Malaysia pumped hydro storage

Malaysia pumped hydro storage

The development of major hydropower projects in Malaysia is generally undertaken by the utility companies such as Tenaga Nasional Berhad (TNB) in Peninsular Malaysia, Sarawak Energy Berhad (SEB) in Sarawak while in Sabah by the Sabah Electricity Sdn Bhd (SESB). There have been attempts by private players to participate in the development of major hydropower in Malaysia but with very little success to date. The development of smaller hydropower projects below 30MW is open to private parties and incentivized by the Feed-in Tariff (FiT) mechanism managed by the Government.

During the period up to the 1960"s, the Cameron Highlands Hydropower Scheme was developed comprising the major Cameron Highlands (105MW) and Batang Padang (154MW) projects. The scheme involves small but steep mountain streams where the river flows were diverted via long tunnels. The major developments are pondage projects with relatively small dams and limited reservoir storages, whilst the smaller ones are all run-of -river projects.

The concept of maximum resource utilization in the energy sector was adopted by the country in the 1970"s and saw the development of more major hydro projects in the Perak and Terengganu river basins.

Along the upper reaches of the Perak river, a cascade of three dam hydropower projects was constructed and the first of these projects was Temengor (348MW), a zoned processed rockfill dam constructed between 1974 to 1978. The Bersia dam project (72MW) located immediately downstream of Temengor was constructed between 1980 to 1983. Bersia is a concrete gravity dam with four gated spillway bays. The third, Kenering dam project (120MW), located further downstream of Bersia was constructed during the same period. Kenering is also a concrete gravity dam with six gated spillway bays.

Concurrently, the Kenyir Dam project (400MW) was being developed in the Terengganu river basin. The Kenyir Dam is a 155m high rockfill dam with eight earthfill saddle dams forming a reservoir surface area of 370km2. The ungated chute spillway has a discharge capacity of 7000m3/sec. This is the largest dam in Peninsular Malaysia and provides significant flood mitigation in addition to power generation.

The first major hydropower development in Sarawak was the Batang Ai project constructed between 1981 to 1985. The project comprises an 85m high concrete faced rockfill dam and three saddle dams with a reservoir surface area of 85km2. The Lima saddle dam is similar in construction as the main dam while the other two saddle dams Bekatan and Sebangi are of the earthfill type. The gated spillway of the main dam is capable of discharging 2600m3/sec.

In the late 1980s up to the early 1990s, many projects around the world, including in Malaysia, were paused due to a number of factors including global financial constraints and concerns over the environmental and social impacts of hydropower development.

It was not until 1991 that the next major hydropower project emerged. The Pergau project (600MW) comprises a 75m high earthfill dam with ungated chute spillway with a discharge capacity of 2470m3/sec, a complex 24km system of tunnels and a underground power station. In addition to the inflow from the Pergau river, water is also diverted into the reservoir through the tunnel with six gravity intakes over the 24km length.

Next came the massive 2400MW Bakun project in Sarawak, which after some years of difficulty was undertaken through a contract with a Malaysia China Joint Venture for the civil works. Amidst significant commercial, technical and socio-environmental issues faced during construction, the project was finally commissioned in 2011.

Having identified hydropower as a key catalyst to drive and accelerate socio-economic growth in the state, Sarawak continued building large hydropower projects, including the Murum hydropower project (944MW). Meanwhile in the Peninsular, it was more than a decade before any development of new major hydro projects resumed. The Hulu Terengganu project started construction in 2010 followed by the Ulu Jelai Hydroelectric project a year later in 2011.

The Hulu Terengganu project (265MW) was commissioned in 2015 comprising two cascading schemes, the 75m high Puah earthfill dam (250MW) with three gated spillways and an underground power station, and the 36m high Tembat concrete dam (15MW) with a free overflow spillway and a surface power station. SMEC carried out the feasibility study and tender design for the Project.

The Ulu Jelai hydro project (372MW), for which SMEC carried out detailed design, construction supervision and contract management, was commissioned in 2016 comprising an 88m high roller compacted concrete dam, spillway discharge capacity of 2300m3/sec and an underground power station.