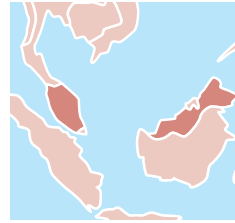


Asia **Malaysia**

# Port Dickson Power Station Rehabilitation Project

Contributing to the stabilization of the power system, improvement of atmospheric environment, and diversification of energy source by shifting to highly efficient combined cycle gas turbine power station

## [External Evaluator]

Mitsue Mishima, OPMAC Corporation

### Rating

Effectiveness, Impact	a	Overall Rating <b>A</b>
Relevance	a	
Efficiency	b	
Sustainability	a	

### Project Objectives

To provide stable power supply and reduce the amount of hazardous gas emission by demolishing seriously deteriorated and inefficient oil-fired power plant facilities (240MW out of 600MW in the project) and replacing them with highly efficient combined cycle gas turbine power generation facilities with low emission of hazardous gas in Port Dickson Power Station located in Negeri Sembilan state, thereby contributing to the stabilization of the power system and diversification of energy sources in Peninsular Malaysia.

### Outline of the Loan Agreement

- Loan amount / Disbursed amount: 49,087million yen / 48,607million yen
- Loan agreement: March 1999
- Terms and conditions: 0.75% interest rate; 40-year repayment period (including a 10-year grace period); general untied
- Final disbursement date: June 2006
- Executing agency: Tenaga Nasional Berhad (TNB)
- Website URL: <http://www.tnb.com.my/tnb/index.php>

## Effects of Project Implementation (Effectiveness, Impact)

Since FY2005-06, actual output of the combined cycle gas turbine power generation facilities renewed in the project exceeded the planned values, recording approximately 5,500GWh per year. Capacity factor and availability factor are high. The project is estimated to be effective in reducing emissions of NO<sub>x</sub>, SO<sub>x</sub> and CO<sub>2</sub> in comparison to oil-fired power station, and the results of atmospheric environment monitoring satisfied the standard set by the Environment Bureau. In Peninsular Malaysia, the project makes up 6% of total capacity and 14.5% of output. The project can be evaluated for its contribution to stabilizing power supply with highly reliable power generation facilities suitable to providing base load electricity. In terms of diversification of energy sources, the project contributed to reducing oil based power generation share and increasing gas based power generation. Simultaneously the highly efficient gas-fired power generation is considered economically effective in reducing fuel cost. Moreover, in terms of technical impact, the lessons learned by TNB in terms of project management impacted the operation of other power plants. The power station, which is known as a model case in Malaysia, accepts over 1,000 visitors from inside and outside the country. In light of the above, the project has largely achieved its objectives and, its effectiveness is high.

## Relevance

This project has been highly relevant with Malaysia's national policies and development needs at the times of both appraisal and ex-post evaluation. The project, with its achievements in high-efficiency energy shift and alleviation of environmental impact, was consistent with the 7<sup>th</sup> and 8<sup>th</sup> Five Year Plan (1996-2005), which upheld the diversification of energy sources to reduce heavy dependency on oil. In addition, according to forecast and analysis on the reserve margin in the Peninsula, strengthening of power generation facilities was urgently needed.

## Efficiency

Project cost was less than planned (81% of the plan), while the project took slightly longer than planned; therefore, the evaluation for efficiency is moderate. Delay was caused due to demolition work of the existing power station.

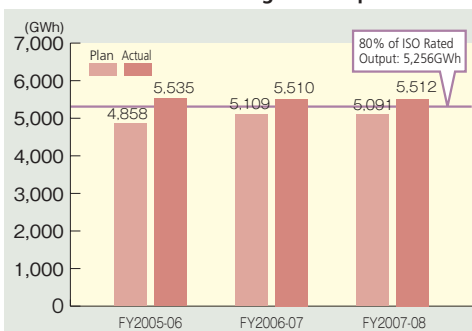
## Sustainability

No major problem has been observed in the capacity of the executing agency nor its operation and maintenance system; therefore, sustainability of this project is high. There are sufficient employees to implement daily operation and maintenance and periodic operation and maintenance are outsourced to REMACO (TNB Repair and Maintenance Sdn. Bhd), a subsidiary of TNB. Training is periodically conducted for TNB employees, and rank and skills of REMACO are deemed sufficient. Regarding finance for operation and maintenance, there is also no major negative factor that may influence the project in the short-run.

## Conclusion, Lessons Learned and Recommendations

In light of the above, this project is evaluated to be highly satisfactory. As a lesson learned, sufficient preparation time should be incorporated in the work schedule in advance, since detailed planning is required in case of constructing a new facility within the site of an existing power plant.

### Plan and actual of receiving-end output



[Source] TNB

\*All ex-post evaluation reports including this can be referred to in JICA's website, "Evaluations"→"Ex-post Evaluation (ODA Loan)" ([URL:http://www.jica.go.jp/english/operations/evaluation/oda\\_loan/post/](http://www.jica.go.jp/english/operations/evaluation/oda_loan/post/))