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Multiple use benefits

Bhumibol Dam, Thailand

The construction of Bhumibol Dam, Thailand, and associated energy infrastructure significantly improved quality of life through the provision of flood protection, increased agricultural productivity and the development of new industries such as tourism and fishing.

Overview

Originally known as Yanhee Hydroelectric Project, Bhumibol Dam was first conceived in 1951 to provide irrigation water to farmlands in the downstream Chao Phraya River Valley and to counter Thailand's electricity shortage. Construction commenced in 1952 and the first two turbines were commissioned in 1964. Six additional units were installed in later years to cope with the country's rapid growth in electricity demand.

Bhumibol is a concrete arch gravity dam constructed across the Ping River, a tributary of the country's main lifeblood, the Chao Phraya River. The dam is 154 meters high, 486 meters long and 6 meters wide at its crest, creating a storage of 13,462 million cubic meters. This is sufficient for flood mitigation and the provision of irrigation water for year round rice cultivation.

In an effort to maximize benefits, a lower barrage was constructed approximately 5.5 kilometers downstream of Bhumibol Dam in 1991, providing a lower pond suitable for the operation of a new reversible pump turbine. The concrete Lower Mae Ping Barrage is 8 meters high and 300 meters long and has a storage capacity of 5 million cubic meters.

The hydroelectric plant situated at the dam base has a total installed capacity of 743.8 MW from seven conventional generating units (Units 1-6 of 76.3 MW each and Unit 7 of 115 MW) and one reversible pump turbine unit of 171 MW. Bhumibol Unit 8 has a two-fold function, serving as a water pump during the off-peak hours to recapture water from the lower reservoir and pump it back up to the upper reservoir; and also operating as a generator to produce electricity during peak periods.

At the time of commissioning, Bhumibol Dam and its powerhouse operated as a baseload station and contributed 73.66% of the total Thai generating capacity. By 2003, the dam contributed only 2% of the nations electricity supply. Nonetheless, Bhumibol Dam remains an essential power generation asset during periods of peak electricity demand.

Dam Name

Scheme operator
Electricity Generating Authority of Thailand

Size of scheme (MW)
743.8

Country
Thailand

Catchment area

River
Ping River

Effective reservoir capacity
13.47 x $10^9 m^3$

Construction years
1952-64

Reservoir size

External recognition
Nil

Details

Aside from its role in supplying electricity to Thailand, the Bhumibol Dam provides the following benefits:

• *Increased agricultural productivity*
Prior to the construction of the Bhumibol Dam, rice crops were grown in the Ping and Chao Phraya River basins only during the wet season. Construction of the dam enables dry season crops, effectively doubling the annual harvest in these basins.

• *Management of saline incursion*
Dry season releases from the dam are timed to prevent the incursion of sea water into the irrigation areas through natural penetration of an estuarine salt wedge.

• *Flood mitigation*
Reductions in flood frequency, volume and duration during the wet season are important benefits of the dam, protecting downstream crops and populations.

• *Fishing*
The Bhumibol storage is stocked annually with a significant number of fish fry, and now supports a sustainable commercial fishing industry, creating employment opportunities for local people.

• *Tourism industry*

Increased tourism is a significant benefit of Bhumibol Dam, and now contributes significantly to the local economy. The construction of tourist accommodation, conference centers, museums and golf courses have boosted tourism to the area. Boat cruises on the storage are a popular tourist drawcard.

Other Aspects

Safety
The flood mitigation capacity of the Bhumibol Dam plays an important part in protecting downstream populations during the wet season.

Distribution and Sharing of Benefits
The multiple use benefits of the Bhumibol Dam are widespread throughout the Tak province. Aside form the availability of electricity new industries have emerged, such as tourism and commercial fishing. The quality of life and average household income of the Tak Province has significantly improved.

Demonstrated need
At the time of construction Bhumibol Dam was the major electricity generating facility in Thailand, and hence played a fundamental role in the nation's development. The creation of an irrigated rice industry provided greater security for rice growers in an area prone to cycles of floods and drought.

Energy system benefits
Although the Bhumibol Dam now provides only a relatively small proportion of Thailand's electricity, it plays an essential role during periods of peak electricity demand. The pumped storage capability provides spinning reserve, black start capability and emergency backup.

Further Information

Source: Hydropower Good Practices Workshop, Annex VIII - Examples for Good Practice Report, Villach, Austria, October 2005. International Energy Agency.

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