Republic of Indonesia

Ex-Post Evaluation of Japanese ODA Loan Project

"Muara Tawar Gas Fired Power Plant Extension Project"

External Evaluator: Masumi Shimamura

Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

This project developed a new gas-fired combined cycle power plant in the existing Muara Tawar power complex with the aim of improving power supply and demand balance as well as improving stability and maintaining quality of power supply in the Java-Bali system. The project objective – to meet increasing power demand from both quantity and quality viewpoints by providing basic support to develop new power source until the State Electricity Company, PT. PLN (Persero)[1] (hereinafter referred to as "PLN"), and private enterprises can make on investment in power generation – is consistent with Indonesia's energy/power policy and with the development needs, as well as Japan's ODA policy; thus, the relevance of the project is high. All the Operation and Effect Indicators set at the time of appraisal have been achieved against the target figures after the commencement of power generation. It is worthy of special mention that the project is located in Jakarta Capital Region where there is a greatest demand of electricity, and is playing an important role to reduce power loss and to maintain quality (voltage) of power supply in the Java-Bali system. The power plant has been operating smoothly and project effects have appeared as planned; thus, the project's effectiveness and impact are high. No negative impact on natural environment has been pointed out. Land acquisition and resettlement which were not expected at the time of appraisal took place, however, the process was properly carried out in accordance with the governing Indonesian regulation and no particular problem has been pointed out. Both the project cost and project period exceeded the plan though not significantly; thus, efficiency of the project is fair. No major problem has been observed in the institutional, technical and financial aspects of the operation and maintenance system; thus, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

[1] PT. Perusahaan Listrik Negara (Persero)

1. Project Description

Project Location

Muara Tawar Gas Power Plant (Block 5)

1.1 Background

After the Asian Financial Crisis in 1997, new investments in power plants dried up in the Java-Bali system in Indonesia. However, demand for power grew at an annual rate of 9% fueled by economic recovery that followed the crisis, and reserve margin was decreasing. Despite plans for developing new power generation projects, prospect for their financing was not yet in sight. For these reasons, supply-demand balance worsened in the Jakarta Capital Region where demand for power was the country's largest, and this situation combined with falling capacities in the aging existing power plants raised the possibility of a major problem, as a tight supply situation was expected to emerge in 2004 and beyond. The project was expected to ensure stable power supply at the center of the Indonesian economy by expanding power outputs in the Jakarta Capital Region.

1.2 Project Outline

The objective of this project is to improve power supply and demand balance as well as to improve stability and to maintain quality of power supply in the Java-Bali system by building a new gas-fired combined cycle power plant with a capacity of 225MW class[2] at the existing Muara Tawar power complex in the suburbs of Jakarta, thereby contributing to the power sector reform until new investments for power development can be realized using PLN's own fund and through private enterprises.

[2] 234MW in actuality due to difference from planned specification as a result of bidding, which led to change in rated power output.

Loan Approved Amount/ Disbursed Amount	18,182 million yen / 16,526 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2003 / July, 2003
Terms and Conditions	Interest Rate 1.8% Repayment Period 30 years (Grace Period 10 years) Conditions for Procurement General Untied
Borrower / Executing Agency	Republic of Indonesia / State Electricity Company (PT. PLN)
Final Disbursement Date	January, 2013
Main Contractor (Over 1 billion yen)	PT. Alstom Power Energy System Indonesia (Indonesia) / Marubeni Corporation (Japan) / Alstom Switzerland Ltd. (Switzerland), JV
Main Consultant (Over 100 million yen)	Fichtner GMBH & Company KG. (Germany) / PT. Jaya CM Manggala Pratama (Indonesia) / PT. Kwarsa Hexagon (Indonesia) / PT. Connusa Energindo (Indonesia) / Tokyo Electric Power Company, Incorporated (Japan) / Tokyo Electric Power Services Co., Ltd. (Japan), JV
Feasibility Studies, etc.	F/S conducted in 2001
Related Projects	Japanese ODA Loan (Loan Agreement signing year and month in parentheses) ・ South Sumatra-West Java Gas Pipeline Project (March, 2003) ・ Muara Karang Gas Power Plant Project (July, 2003) ・ Tanjung Priok Gas Fired Power Station Extension Project (March, 2004) ・ Semarang Power Plant Rehabilitation and Gasification Project (March, 2004) ・ Engineering Services for Kamojang Geothermal Power Plant Extension Project (March, 2006) Technical Cooperation ・ Study on the Effective Use of Captive Power in

	Java-Bali Region (2002) Electric Power and Energy Policy Adviser dispatched to the Ministry of Energy and Mineral Resources Grant Aid (Exchange of Notes signing year and month in parentheses) ・ The Project for Rehabilitation of Gresik Steam Power Plant Units 3 and 4 (July, 2004) World Bank ・ Technical Cooperation (Supporting PLN's Corporate and Financial Restructuring) ・ Java-Bali Power Sector Restructuring and Strengthening Project Asian Development Bank ・ Power Transmission Line Improvement Sector Project Renewable Energy Development Sector Project

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

Duration of the Study: September, 2014 – July, 2015

Duration of the Field Study: November 22–December 18, 2014, February 24–March 8, 2015

3. Results of the Evaluation (Overall Rating: A[3])

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of Indonesia

At the time of appraisal, according to Indonesian government's National Electricity General Plan (hereinafter referred to as "RUKN") in 2003, the minimum reserve margin necessary for stable power supply in Indonesia was considered to be 25%, and it was urgently necessary to secure new power sources because the ratio was declining (38.8% in 2001 to 30.5% in 2002), and the figure could lead to less than 25% due to the increasing power demand in the Java-Bali system. RUKN pointed out the necessity of fulfilling both

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[4] ③: High, ② Fair, ① Low

quantity and quality of increasing power demand. In addition, the government of Indonesia announced a reorganization policy for the power sector[5] in 1998 and initiated reforms including financial restructuring of PLN, the executing agency, and the participation of private sector in order to establish a competitive power market and to improve the efficiency of the power sector. The project objective to provide basic support to develop new power source until new investments for power development can be realized using PLN's own fund and through private enterprises was consistent with the above policy.

At the time of ex-post evaluation, the project objective is consistent with Indonesia's energy/power policy. The government of Indonesia prepared National Energy Policy (KEN) in January 2014 after an interval of about ten years, and has set targets to increase the country's generation capacity from 51GW in 2014 to 115GW by 2025 and then to 430GW by 2050. At the time of ex-post evaluation, RUKN 2012-2031 set aims in the power supply plan to finish the shortage of power supply and to develop power plants for peak load by using gas and hydro power plants, so that oil fueled power plant development is minimized. Furthermore, PLN's Long Term Electricity Development Plan (hereinafter referred to as "RUPTL") 2013-2022, PLN's company plan to supply electric power for the next 10 years, states that power demand is expected to increase on an average of 7.6% per year for the Java-Bali system, and the additional generation capacity requirement is 31.5GW (an average of 3.2GW per year) by 2022 in order to alleviate tight power supply and demand situation.[6] RUPTL indicates that fuel sources and the availability, distance to the demand area and regional balance, transmission development plan and its constraints, and restrictions on environmental and social aspects should be taken into consideration when selecting the location of power plants. Trend of power supply and demand balance, and reserve margin in the Java-Bali system is shown in Figure 1. Reserve margin was 24.4% in 2010, less than 25%, however, it recovered to 34.9% in 2011 due to development of power sources. (See Table 1)

[5] Power Sector Restructuring Policy

[6] The additional generation capacity requirement is 38.5GW (an average of 3.8GW per year) by 2024 in RUPTL 2015-2024, which was prepared under the new "Jokowi" administration in January 2015. The administration has set forth a priority of newly developing 35GW generation capacity by 2019.

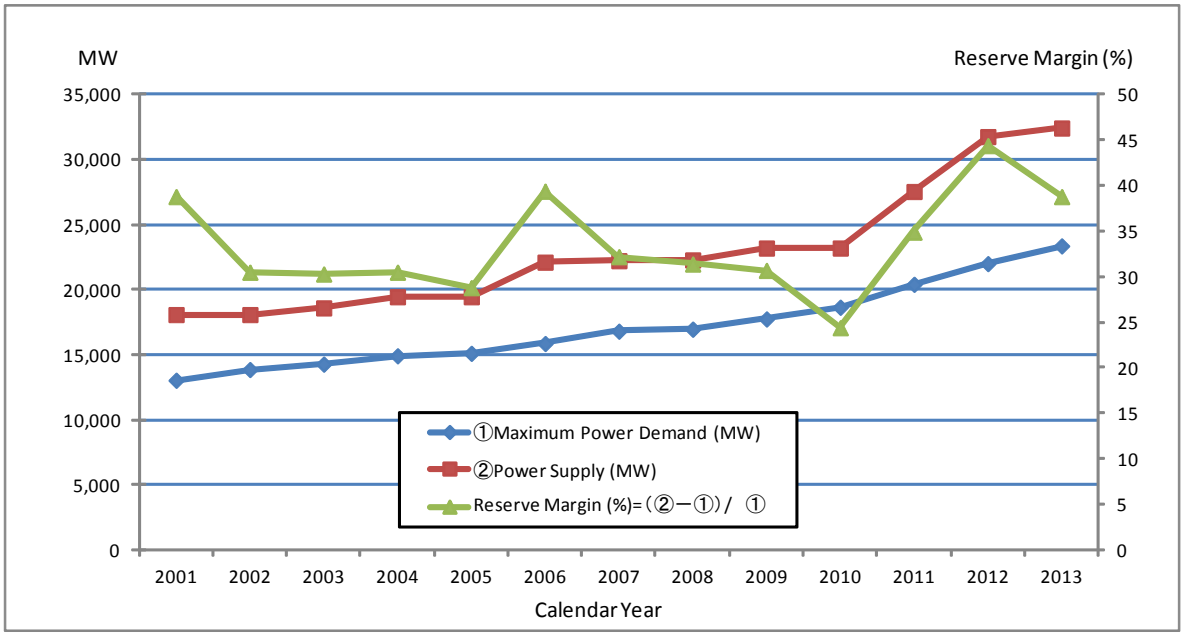


Figure 1: Trend of Power Supply-Demand Balance and Reserve Margin in the Java-Bali System

Source: Results from questionnaire survey of executing agency

In order to improve tight electricity supply and demand situation, the government of Indonesia has prepared two Crash Programs (short-term power development plans) (First Crash Program was prepared in 2006, and Second Program in 2010), and has been pushing forward large-scale development of power sources. The main purpose of the First Crash Program, which is the development plan of coal-fired power plants of approximately 10,000MW in total is to urgently develop power sources in the Java-Bali areas, however, significant delay has occurred due to problems of land acquisition and financial situations. The purpose of the Second Crash Program is to introduce renewable energy, including urgent development of power sources, diversification of power sources, and geothermal power generation, of approximately 10,000MW in total. Projects under the Second Crash Program have also encountered delay due to problems on financial arrangements. Development of new power sources for more than 20GW is assumed by the independent power producers (hereinafter referred to as "IPPs") among the targeted new power generation capacity of 35GW, which the new "Jokowi" administration considers as priority.

3.1.2 Relevance to the Development Needs of Indonesia

At the time of appraisal, coping with tight power supply and demand in the Java-Bali system and establishing stable power supply system were a pressing issue. In the Java-Bali system, which supplies power to the Jakarta Capital Region where demand for power was the country's largest, time was necessary until new investments for power development can

be recovered using PLN's own fund and through private enterprises. Therefore, it was important to tackle the immediate problem of stringent power supply and demand for stable economy and social situation of the country.

At the time of ex-post evaluation, facilitation of power development in the Java-Bali system, which supplies power to Jakarta Capital Region where many Japanese companies are investing, is also an urgent issue. RUPTL 2013-2022 states that demand for power in the Java-Bali system is expected to increase from 144TWh in 2013 to 275TWh in 2022, growing at an average rate of 7.6% per year.[7] While the government of Indonesia has been promoting Crash Programs as mentioned above, delays in the progress are seen. Further utilization of IPPs continues to be expected in developing power sources, and IPPs account for more than half of power development in the Second Crash Program. (Whereas PLN projects accounted for 100% of projects in the First Crash Program.) Table 1 shows the additional investment capacity of power sources in the Java-Bali system.

Table 1: Additional Investment Capacity of Power Sources in the Java-Bali System

(Unit: MW)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Power Generation Investment by PLN														
Coal Fired							1,320			300	300	3,220	1,950	980
Combined Cycle							740			500		444	740	
Hydroelectric														
Gas Turbine					899	41								
Diesel											65	51	140	
Geothermal														
Others														
Power Generation Investment by IPPs														
Coal Fired	2,450						600						1,475	
Combined Cycle												150		120
Hydroelectric														
Gas Turbine														
Diesel														
Geothermal	200		60					110	60	110				
Others														
Total Investment Capacity of Power Sources by PLN and IPPs														
Total	2,650		60		899	41	2,660	110	60	910	365	3,865	4,305	1,100

Source: Results from questionnaire survey of executing agency

3.1.3 Relevance to Japan's ODA Policy

The Medium-Term Strategy for Overseas Economic Cooperation Operations of Japan Bank for International Cooperation (current Japan International Cooperation Agency (JICA)) (April 2002) indicated "economic infrastructure development" as priority area for

[7] RUPTL 2015-2024 states that the power demand is expected to increase from 165TWh in 2015 to 324TWh in 2024, growing at an average rate of 7.8% per year.

assistance in Indonesia. In addition, Japan Bank for International Cooperation (current JICA) stated in its Country Assistance Strategy for Indonesia (prepared in November 2002) to support sector reform as well as to cope with development needs with high urgency such as resolving economic bottlenecks for the country's sustainable economic growth. At the time of appraisal, there was a fear of tight power supply in the Java-Bali system, and improvement of supply and demand balance was urgently needed. The project objective to provide basic support to develop new power source until new investments for power development can be recovered using PLN's own fund and through private enterprises, and to contribute to the increase of reserve margin was consistent with the above policy.

This project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The project developed a 1:1:1 structured combined cycle power generation as Block 5,[8] consisting of one gas turbine generator, one steam turbine generator and one heat recovery steam generator in the existing Muara Tawar power complex.[9] Table 2 shows the comparison of planned and actual project outputs.

Table 2: Comparison of Planned and Actual Project Outputs

Plan	Actual
Civil Works, Procurement of Equipments etc. (EPC Contract Related to Power Plant Construction)	
・ Construction of one gas turbine generator (150 MW class×1unit)	・ As planned
・ Construction of one steam turbine generator (75 MW class×1)	・ As planned
・ Construction of one heat recovery steam generator	・ As planned
・ Increase/extension of common facilities that need for adding on the gas fired combined cycle system (gas supply facilities, 500kV switchyard etc.)	・ As planned
・ Related civil works and construction works	・ As planned

[8] <Background information regarding the project scope> Originally, the government of Indonesia made project quest to the Japanese government to convert the existing Block 2 power plant to a 3:1:3 structured combined cycle power generation, consisting of three gas turbine generators, one steam turbine generator and three heat recovery steam generators. However, during project preparation process, it became clear that among three gas turbine generators of Block 2, one had been relocated to Bali, and the other had been out of order. Therefore, considering the situation, the executing agency dropped the Block 2 conversion plan. Alternatively, the plan was changed to build a combined cycle power generation as new Block 5, consisting of one gas turbine generator, one steam turbine generator and one heat recovery steam generator, next to the existing Block 3 and 4 power plants. Project appraisal was conducted based on the revised project scope and the Japanese ODA loan agreement was concluded accordingly.

[9] The existing Muara Tawar power plants are Block 1-4.

	・ Additional scope: Installation of Continuing Emission Monitoring System (CEMS)
Consulting Services	
・ Detail design, assistance in tendering, construction supervision, inspection, testing, and delivery control during manufacturing, support in operation and maintenance during project period, assistance in environmental management, transfer of technology, training etc.	・ As planned ・ Additional scope due to installation of CEMS

Source: Results from questionnaire survey of executing agency

As regards civil works and procurement of equipments, installation of Continuing Emission Monitoring System was added to the scope. The system measures and monitors composition, density and emission amount of exhaust gas. According to the executing agency, this additional scope was due to the newly enforced regulation[10] of the Ministry of Environment in Indonesia. There was additional scope for consulting services as a result of installing Continuing Emission Monitoring System. The additional output is deemed appropriate, commensurate with inputs, in light of the objective to reduce environmental burden in accordance with the regulation of the Ministry of Environment. Other outputs were as planned – no other output change has observed.

As regards inputs of consulting services, total inputs have significantly increased as shown in Table 3.

Table 3: Comparison of Planned and Actual Inputs of Consulting Services

(Unit: M/M)

	Plan	Actual	Comparison
International Consultants	218.5	341.71	Increased by 123.21
Local Consultants	302.5	335.87	Increased by 33.37
Total	521.0	677.58	Increased by 156.58

Source: Results from questionnaire survey of executing agency

According to the executing agency, significant increase of inputs of consulting services (man-month) took place due to the delay of engineering, procurement, and construction contract (hereinafter referred to as “EPC contract”) and delay of full site handover due to land acquisition and resettlement which were not expected at the time of appraisal (delay

[10] Regulation of the Ministry of Environment No. 21 /2008, Clause 9, Article No.1

prior to construction). (Man-month increased because consultants were on board including the period of project delay). Although the situation can not necessarily be regarded as efficient, it was deemed unavoidable from the viewpoint of securing quality of project implementation.

Facility Containing Gas Turbine Generator

Heat Recovery Steam Generator

Exciter and Generator

Switchyard

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was initially planned to be 21,414 million yen (out of which 18,182 million yen was to be covered by Japanese ODA loan). In actuality, the total project cost was 28,681 million yen (out of which 16,526 million was covered by Japanese ODA loan),

which is higher than planned (133.9%[11] of the planned amount).

The project cost increased mainly due to increase in the price of gas turbine by the rise[12] in steel materials price on a global basis as well as input cost increase due to significant increase in consulting service man-month. Project cost overrun was already assumed at the time of the conclusion of the EPC contract. While power supply and demand in Indonesia was tight, the executing agency made judgment that it could not accept further delay of the project (by rebidding etc.), but decided to bear the project cost overrun. With such premise, JICA concurred the conclusion of the EPC contract.

3.2.2.2 Project Period

The overall project period was planned as 75 months, from March 2003 (conclusion of Loan Agreement) to May 2009 (completion of warranty period) as opposed to 112 months in actuality, from July 2003 (conclusion of Loan Agreement) to October 2012 (completion of warranty period), which is longer than planned (149.3% of the initial plan). Loan period was extended due to project delay – loan extension was made on February 2012, resulting in the final loan expiry on January 2013.

Table 4 shows comparisons of planned and actual project period.

Table 4: Comparison of Planned and Actual Project Period

Item	Plan (At Project Appraisal)	Actual (At Ex-post Evaluation)
Selection of consultants	Apr. 2003 – Mar. 2004 (12 months)	Jul. 2003 – Apr. 2004 (10 months)
Consulting services	Apr. 2004 – May 2008 (50 months)	May 2004 – Oct. 2011 (90 months)
Designing and manufacturing	Apr. 2004 – Jan. 2006 (22 months)	May 2004 – Jun. 2009 (63 months)
Power plant construction	Feb. 2006 – May 2008 (28 months)	Jun. 2009 – Oct. 2011 (29 months)
Start of power generation	Jun. 2008	Oct. 2011
Warranty period	Jun. 2008 – May 2009 (12 months)	Oct. 2011 – Oct. 2012 (12 months)

Source: Information provided by JICA, and results from questionnaire survey of executing agency

Main reasons for project delay were as follows: (1) negotiation with the gas company, revision of gas procurement plan, and conclusion of gas purchase contract took time,[13] (2)

[11] This percentage was calculated by comparing the actual cost after the scope change and the planned cost before the scope change.

[12] While the project delayed – in addition to the delay in EPC tendering process, delay in project site handover occurred due to land acquisition – the gas turbine market soared still more. From 2005 to 2009, the FOB (Free on Board) price of gas turbine increased on the average of about 53%, which became one of the major reasons for the increase in project cost. (Data source: Gas Turbine World.)

[13] <Background/reasons for delay of gas supply> As regards securing gas fuel for the project (Block 5), the executing agency initially planned to supply gas to be extracted from the gas field in South Sumatra where a private energy related company reserved the rights, through South Sumatra-West Java gas pipeline. However,

selection of EPC contractor was delayed, and (3) full site handover was delayed due to land acquisition and resettlement. (See "3.4.2.2 Land Acquisition and Resettlement" under "Impact" section below.) Period for consulting services was extended significantly as a result.

3.2.3 Results of Calculations of Internal Rates of Return (Reference only)

Table 5 shows the result of recalculation of the financial internal rate of return (FIRR).

Table 5: Assumption and Results of FIRR Recalculation

	At Project Appraisal	At Ex-post Evaluation
FIRR	28.5% (before tax) 21.2% (after tax)	24.8% (before tax) 21.0% (after tax)
Benefit	Construction cost (costs incurred to the project including consulting service cost), operation and maintenance cost	Construction cost (costs incurred to the project including consulting service cost and land acquisition cost), operation and maintenance cost
Cost	Revenue from electricity tariff	
Project Life	25 years after project completion	

The FIRRs assessed at the time of ex-post evaluation were lower than those at the time of appraisal. This was primarily because the project period and project cost exceeded the plan.

Both the project cost and project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness [14] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Table 6 summarizes the operation and effect indicators set at the time of appraisal and their actual figures in 2013. (Warranty period was completed in October 2012.) In addition, data of the existing Muara Tawar power plant (Block 1) was added to the table as a comparison of the project (Block 5).

long negotiation broke down without reaching an agreement between the executing agency and the company over risk-taking of the gas pipeline which was under construction. While construction of the gas pipeline completed in August 2008, the executing agency revised the original gas procurement plan, and concluded a gas purchase contract with a state-owned gas enterprise in Indonesia (PGN) in the end. (Gas price that was agreed upon between the executing agency and PGN turned out to be higher than the price at the time of the contract negotiation with the private energy related company.)

[14] Sub-rating for Effectiveness is to be put with consideration of Impact.

Table 6: Operation and Effect Indicators

	The Project (Block 5)			Block 1 Actual (for Reference)
	Baseline Note 1)	Target	Actual	
	2002	2009	2013	2013
	Baseline Year	At Completion of Warranty Period	A Year after Completion of Warranty Period	
Maximum output	—	225 MW Note2)	225 MW Note 3)	681MW
Plant load factor	—	70% or more	85.1%	80.9%
Availability factor	—	83% or more	94.3%	96.8%
Auxiliary power ratio	—	3% or less	1.67%	1.96%
Gross thermal efficiency	—	45% or more	45%	43.1%
Outage hours due to periodic maintenance and inspection	—	1,512 hours or less/year	255 hours/year	258 hours/year
Outage hours due to human error	—	— Note 4)	0	0
Outage hours due to machine trouble	—	— Note 4)	65.6 hours/year	19.0 hours/year
Frequency of outage due to periodic maintenance and inspection	—	1 time/year	1 time/year	0 time/year
Annual power production	—	1,338 GWh/year Note 2)	1,622 GWh/year	4,464 GWh/year

Source: Information provided by JICA, and results from questionnaire survey of executing agency

Note 1) Baseline figures did not exist at the time of appraisal because Block 5 power plant was newly developed power plant

Note 2) Maximum output and annual power production were subject to change due to difference from planned specification as a result of bidding.

Note 3) 234MW in actuality as a result of bidding.

Note 4) Targets were not set at the time of appraisal.

Since the commencement of power plant operation up to the time of ex-post evaluation, the operational condition is satisfactory, generating electricity smoothly. Actual figures in 2013 for the project (Block 5) for all the indicators have reached their targets set at the time of appraisal. While outputs of the power plants (scale of power plans) between the existing one (Block 1) and the project (Block 5) are different, plant load factor, auxiliary power

ratio and gross thermal efficiency for Block 5 have shown better figures compared to those of Block 1.

As regards outage hours due to machine trouble, target was not set at the time of appraisal, but according to the executing agency, both the figure of 65.6 hours/year and the contents of trouble were within the scope of the assumption, not to be regarded as a problem. The power plant has been operating without any trouble after restoration by the executing agency.

The reason why the outage hours due to periodic maintenance and inspection were about one sixth of the target was because of major inspection did not take place in 2013. (Major inspections are to be conducted for every 36,000 hour operation for Block 5. See "Sustainability" section below for detail.)

3.3.2 Qualitative Effects (Other Effects)

Table 7 summarizes the share of installed capacity of the power plant (Block 5) in the entire Java-Bali system and in Jakarta Capital Region, respectively. The power plant has a share of 0.72% in the entire Java-Bali system which is small – that is to say, quantitative contribution in terms of improvement of power supply and demand balance, and increase of reserve margin is very small.[15] In addition, as reference figure, provided that all the electricity from the power plant was supplied to Jakarta Capital Region, the share becomes 3.52% – quantitative contribution of the power plant is also limited.

Table 7: Share of Muara Tawar Gas Power Plant (Block 5)

Installed Capacity for:	Installed Capacity for Muara Tawar Gas Power Plant (Block 5)	Share
Entire Java-Bali System in 2013: 32,450MW	234MW	0.72%
Jakarta Capital Region in 2013: 6,647MW		3.52%

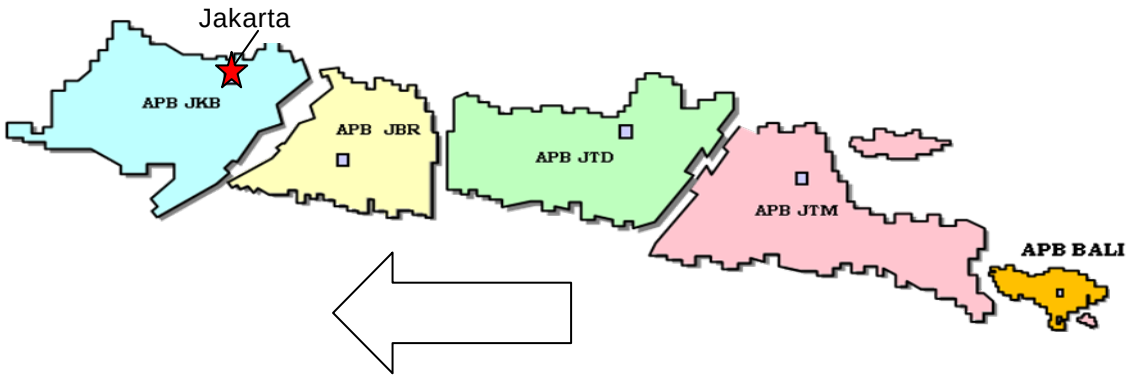
Source: Information provided by JICA, and results from questionnaire survey of executing agency

However, considering that the power plant is located in Jakarta Capital Region, the largest power demand center, it can be said that it plays an extremely important role to

[15] However, it is inferred that the project delay have brought negative effect to the reserve margin in the Java-Bali system to a limited extent. A the time of appraisal, commencement of power plant operation was expected on June 2008, however, due to project delay, operation started in October 2011 in actuality, approximately a little over three years behind the plan. In the mean time, reserve margin for the Java-Bali system changed as follows: 31.4% (2008) ➔ 30.7%(2009 年) ➔ 24.4% (2010) ➔ 34.9% (2011) ➔ 44.4% (2012). In 2010, the figure fell below 25%, necessary level of reserve margin stipulated in RUKN for stable power supply in Indonesia. While the share of the power plant in the Java-Bali system is limited, reserve margin after 2009 could have exceeded a little more than the above figures if project delay did not take place.

reduce power loss and to maintain quality (voltage) of power supply in the Java-Bali system.[16]

Net capacity and load for each of the five business/load dispatch area of the executing agency in the Java-Bali system are shown in Figure 2. Because load (demand) exceeds net capacity in the West Java area (JKB[17]) where Jakarta Capital Region is located, it means that power supply to this area is covered by electricity produced in other areas. The executing agency pointed out that such power interchange beyond business/load dispatch areas would cause voltage drop and power loss[18] in the Java-Bali system and would become a bottleneck for stable and efficient power supply. Hence, the executing agency mentioned that it is important to supply power within the same business/ load dispatch area as much as possible so as to secure stability and appropriate power quality in the entire power system. In this regard, it is extremely significant that the power plant is located in Jakarta Capital Region.



	JKB	JBR	JTD	JTM	BALI
Net Capacity (MW)	9,559	7,445	5,216	8,554	558
Load (MW)	9,778	4,874	3,658	4,982	735

Figure 2: Comparison of Net Capacity of Power Plant and Load by Area in Java-Bali System (2014)

Source: Information provided by executing agency

[16] Among power plants developed by Japanese ODA loan in the same period, this project, " Muara Karang Gas Power Plant Project" and "Tanjung Priok Gas Fired Power Station Extension Project" are located in Jakarta Capital Region, and are playing an extremely important role for stable power supply in Capital Region/West Java Region. There is a shared opinion regarding the significance/importance of these power plants among local experts, World Bank and Asian Development Bank officers in charge of power sector, in addition to officers in the executing agency.

[17] Jakarta and Bandung Load Dispatch Area

[18] The executing agency explained the following as its logic: "When the place for power generation is far from power consuming area (when power transmission distance is long) ➔ electric resistance increases ➔ power loss increases ➔ power voltage reduces."

3.4 Impacts

3.4.1 Intended Impacts

Table 8 shows the electrification rate, SAIDI [19] (power interruption duration per customer per year (minutes)) and SAIFI [20] (power interruption frequency per customer per year) for power plants in the Java-Bali system as data relating to power quality. [21] Data on reserve margin and transmission and distribution losses in the Java-Bali system is also included in the table.

Table 8: Trend of Electrification Rate, SAIDI, SAIFI, Reserve Margin, and Transmission and Distribution Losses in the Java-Bali System

	2008	2009	2010	2011 Note 1)	2012	2013
Electrification Rate (%)	68.0	69.8	71.4	72.3	78.2	83.2
SAIDI for Power Plant (minutes/customer)	4.583	0.614	0.179	0.309	0.076	0.02
SAIFI for power plant (frequency/customer)	1.030	0.247	0.151	0.182	0.04	0.019
Reserve Margin (%)	31.4	30.7	24.4	34.9	44.4	38.8
Transmission and Distribution Losses (%)	13.6	11.2	13.0	9.1	9.3	9.5

Source: Information provided by executing agency

Note 1) Start of combined cycle commercial operation

Since the power plant (Block 5) commenced its operation in October 2011, comparison was made for the Java-Bali system before (before 2010) and after (after 2012) the project. Electrification rates have been increasing steadily. As regards SAIDI and SAIFI for power plant, temporary increase can be seen in 2011 [22], but are generally on a declining trend – when comparing figures in 2010 and 2012, both are definitely decreasing. According to the executing agency, the reason why transmission and distribution losses increased in 2013 was due to little rainfall in general compared to the usual year, which led to decrease in the availability factor of hydroelectric power plants in West Java area, where Jakarta Capital Region is located. This situation impelled the executing agency to interchange power from other areas, which resulted in increase of power loss. The executing agency also explained

19 System Average Interruption Duration Index

20 System Average Interruption Frequency Index

21 SAIDI and SAIFI measure incidence per customer, and (as long as reserve margin is secured) they do not necessarily have direct linkage with Muara Tawar power plant, however, the data is taken up for the analysis on project impact because they have indirect linkage with the impact of the power plant.

22 The reason is uncertain. According to the executing agency, it cannot deny the possibility of data collection and processing error since data collection and consolidation were conducted manually.

that reserve margin in 2013 fell because of increased power demand while new investments of power sources in that year (1,100MW) did not take place as compared to those of the previous year (4,305MW). (See Table 1)

Clear correlation between the above data trend and this project cannot be observed. There may have been a little contribution of the project, however, it is difficult to measure project impact quantitatively by analysing the data trend.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

The project falls under A category of the Guideline for Japan Bank for International Cooperation (current JICA) because it is a development project of a large-scale power plant. At the time of appraisal, the executing agency confirmed its state of environmental procedures, pollution measures, and natural and social environmental considerations, and concluded that there was no problem.

Environmental Impact Assessment Report (ANDAL), Environmental Management Plan (RKL), and Environmental Monitoring Plan (RPL) have been approved by the Ministry of Energy and Mineral Resources on December 14, 1994. After that, ANDAL was revised in accordance with changes in state of land use in the project surrounding areas as well as changes in project plan within the power plant site. The revised ANDAL was approved in May 2003 by Regional Impact Control Board of West Java.

The executing agency conducted environmental monitoring before and during the project as well as after the commencement of operation, and no particular negative environmental impact has been reported at the time of ex-post evaluation. In addition, no negative project effect has been identified from the results of interview with the local residents. The summaries of the monitoring results by the executing agency are as follows.

- Before construction (existing power plant): Monitoring was conducted within the power plant site and the surrounding areas (total of four places).
  - Measurements for ambient air quality were all below the standard.
  - Noise level slightly exceeded the standard in one place.
- During construction (first time): Monitoring was conducted within the project site and the surrounding areas (total of four places).
  - As regards ambient air quality, NO2, SO2, CO, CO2, Pb, H2S, particles (PM10), and TSP were all below the standard.
  - Noise levels were all below the standard.
  - Solid wastes were limited in quantity and were handled appropriately.
  - The results of interview survey with 50 local residents near the project site have shown that 40% of the residents expressed their support to the environmental

improvement which was anticipated after project completion.

- During construction (second time): Monitoring was conducted within the project site and the surrounding areas (total of four places).
  - Measurements for ambient air quality were all below the standard.
  - Noise levels were all below the standard.
  - Solid wastes were limited in quantity and were handled appropriately.
- The latest environmental monitoring results (data on ambient air quality and noise levels) within the project site after the commencement of the power plant (Block 5) operation are shown in Table 9. Monitoring was conducted on September 28, 2014. The executing agency has been conducting environmental monitoring every three months.

Table 9: Environmental Monitoring Results after the Commencement of Operation

Item	Unit	Measurement Record	Standard Note 1)
Ambient Air Quality (24 hours sampling)			
SO_2	$\mu g/Nm^3$	30.61	260
NO_2	$\mu g/Nm^3$	15.27	92.5
CO	$\mu g/Nm^3$	1,305	9,000
TSP	$\mu g/Nm^3$	113.26	230
Pb	$\mu g/Nm^3$	0.02	2
HC	$\mu g/Nm^3$	7.6	160
O_3	$\mu g/Nm^3$	< 8	—
Particles (PM10)	$\mu g/Nm^3$	48.17	150
Particles (PM2.5)	$\mu g/Nm^3$	< 5	65
Noise (recorded on following time)			
7:00	dB	59.5	70
10:00	dB	61.3	70
15:00	dB	61.9	70
20:00	dB	59.9	70
23:00	dB	59.7	70
1:00	dB	59.2	70
4:00	dB	58.8	70

Source: Information provided by executing agency

Note 1) National Standards in Indonesia (Standards in Jakarta Capital Region) [23]

Data on positive impacts on the natural environment (reduction of discharge density of air pollutant) does not exist because the project was a development of new power plant (Block 5) and the fuel used for power generation was natural gas in the first place.

On the other hand, the existing Muara Tawar power plants (Block 1-4) had been installed with dual type turbines, compatible with both gas fuel and diesel oil fuel. Since 2008, these

[23] Standards based on Kep Gub DKI Jakarta Governor Decree No. 551/2001.

existing power plants have converted the fuel from diesel oil to gas in generating power, contributing to the reduction of environmental burdens.

3.4.2.2 Land Acquisition and Resettlement

At the time of appraisal, necessary land had already been acquired, and land acquisition and resettlement were not expected.. However, as a result of survey conducted after the commencement of the project, it became clear that layout problems would occur if land for the power plant were not newly extended. For this reason, the executing agency decided to acquire land.[24] Moreover, the executing agency decided to acquire additional land based on the request from local residents living in adjacent land outside Block 5 extended area to buy their land. Table 10 shows the results of land acquisition.

Table 10: Results of Land Acquisition

Areas of acquisition (for extended areas for Block 5 and for adjacent land outside Block 5)	5.7ha
Removed structures	33
Number of land ownership	228

Source: Information provided by executing agency

The land acquisition process was properly carried out based on the governing Indonesian regulations.[25] Consultations with the affected residents were conducted repeatedly, and no particular problem was pointed out by local residence regarding land acquisition and process for payment of compensation. Residents who needed to be resettled[26] received compensation and desired to move to the nearby land on their own, therefore, development of alternative land was not necessary for the executing agency. According to the interview survey with the residents, resettlement process to the nearby land, including negotiation of compensation of land, took place smoothly after public hearing was conducted by the executing agency. As part of CSR activities of the executing agency, mosques and nursery schools have been constructed near the project site. Among the affected residents, there are residents engaging in duties at the power plant such as cleaning, which has become their income source.

24 Remote cause of land acquisition is the lack of feasibility study of the project in the first place. At the time of appraisal, drawing of the existing power plants (Block 1 and 2) was utilized for the layout plan of the project (Block 5), and the power plant was anticipated to fit in the site. However, after the survey, it revealed that land acquisition was necessary.

25 Governing regulations are Presidential Decree No.36-2005 and No.65-2006 (revised regulation).

26 Although repeated inquiry was made during the local interview survey, the number of resettled households is unknown since the data was not left in the executing agency.

This project has largely achieved its objectives. Therefore effectiveness and impact of the project are high.

Transformer

Water Intake

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The operation and maintenance of the power plant (Block 5) after project completion is undertaken by Java Bali Power Company (hereinafter referred to as "PJB[27]"). PJB is an affiliate company[28] of PLN, the executing agency, and is undertaking operation and maintenance of the existing Muara Tawar power plants (Block 1-4). Performance based contract has been concluded between PLN and PJB, and operation and maintenance budget has been allocated to PJB from PLN based on the contract.

The total number of employees at PJB as of 2014 is 4,417, of which 3,821 are engineers in charge of operation and maintenance. At the time of ex-post evaluation, PJB is in charge of operation and maintenance of 26 power plants including Muara Tawar.

For the purpose of increasing efficiency and performance in its operation, PJB initiated "Integrated Management System" in its organizational management in 2012, which covers human resource management/personnel utilization, management and procurement of maintenance system and spare parts, fuel management, safety management and so on. Under this system, PJB introduced "Maintenance Optimization Program" called "Big O" for efficient operation. According to Muara Tawar power plant staffs, PJB's such management system and the program's way of thinking have penetrated across staffs, and

27 PT. Pembangkitan Jawa-Bali

28 PLN has 47 business units across the country for generation, transmission, transformation and distribution. As regards generation assets and operation and maintenance in the Java-Bali system., two affiliate companies (PJB and PT. Indonesia Power) were divided from the generation section in 1995, and have been promoting efficient operation. (PLN reshuffled its organization in December 2009. The organization used to be siloed into two sections: construction, and sales/administration. The verticals were then reorganized into regional division to assure consistency from planning to procurement, construction, generation, transmission, distribution and sales, to realize more efficient operation.)

instruction system between PJB and the power plant is clear. The organizational structure of Muara Tawar power plant is illustrated in Figure 3.

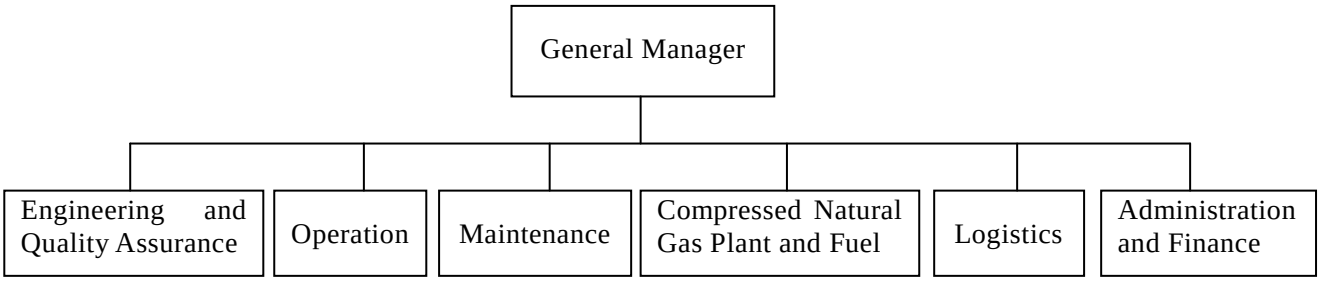


Figure 3: Organizational Structure of Muara Tawar Gas Power Plant

Source: Information provided by executing agency

Under the General Manager, 261 staffs are working in the entire power plant, and of which 72 are engineers. According to power plant staffs, number of engineers necessary for operation and maintenance has been secured. No particular problem has been identified regarding the organizational structures of this power plant as well as PJB which manages the power plant.

3.5.2 Technical Aspects of Operation and Maintenance

Engineers who have gained sufficient experiences through operation and maintenance of the existing power plant are undertaking operation and maintenance work of the power plant (Block 5) after completion of the project. In addition, during project implementation, contractors and consultants have provided necessary training and technology transfer for operation and maintenance of Block 5 power plant to 17 staffs who have been in charge of operation and maintenance of the existing power plant (these include domestic training as well as training and inspection in Japan and in Germany). Also, PJB has prepared work instructions for staffs by adding easy-to-understand explanations to the manuals which contractors had prepared. The manuals/work instructions have been utilized for daily operation and maintenance work as well as periodic inspections. Moreover, on the job training is provided to operation and maintenance staffs. Therefore, it can be observed that technical level of operation and maintenance staffs is sufficient for ordinary maintenance work.

Furthermore, PJB has acquired ISO 90001 (quality management system), ISO 14001 (environmental management system), ISO 55000 (asset management system/risk management system), OHSAS 18001(occupational health and safety management system), and operation and maintenance of Muara Tawar power plant has been taken place in

conformity with these management systems.

Therefore, no particular problem has been identified regarding the technical aspects of operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

The operation and maintenance costs are estimated by Muara Tawar power plant, and the estimation will be reviewed by PLN via UPJB[29] in Yogyakarta, which administers the power plant. The budget is allocated from PLN to the power plant based on the performance based contract between these organizations. Table 11 shows comparison of planned and actual maintenance cost of the power plant (Block 5) after completion of the project. The power plant's maintenance cost has been properly secured, and is well operated and maintained.

Table 11: Maintenance Cost of the Power Plant (Block 5)

(Unit: million IDR)

2012		2013		2014	
Plan	Actual	Plan	Actual	Plan	Actual (up to October)
30,925	— Note 1)	57,316	74,739 Note 2)	57,211	52,398 Note 3)

Source: Results from questionnaire survey of executing agency

Note 1) The reason for the unavailable figure on the actual maintenance cost in 2012 is that contract between PLN and PJB had not been concluded procedurally then, and PLN paid the expense incurred in connection with maintenance. (Maintenance cost including the expense paid by PLN in the previous year has been allocated to PJB in 2013.)

Note 2) The actual allocation in 2013 was below the total amount of budget for 2012 and 2013 because the operation of the power plant was smooth without any problem and thus maintenance cost turned out to be lower than expected.

Note 3) The actual allocation in 2014 was below the budget because the figure was up to October.

When reviewing the overall financial situation of PLN, while electricity sales have been increasing smoothly every year, the organization would become mired in deficits without government subsidy – PLN is supported by a big amount of government subsidy. Based on "Public Service Obligation",[30] PLN has no choice but to sell electricity at the price that is lower than supply cost, and the generated losses have been compensated by the government

[29] Unit Pembangkitan Jawa-Bali

[30] The government subsidy to PLN is stipulated in the Article 66 of the Law on State Enterprises of 2001. (Financial compensation for state-owned enterprises.)

subsidy. Main factors behind the high-cost structure are identified as the high financial burden for fuel and lubricants necessary for power generation, low electricity tariff, and so on. Financial performance and balance sheet of PLN are shown in the tables below.

Table 12: Financial Performance of PLN Note 1)

(Unit: billion IDR)

	2010	2011	2012	2013
Sale of Electricity	102,974	112,845	126,722	153,486
Government's Electricity Subsidy	58,108	93,178	103,331	101,208
Other Revenues	1,293	1,995	2,604	2,711
Total Revenues	162,375	208,018	232,656	257,405
Fuel and Lubricants	84,190	131,158	136,535	147,634
Maintenance	9,901	13,593	17,567	19,839
Personnel	12,954	13,197	14,401	15,555
Other Operating Expenses Note 2)	42,062	27,692	34,612	37,883
Total Operating Expenses	149,108	185,640	203,115	220,911
Income Before Financial and Other Items	13,267	22,378	29,541	36,493
Net Financial and Other Items Note 3)	-1,861	-16,863	-28,509	-75,715
Tax Benefit	-1,313	-89	2,174	9,654
Income (Loss) for the Year and Total Comprehensive Income	10,093	5,426	3,206	-29,567

Source: PLN Annual Report

Note 1) Partial inconsistency of figures exists due to rounding error

Note 2) Power Purchase, Depreciation of Fixed Assets etc.

Note 3) Tax Revenue and Cost, Foreign Exchange Profit and Loss etc.

Table 13: Balance Sheet of PLN Note 1)

(Unit: billion IDR)

	2010	2011	2012	2013
Total Assets	406,100	476,453	549,376	595,877
Total Noncurrent Assets	361,327	409,530	472,066	511,040
Total Current Assets	44,773	66,923	77,310	84,837
Total Equity and Liabilities	406,100	476,453	549,376	595,877
Total Equity	142,114	154,683	159,270	133,232
Total Noncurrent Liabilities	208,590	258,219	315,503	374,331
Total Current Liabilities	55,397	63,550	74,603	88,315

Source: PLN Annual Report

Note 1) Partial inconsistency of figures exists due to rounding error

PLN aims to reduce government subsidies, raise the electricity tariff, increase self-financing ratio, and introduce private fund aggressively, in order to improve its financial and management conditions. Electricity pricing is a decision matter of Indonesian government, which is out of control of PLN, though the government has been expanding

customer categories introducing floating tariff as a direction of reform.[31] Furthermore, PLN has been producing corporate bonds, and the ratings by the credit rating agencies have been good.[32] However, government's subsidy may increase in the future considering the government's policy to improve electrification ratio of the entire country – electric power sales to unprofitable customers, the households with little power consumption, are expected to increase, and this would raise government's subsidy. For this reason, PLN has aimed to increase efficiency through converting diesel and oil to high efficiency coal, gas, geothermal, developing more efficient power generation facilities, decreasing transmission and distribution losses and so on to reduce power cost and to decrease government's subsidy. Table 14 shows the projected electrification ratio, number of residential customers, and transmission and distribution losses in the entire country.

On the other hand, such PLN's financial situation will not directly affect the project because, as mentioned above, maintenance cost for the power plant (Block 5) has been appropriately financed and the power plant has been well operated and maintained. Therefore, no particular problem has been identified regarding the financial aspects of operation and maintenance.

Table 14: Projected Electrification Ratio, Number of Customers (Residential), and Transmission and Distribution Losses in Indonesia

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Electrification Ratio (%)	87.7	91.3	93.6	95.7	97.4	98.4	98.9	99.1	99.3	99.4
Number of Customers – Residential (million) Note 1)	56.0	59.1	61.3	63.5	65.4	66.8	67.9	68.7	69.5	70.3
Transmission and Distribution Losses (%)	6.72	6.68	6.61	6.57	6.51	6.48	6.46	6.44	6.42	6.40

Source: PLN

Note 1) According to PLN, most are households with little electricity consumption.

[31] The Ministry of Energy and Mineral Resources has indicated to introduce floating tariff for electricity in 12 customer categories out of 17 in total, which would not be eligible for government's electricity subsidy. This measure is based on the Presidential Decree No. 31 in 2014 to increase the number of customers who pay their electricity consumption based on floating tariff, in accordance with the market price. In fact, major electricity customers for industry were added as the target for this floating tariff from January 1, 2015. Fixed tariff will be maintained as before to households with little power consumption, commercial facilities and industries with less than a capacity of 200kVA. (Source: "Jakarta Shimbun", dated December 6, 2014.)

[32] Ratings as of the end of December, 2013 were as follows: Moody's: Baa3 stable, Standard & Poor's: BB, Fitsch: BBB-. (Source: PLN Annual Report.)

3.5.4 Current Status of Operation and Maintenance

The power plant facilities (Block 5) have been maintained well and operated smoothly. Maintenance activities (maintenance and inspections) have been conducted appropriately and no particular problem has been observed. Concretely, daily maintenance, periodic maintenance (weekly, monthly, every two months, and quarterly maintenance), condition based maintenance, corrective maintenance, preventive maintenance, and predictive maintenance activities have been conducted on site. As mentioned above, "Maintenance Optimization Program" has been introduced, and the executing agency aims to reduce accident ratio and to increase efficiency of the entire operation through raising the share of preventive maintenance (periodical cleaning, exchange of filters, inspection of various facilities etc.) and predictive maintenance (prevention of power plant's overheating and abnormal vibration by analyzing the past records). Inspections are conducted for every 9,000 hours of operation and major inspections for every 36,000 hours of operation.

As regards spare parts, PJB has introduced "Supply Chain Management System" in 2002 with the aim to realize automatic management of inventory system. Muara Tawar power plant has also adopted this system and has been securing necessary spare parts on a timely basis. Concretely, spear parts have been categorized A, B, and C, based on their importance,[33] and the power plant staffs are automatically reminded of necessary spear parts to be refilled, based on the inventory status and predicted period of time for the spear parts to be actually procured.

As regards gas fuel, PLN has concluded contracts with several gas supply companies to secure necessary gas. Table 15 summarizes the actual and projected gas fuel supply and demand for the entire Muara Tawar power plant including this project (Block 5).

Therefore, no particular problem has been identified regarding the current status of operation and maintenance.

Table 15: Actual and Projected Gas Fuel Supply and Demand for Muara Tawar Power Plant

Note 1), 2)

(Unit: BBTUD)

	2011	2012	2013	2014	2015	2016	2017	2018
Total Demand of PLTGU Muara Tawar	125	161	150	183	211	217	215	213
Total Gas Supply	147	182	180	264	213	217	217	219
Pertamina	35	31	25	24	20			

[33] In case spear parts have not been procured in a timely manner, lack of A category spear parts would cause highly serious problems such as blackouts, lack of B category spear parts would cause temporary problems such as power output losses, and lack of C category spear parts would cause some problems but not to the point of affecting power outputs.

PGN	113	109	125	161	41	41	41	41
Medco					43	33	25	19
Jambi Merang		42	30	20	35	35	35	35
PHE						25	25	25
Swap Premier				4	5			
FSRU Lampung				55	68	83	91	99

Source: Results from questionnaire survey of executing agency

Note 1) Partial inconsistency of figures exists due to rounding error

Note 2) Actual figures for the year 2011 to 2014, and projection for the year 2015 to 2018.

No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project developed a new gas-fired combined cycle power plant in the existing Muara Tawar power complex with the aim of improving power supply and demand balance as well as improving stability and maintaining quality of power supply in the Java-Bali system. The project objective – to meet increasing power demand from both quantity and quality viewpoints by providing basic support to develop new power source until PLN and private enterprises can make on investment in power generation – is consistent with Indonesia's energy/power policy and with the development needs, as well as Japan's ODA policy; thus, the relevance of the project is high. All the Operation and Effect Indicators set at the time of appraisal have been achieved against the target figures after the commencement of power generation. It is worthy of special mention that the project is located in Jakarta Capital Region where there is a greatest demand of electricity, and is playing an important role to reduce power loss and to maintain quality (voltage) of power supply in the Java-Bali system. The power plant has been operating smoothly and project effects have appeared as planned; thus, the project's effectiveness and impact are high. No negative impact on natural environment has been pointed out. Land acquisition and resettlement which were not expected at the time of appraisal took place, however, the process was properly carried out in accordance with the governing Indonesian regulation and no particular problem has been pointed out. Both the project cost and project period exceeded the plan though not significantly; thus, efficiency of the project is fair. No major problem has been observed in the institutional, technical and financial aspects of the operation and maintenance system; thus, sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

The importance of the executing agency's cross-sectoral and comprehensive risk analysis regarding fuel supply as well as proactive sharing and consultation of its results with the central government in consideration of facilitating cross-ministerial coordination

The delay of gas supply was one of the main reasons for the project delay. The executing agency had initially planned to supply gas from the gas field in South Sumatra for which an affiliated private energy company reserved the concession, through South Sumatra-West Java gas pipeline to the plant. However, long negotiation failed to reach an agreement between the executing agency and the company over risk-taking of the gas pipeline which was under construction. While construction of the gas pipeline was completed in August 2008, the executing agency revised the original gas procurement plan, and concluded a gas purchase contract with a state-owned gas enterprise in Indonesia (PGN) in the end. If the executing agency had been more risk-conscious at an early stage and undertaken sufficient analysis from cross-sectoral and comprehensive perspectives on risk associated with prolonged contract negotiation with the private energy related company to the project and power supply to the Java-Bali system (possible risk that may occur from project delay and delay of commencement of power supply as a consequence), then it could have sought to secure project implementation by considering and adopting alternative options before contract negotiation was extended for a long period of time. In other words, the executing agency could have: (1) conducted sufficient risk analysis regarding possibility of prolonged contract negotiation with the private energy related company, (2) communicated with the central government (Ministry of Energy and Mineral Resources) on the results of analysis, and (3) considered alternative measures to secure fuel for the project and urged the central government to do the necessary cross-ministerial coordination in a timely manner. In view of the above, it is critical that the executing agency extensively conducts cross-sectoral and comprehensive risk analysis on fuel supply, urges the central government based on the analysis as required, and encourages the government to take appropriate actions including cross-ministerial coordination. The above lessons learned should be considered applicable

to PLN’s other thermal power plant development projects.

<For reference>

The executing agency of the project has set up a “Risk Management Division” in December 2009, thereby establishing a system to conduct cross-organizational and comprehensive risk analysis from technical and operational perspectives. Risk management unit existed before then, however, its function had been limited to reviewing decisions made by the board, and in-depth, and comprehensive analysis on the executing agency’s company-wide corporate risk had not taken place.

4.4 Others

In relation to this project, JICA decided to take measures[34] against the main contractor as they admitted their involvement in bribery.

End

[34] http://www.jica.go.jp/english/notice/150209_01.html

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs	1) Civil Works, Procurement of Equipments etc. ・ Construction of one gas turbine generator (150 MW class×1unit) ・ Construction of one steam turbine generator (75 MW class×1) ・ Construction of one heat recovery steam generator ・ Increase/extension of common facilities that need for adding on the gas fired combined cycle system (gas supply facilities, 500kV switchyard etc.) ・ Related civil works and construction works 2) Consulting Services ・ Detail design, assistance in tendering, construction supervision, inspection, testing, and delivery control during manufacturing, support in operation and maintenance during project period, assistance in environmental management, transfer of technology, training etc.	1) Civil Works, Procurement of Equipments etc. ・ As planned ・ As planned ・ As planned ・ As planned ・ As planned ・ Additional scope: Installation of Continuing Emission Monitoring System (CEMS) 2) Consulting Services ・ As planned ・ Additional scope due to installation of CEMS
2.Project Period	Mar. 2003 – May 2009 (75 months)	Jul. 2003 – Oct. 2012 (112 months)
3.Project Cost Amount paid in Foreign currency	15,617 million yen	24,153 million yen
Amount paid in Local currency	5,797 million yen (446,077 million IDR)	4,528 million yen (371,003 million IDR)
Total	21,414million yen	28,681million yen
Japanese ODA loan portion	18,182million yen	16,526million yen
Exchange rate	1 IDR=0.013 yen (November 2002)	1 IDR=0.012 yen (November 2006)

[END]