abidin bin Othman

THE Water Resources Technical Division organised a technical talk on the construction of a 372 MW hydro-power project in Cameron Highlands in April 2012 at the Wisma IEM, Petaling Jaya.

The talk on the Ulu Jelai Hydroelectric Project was jointly presented by Ir. Mohd. Isa Mustaza, a Civil Engineer (Project Services) attached to Tenaga Nasional Berhad; and Mr. Keith Kinsella, the current Chief Resident Engineer (CRE) for the project.

Ir. Isa kick-started the talk by highlighting the rationale for implementing the project, which is to help meet the power demand of the country. Subsequently, Mr. Keith Kinsella elaborated on the project components and briefed the audience on the current construction progress of the project.

The Ulu Jelai Hydroelectric Project is a 372 MW hydropower development on the Bertam River, Pahang. The scheme is expected to produce an annual energy supply of 326 GWh. The main features of the project are an 88-metre high, 740,000 cubic metre RCC dam with service and emergency ungated spillways, provision for the flushing of sediment from the reservoir, diversion weirs on the Telom and Lemoi rivers for the transfer of water to Susu Dam, an intake tower, power tunnels and an underground powerhouse cavern.

Construction work for the project commenced in late 2010 and has been scheduled to complete by end of 2016. The first contract package involving the access roads and associated earthworks is in progress. Meanwhile for the second contract package, construction of the dam and the various tunnels leading to the underground power station has just begun.

The dam is constructed of roller compacted concrete (RCC), reaching a crest height of approximately 88 metres above existing river bed level and extending approximately 470 metres along the crest. Integrated into the RCC dam is a non-gated 78-metre long service spillway, a 60-metre long non-gated emergency spillway and a stepped spillway chute on the downstream dam face, terminating in a stilling basin.

Appropriate river diversion works for the dam including upstream and downstream cofferdams and two 90 metres long and 4.5 metres width by 8.0 metres height diversion culverts would also be required.

The gated power intake structure is located near the upstream face of Susu Dam. The power intake comprises a tower with three gated orifices fitted with trashracks and 3 metre wide by 6.5 metre high vertical gates, through which the water will enter into the power waterway leading to the underground Telanok power station.

The power waterway which extends from the power intake structure to the power station basically consists of a 9.5 metre diameter horseshoe-shaped and 4.2 kilometre long unlined headrace tunnel, which includes a 40 metres long concrete lined rock trap; a 5.2 metre diameter by 173 metres high concrete-lined pressure shaft; 5.2 metre diameter horseshoe-shaped by 86 metres long concrete lined pressure tunnel; 5.2 metre diameter, 10 metres long steel-lined, single penstock embedded in concrete; steel bifurcation; and 3.75 metre diameter steel-lined, dual penstock, embedded in concrete.

The generating units (2 x 186 MW) would be housed in an underground power station cavern, approximately 82 m x 22.5 m x 35.5 m. Other underground facilities include the transformer cavern of approximately 34 m x 17 m x 17 m, downstream surge chamber of approximately 40 m x 14 m x 35 m, associated service tunnels, access tunnels, and ventilation tunnels, and a concrete lined 7.7 metre diameter horseshoe-shaped tail race tunnel of approximately 1,720 metres in length.

The scheme also includes the diversion of water from the Telom and Lemoi river catchments through the 3-metre diameter transfer tunnels, with respective lengths of 8,500 metres and 7,500 metres to the Susu Dam storage.

Tunnel construction within Lemoi river catchment

Apart from presenting the project key features and how it works, the talk also touched on the excavation of the tunnels, which is a major part of the construction work. The construction of the Main Access Tunnel (MAT) involving the excavation of a top heading in soft material using canopy tubes, steel ribs and shotcrete for support was highlighted. Upon reaching competent rock, the tunnel excavation

Construction of the Main Access Tunnel (MAT)

would be continued by drill and blast methods. Tunnelling in rock for the Telom and Lemoi tunnels would be carried out using a Tunnel Boring Machine (TBM).

The talk was followed by a lively Q&A session between the participants and the speakers. Most of the questions were related to the return on investment (ROI) of the project, as well as environmental and operational issues. The session ended with a memento presentation to the speakers. ■

CONGRATULATIONS

The IEM Council wishes to congratulate **Y.Bhg. Academician Dato' Ir. Lee Yee Cheong** for being appointed Pro-Chancellor of Kuala Lumpur Infrastructure University College. IEM is confident that this appointment will afford Y.Bhg. Academician Dato' Ir. Lee a platform to assist in human resource capacity building for infrastructure development in the country.