Bhumibol Hydro Power Plant Rehabilitation Project

Report Date: March 2000
Field Survey: November 1998

1 Project Summary and Japan's ODA Loan

(1) Background

In the late 1980's, when this project was first planned, Thailand was entering a period of rapid economic growth that produced a sharp increase in the demand for electrical power. Peak demand grew at an annual rate of 13% in 1987, 15% in 1988, and 15% in 1989. Increasing electrical output to meet this rising demand had become an urgent issue for the country. With this background, the Electricity Generating Authority of Thailand (EGAT) drafted its Power Resources Development Plan (1988~2001) calling for 14,790MW of electrical output by 2001 with annual output capacity expanded to 76,172GWh.

At the time of planning this project, Bhumibol Hydro Power Plant had equipment output of 535MW, second to Srinagarind Power Plant, which had its output 540MW. Two of the seven generators at Bhumibol Hydro Power Plant, generating units 1 and 2, began their operations in 1964 and had become fatigued. Many of the equipment and facilities were out-dated. Efficiency had fallen and maintenance costs had risen due to deterioration over time. Therefore, prompt renovation had been in need.

(2) Objectives

This project aims to improve the reliability of power facilities, improve power output and efficiency, and extend the operating life of facilities by renovating some of the deteriorating equipment (generating units 1 and 2) at the Bhumibol Hydro Power Plant.

(3) Project Scope

The project scope covered renovation of generating units 1 and 2, as well as consulting services. The ODA loan covered the entire foreign currency portion.

(4) Borrower/ Executing Agency

Electricity Generating Authority of Thailand / Electricity Generating Authority of Thailand (EGAT)

(5) Outline of Loan Agreement

Loan Amount	¥2,425 million yen
Loan Disbursed Amount	¥2,324 million yen
Date of Exchange of Notes	September 1988
Date of Loan Agreement	September 1989
Loan Conditions	
Interest Rate	2.9%
Repayment Period (Grace Period)	30 years (10 years)
Procurement	General Untied
Final Disbursement Date	January 1995

2 Analysis and Evaluation

(1) Project Scope

This project consisted of rehabilitation of generating units 1 and 2 and the provision of consulting services. Specifically, this included water turbines (adopting a new runner and electronic governor, replacing bearings), power generators (replacing stator coils and field coils, adopting static excitation equipment), control equipment (adopting automatic control equipment and gas breakers), as well as detailed design and other consulting services. The project was basically carried out according to plans without any major changes to its scope.

(2) Implementation Schedule

The project implementation was initially planned to run for a period of three years and nine months from March 1989 to January 1993. However, the project was actually executed from May 1989 to November 1993 for a delay of 10 months. Delays were mainly due to some equipment faulty in part that needed to be returned and replaced.

(3) Project Cost

Initial costs estimates for the project called for ¥2,425 million for the foreign currency portion and ¥624 million (125 million bahts) for the local currency portion. However, the actual cost of the project was ¥2,324 million for the foreign currency portion, 4.2% less than forecasted, and ¥790 million (200 million bahts) for the local currency portion, 27% more than forecasted. Overall, there was 2.1% cost overrun mainly due to an extension in the period for providing consulting services.

Comparison of Original Plan and Actual

Item	Plan(1)	Actual (2)	Difference (2-1)
1.Project Scope			
i) Renovation of Units 1 &2			
・Hydro turbine	New runner, adoption of electric governor, replacement of bearing etc.	As planned	None
・Power generator	Replacement of stator coils and field coils, adoption of static excitation equipment	As planned	None
・Control system etc.	Adoption of automatic control equipment and gas breakers	As planned	None
ii)Consulting Services	Detailed design,bidding preparation assistance, bidding evaluation assistance, construction supervision	As planned	None

(4) Project Implementation Scheme

Electricity Generating Authority of Thailand (EGAT) was executing agency for this project. This project marked the first time that EGAT attempted a major renovation of hydro power equipment, but this did not prove to be a hindrance to the project. EGAT may be credited for its solid performance in executing the project.

Due to the urgency of this project, Japanese consultants involved with F/S were directly employed. No particular problems were reported in terms of the performance of the consultants. Regarding the performance of the contractors, faults with some of the equipment resulted in implementation schedule delays. In the final analysis, however, a maximum output greater than that of the planned was achieved with the project only being delayed by 10 months.

(5) Operations and Maintenance

Good operating conditions were maintained after the renovation of generating units 1 and 2. Good maintenance was also provided and no problems are seen in supplying the needed spare parts. Following the renovation, operations of generating unit 1 started in November 1992, with operation for unit 2 starting in November 1993. A maximum output of 76.3MW was achieved, exceeding the expected 75.4MW. Results after operations resumed are as shown in Table below. The results

obtained as of fiscal year 1996 were basically in line with the expected level of output. Power output for fiscal 1998 was lower due to a drought that would not occur during an average year.

Table.1 Power Generating Results of Units 1 and 2 after Rehabilitation

FY [1]		Power Generating Results				
	Plan [2]	Total	Unit 1		Unit 2	
	Power generating volume (GWh)	Power generating volume (GWh)	Power generating volume (GWh)	Power generating time (hr)	Power generating volume (GWh)	Power generating time (hr)
FY1994	378.0	46.7	46.7	830.2	—	—
FY1995	377.2	313.9	149.6	2,489.8	164.3	2,540.3
FY1996	376.4	368.5	185.5	3,005.8	183.0	2,862.9
FY1997	375.6	364.2	182.0	2,972.8	182.2	2,961.4
FY1998	374.8	225.3	111.0	1,895,5	114.3	2,061.4

Note : 1) The fiscal accounting period is from October to September of the following year.
2) Assumed output level based on economic analysis at the time of appraisal.

(6) Project Effects and Impacts

FIRR was calculated as 14.4% at the time of appraisal.

(Premise) (i) Benefit: Increased revenue through improved productivity and higher output.
(ii) Expense: Investment in rehabilitation and additional expense associated with increased power output.
(iii) Project life: 15 years

The output of the rehabilitaton was higher than expected, however project completion was delayed by almost one year. Therefore, the actual FIRR of 14.0% was roughly even with the projected figure.

The Hybraulic Pressure Pipes, units1and 2