Republic of Indonesia

Transmission Line Construction Project in Java-Bali (I), (II), and (III)

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Field Survey: February 2009

1. Project Profile and Japan's ODA Loan

Map of project area

Depok III substation

1.1 Background

In 1995 at the Java-Bali Grid, which supplies power to Java Island and Bali Island in Indonesia, growth in annual power demand was at a record high—well over 10%—as a result of rapid economic development. Power demand has increased to about 80% of the entire power demand in Indonesia, and the country had previously planned to enhance their power generating infrastructure to 20,000MW by 2005 in order to meet this growth. Nearly 50% of the power demand distribution for the Java-Bali Grid is concentrated in West Java, where Jakarta, the capital city of Indonesia, is located. However, the power source in the West is incapable of supplying sufficient power to the area, while the capacity of the power source in the East is more than enough.[1] It was thought that this geological imbalance would continue or even worsen in the future.

Until now, the Java-Bali Grid has used an ultrahigh voltage transmission system that crosses east-west on the Northern Coast. Nonetheless, it is vital to further expand the capacity of the power grid in considering power-generating infrastructure improvement projects and the growth in power demand.

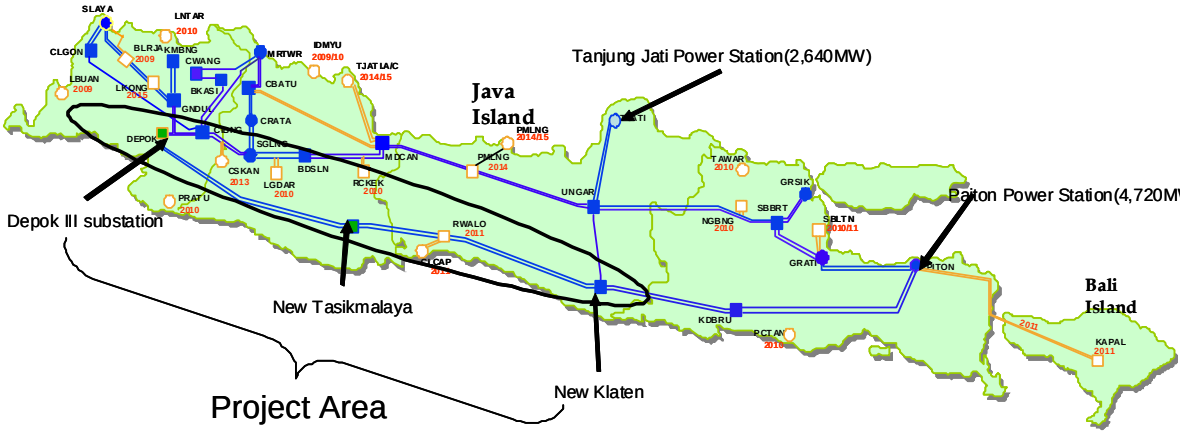
This project aims to ensure an effective power transmission system for the area of power consumption that lies in the East/Central region and Western region of Java Island. This would be done by reinforcing the 500kV transmission line installed east to west along the South coast of Java Island, thereby boosting the stability and reliability of the transmission system.

[1] Major power sources have been constructed in Eastern and Western Java, including the country's largest power plants: Paiton Coal-Fired Power Plant (4,720MW) and Tanjung Jati Coal-Fired Thermal Power Station (2,640MW).

1.2 Objective

The objective of this project is to secure efficient and stable transmission of power and improve the geological imbalance in power supply and demand, and thereby contribute to cover the rapid growth of power demand at the project site. The project consists of construction of a 500 kV transmission line between the Paiton substation on the east coast of Java and the Depok III on the outskirts of the state capital, in addition to construction of related substations. The east coast of Java Island has abundant power sources and Jakarta is in the major power-consuming area. This project shall thereby help promote industrial development in the area and improve living conditions for local residents.

Fig 1 Overview of the Java-Bali Grid and project area



Source: Created based on data provided by the State Electricity Company (PT. PLN)

1.3 Borrower/Executing Agency

Borrower: Republic of Indonesia

Executing agency: State Electricity Company (Perusahaan Listrik Negara, PT. PLN)

1.4 Outline of the Loan Agreement

Approved Amount/Disbursed Amount	Total: 30,795 million yen/20,563 million yen Phase I: 17,037 million yen /16,261 million yen Phase II: 2,840 million yen/1,638 million yen Phase III: 10,918 million yen /2,664 million yen
Exchange of Notes/Loan Agreement	Phase I: December 1995/ December1995 Phase II: December 1996/December 1996 Phase III: November 1997/January 1998

Terms and Conditions	Phase I: Interest rate: 2.5% Phase II: Interest rate: 2.7% Phase III: Interest rate: 2.7% Consultant Services: Interest rate: 2.3% Repayment period (Grace Period): 30 years (10 years), General untied
Final Disbursement Date	Phase I: June 2006 Phase II: June 2005 Phase III: November 2005
Main Contractors (Over 1 billion yen)	Asea Brown Boveriaktiengesellschaft (Germany) /Balfour Beatty Group Ltd. (UK), PT. Balfour Beatty Sakti (Indonesia) / PT. Multifabrindo Gemilang (Indonesia), Alstom T&D SA (France), and Mitsubishi Electric Corporation
Main Consultant (Over 100 million yen)	Newjec Inc., PB Power Ltd. (UK), PT. Connyusa Energindo (Indonesia), PT. Trimitra Nusa Engineering (Indonesia)
Feasibility Studies, etc.	

2. Evaluation Results (Rating: B)

2.1 Relevance (Rating: a)

2.1.1 Relevance at Appraisal

For the sixth Five-Year Development Plan (1994-1998), the original target was to improve the reliability of the power supply and develop power sources based on state policy, which aimed to create a post-petroleum paradigm. Consequently, power source development and construction of a transmission line were planned based on the abundance of resources in each area. Actually, power demand for the Java-Bali Grid at the time of appraisal was increasing by 10% annually (1991-1995); therefore, development of power sources and improvement of the distribution grid were indispensable to meet rapidly increasing power demand.

Further, the Java-Bali Grid suffered from an imbalance in supply and demand between the Eastern/Central region and Western region (See 1.1 “Background” for details). Therefore, improvement and expansion of an efficient power grid between east and west was urgent. This project was therefore highly relevant.

2.1.2 Relevance at Ex-Post Evaluation

The current Yudhoyono administration is carrying out a policy to improve investment conditions and build infrastructure under the National Mid-term Development Plan (RJPM Nasional 2004-2009), which calls for state development through economical, political, social, and legal reform. As part of this policy, the administration has also prioritized infrastructure development as a key policy for stabilizing power supply. The ongoing policy of the General National Power Plan (RUKN), designed to put the RJPM Nasional in more concrete terms, emphasized the necessity of further expansion in power generation and the power grid. Actually, the government of Indonesia plans to invest 7.68 billion dollars over the next decade to expand power generation capacity and the power grid in order to meet ever-increasing power demand.

As a matter of fact, growth in power demand for the Java-Bali Grid, although the growth turns slower, has continued to grow at an annual rate of 3 to 5% since project appraisal.

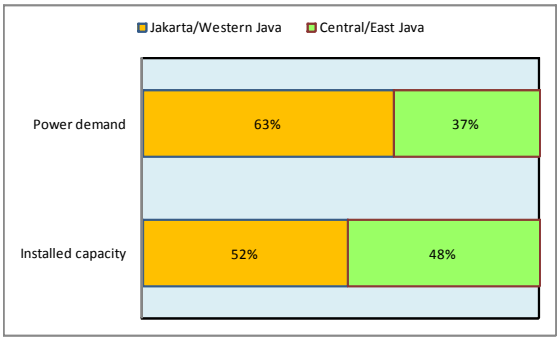
Table 1 Trend in power demand for the Java-Bali Grid

		2004	**2005**	**2006**	**2007**	**2008***
Installed capacity	MW	19,466	19,466	22,126	22,236	22,296
Net capacity	MW	15,741	15,741	17,960	20,309	20,369
Gross peak load	MW	14,920	15,359	15,954	16,840	16,892
Net peak load	MW	14,398	14,821	15,396	16,251	16,301
Growth rate	%	5.2	2.9	3.9	5.6	0.3

Source: The Electrical Power Supply Business Plan (RUPTL) 2009-2018

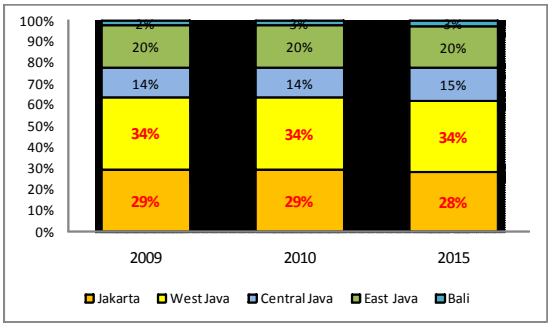
Further, imbalances in power supply and demand between the Eastern and Western regions still remain. Although the power source distribution ratio is balanced between the Eastern/Central region and the Western region, power demand in the Jakarta metropolitan area and West Java is believed to account for more than 60% of the entire Java-Bali Grid, even looking ahead to the period up to 2015. Fig. 2 shows the ratio between power demand and installed capacity allocated in the metropolitan area, West Java, Central Java, and Eastern Java. In contrast to the metropolitan area and Western region (which accounts 63% of whole consumption), installed capacity is nearly balanced between the metropolitan/Western region and Central/Eastern Java, suggesting an imbalance in supply and demand. Also, as Fig. 3 shows, the outlook for power demand through 2015 assumes that this imbalance will continue for quite a while.

Fig 2 Supply/demand balance between regions



Source: Created based on data provided by PLN

Fig 3 Outlook for power demand for the Java-Bali Grid by region



Source: The Electrical Power Supply Business Plan (RUPTL) 2009 - 2018

As described above, the imbalance between power source distribution and power demand remains unsolved in the face of ever-increasing power demand. Therefore, the importance of a trunk power grid remains high for supplying power from the Eastern region to the Western region.[2]

This project has been highly relevant with Indonesia's national policies and development needs at the time of both appraisal and ex-post evaluation.

2.2 Efficiency (Rating: b)

2.2.1 Project Outputs

Table 2 shows the plan and actual output of this project. Major changes are as described below:

(1) Installation of a 500kV transmission line: total length of the transmission line was changed and additional materials were procured. This was due to a change in the installation route.

(2) Construction of Rawalo Baru substation: cancelled

(3) Construction of 150kV transmission line: cancelled

[2] According to a PLN deputy director in charge of construction management, power supply to Western Java is a one of the most pressing issues for the Java-Bali Grid. Therefore, the project contributing to South route improvements in response to further increases in power demand in the near future was extremely vital in terms of ensuring the stability of the power supply.

Table 2 Original/Actual Outputs

Output	Original	Actual
(1) 500kV transmission line		
1) New Klaten through New Tasikmalaya	296km(double circuit)	304km(double circuit)
New Klaten thourhg New Rawalo Baru	195km(double circuit)	195km(double circuit)
Rawalo Baru through New Tasikmalaya	111km (double circuit)	109 km (double circuit)
2) New Tasikmalaya through Depok III	255km(double circuit)	272 km (double circuit)
3) Depok III substation leading wire		(Total of Phases I~III)
Portion for Phase I	1km (double circuit)	3.5km (double circuit)
Portion for Phase II and III	15km (single circuit)	
4) New Bahatt substation leading wire	2km (double circuit)	2km (double circuit)
(2) 150kV transmission line		
New Tasikmalaya substation through Tasikmalaya substation	25km (double circuit)	Cancelled
New Bahatt substation through Bahatt substation	25km (double circuit)	Cancelled (Both were built with self fund of Indonesian government)
(3) Substation		
Depok III substation (newly built)	Newly built	Same as planned
Rawalo Baru substation (newly built)	Newly built	Cancelled
(4) Consulting Services	Total: 526M/M International consultants: 200M/M Local consultants: 326M/M	Total: 683M/M International consultants: 288M/M Local consultants: 395M/M

Regarding the 500kV transmission line, core portion of this project, was modified due to changes in installation route (See 2.2.2 “Project period” for details). This change was caused by stagnation lf

land acquisition negotiations and resulted in a slight increase in the length of the transmission line as well as procurement of extra equipments, such as tower type and the additional length of power lines.[3] In addition to these changes, construction of the Rawalo Baru substation and 150kV transmission line was cancelled.

The Rawalo Baru substation was originally designed to receive the power from the Cilacap power plant (IPP), which was supposed to be constructed. However, in accordance with the delay of the plant, the construction of the substation under this project was cancelled. The 150kV transmission line was excluded from the scope of the project and later executed using PLN's own funds.

The quantity of consultant service increased by 30% due to delays in the construction schedule, protracted acquisition of land and right-of-way, as well as changes on the transmission line installation route.

Fig 4 The 500kV transmission line installed through the project

Fig 5 Depok III substation control center

2.2.2 Project Period

The planned project period was delayed and much longer than planned: the December 1995–August 2000 (57 months) plan ended up being carried out from December 1995 through November 2006 (132 months/232% of planned period). The reasons for the delay were on both delays in procurement process before commencement and delays in implementation process. Detailed information on the delays follows:

(1) Delays in procurement process: December 1995 through December 1999 (49 months)

Although the loan agreement of Phase I project was signed in 1995, due to the significant delay on procurement process, actual procurement was executed at the same time as the Phase II project. The

[3] The original plan for the 500kV transmission line was to improve one of two lines during Phase I and improve the remaining line during Phase II. However, when ODA agreement for Phase II was made, procurement of the equipment necessary for Phase I was not yet complete. Therefore, the two phases were executed simultaneously as a construction project for two 500kv transmission lines.

primary reasons for the delays were as follows:

1) Delays in the tender evaluation process due the Asian economic crisis of the late 1990s
2) Change in project scope due to revised power supply plan
3) Re-execution of tender due to price fluctuation following the economic crisis

Since the delays explained above were caused by uncontrollable external factors such as economic crisis, they can be considered unavoidable.

(2) Delays in construction schedule (construction period: January 2001 to November 2006 (71 months))

Actual construction started in 2001. However, the construction schedule was delayed due to the long and tough negotiations for land acquisition and compensation for ROW[4] for the transmission line and towers of the transmission line, and subsequent redesigning of the installation route, and construction of additional transmission towers. The major reason for the difficult negotiations was failure to reach agreement with landowners over the amount of compensation for land and ROW. Particularly with a certain area near New Klaten[5], local residents refused to have the transmission line cross over the land worshiped historically and religiously. The PLN had to design an alternative route to get around the particular area, causing further delays in design and transmission tower construction. Moreover, land acquisition negotiations for constructing a transmission tower near the Depok III substation (equivalent to about 5% of all acquired land) also ran into trouble due to interference from local residents opposed to the construction. Because of this, the contractor was not able to investigate the site. Now, a very limited number of residents (13 out of 50,000 families) remain in opposition to the site and to ROW acquisition negotiations.

[4] Abbreviation of "Right of way"
[5] Planned construction site near New Klaten (4.5% of the entire land), approximately 206km (equivalent to 70% of the project area

Fig 6 Bypass route site

Fig 7 Current status of a site where no right-of-way was acquired

Reference: Current right-of-way negotiation status (as of February 2009)

- As of February 2009, thirteen families still refused to accept compensation for ROW. Another 50,000 families have already received compensation and reached agreement.
- The thirteen families demanded nearly 100 times more compensation than normal. However, at present it is believed that they will not resort to extreme behavior such as destruction of the transmission line and/or transmission tower. Since the PLN has adhered to legally-valid compensation (10% of the assessed value of the land), it is highly unlikely that agreement will be reached.
- Investigation conducted during site inspection revealed a fact that opposition figures refused to cut coconut trees growing directly beneath the transmission line. Not only that, they are planting new coconuts and other plants. According to the PLN, the newly planted trees are also subject to compensation; therefore, there are some residents who have tried to get compensation by newly planting trees in this area as well as in other parts of Indonesia.

2.2.3 Project Cost

In spite of delays in the construction schedule and an increase in site acquisition, the total final project cost was 34,111 million yen (including an ODA loan of 20,563 million yen). This was lower than planned, amounting only about 76%[6] of the original estimation at the time of appraisal (45,021 million yen). The major causes affecting the change in project cost were as follows:

(1) Cost reduction due to changes in materials and equipment and a switch in procurement of some equipment to domestic products

[6] Rigorous calculations that take scope modifications into account show that the actual figure becomes 86%, under the following conditions: 39,644 million yen set as the total project cost and deducting the cancelled Rawalo Baru substation construction costs (planned project cost: 5,377 million yen) from the total project cost at the time of examination.

(2) Cost reduction in the local currency portion due to the rupiah depreciation (at the time of appraisal, 1 rupiah was equal to 0.046 to 0.052 yen (fluctuated during Phases I–III). The average rate during execution of the project was 0.0126 yen (2001 through 2006))

(3) Cancellation of Rawalo Baru substation construction (project cost estimated at the time of appraisal: approximately 5,377 million yen)

Although the project cost was lower than planned, the project period was much longer than planned; therefore, the evaluation for efficiency is moderate.

2.3 Effectiveness (Rating: a)

2.3.1 Operational status of project area

Major operation indicators of the system are as follows:

Table 3 South route of the Java-Bali Grid: Major operation indicators

Indicator	2006	2007	2008	2009
(1) Utilization factor(%)				
1) New Klaten - Tasikmalaya	37.8	74.8	85	N/A
2) Tasikmalaya －Depok III substation	N/A	60.5	78.9	N/A
(2) Voltage drop at end user (%)	4.3%	2.9%	3.2%	N/A
(3) Outage times (times/year)				
1) New Klaten - Tasikmalaya	10	8	7	N/A
2) Tasikmalaya －Depok III substation	12	2	6	N/A
(4) Transmission Loss (%)				
1) New Klaten - Tasikmalaya	0.33%	0.42%	0.85%	0.85%
2) Tasikmalaya －Depok III substation	0.04%	0.05%	0.07%	0.10%

Source: PLN

Note: Utilization factor= (annual gross hour - (mechanical down time + scheduled down time))/per annum gross hour

Note: 2009 figures are interim figures before April

The utilization factor has been improved year by year, and in 2008 it reached approximately 80%. Although the PLN has not achieved their target of 90%, the availability factor remains stable. According to the PLN, the availability factor will be improved as an investment program for transformers and other equipment advances. For voltage drop, it remains stable, as it stays within ± 5% of the PLN standard. Since the transmission loss rate of the project area also remains steady at less than 1%, the operational status of the power transmission system can be evaluated as good in

terms of efficiency and stability.

2.3.2 Contribution to the efficiency of the whole Java-Bali Grid

(1) Operational status for the entire system

Transmission loss rate for the entire grid has improved by the completion of the project in 2006. At present, there is an increase in the load factor and loss rate following constant growth of power demand, while transmission loss rate stays below the level before project implementation.

Table 4 Operational status of the entire Java-Bali Grid

	2004	2005	2006	2007	2008
Load factor	73.0%	75.5%	75.6%	80.0%	80.1%
Transmission loss rate	2.31%	2.22%	2.11%	2.13%	2.15%

Source: The Electrical Power Supply Business Plan (RUPTL) 2009-2018

Table 5 shows record of outage-related indicator for the entire grid, suggesting that the PLN has accomplished their target. Therefore, the operational status of the entire grid can be evaluated as good.

Table 5 Operational status of the Java-Bali Grid transmission line/transformer (2008)

Indicator	Unit	Target	Actual
Duration of blackout per 100km	hours/100km	9.62	9.65
Transformer downtime	hours/1 unit	6.54	3.86
Number of blackouts per 100km	time/100km	1.82	1.35
Frequency of transformer rest	time/1 unit	0.31	0.17

Source: PLN

In addition, the project contributed to reducing the reserve margin of the system to 34%—a rate that had reached 50% in 2000—by boosting transmission volume from the Central/Eastern region to the Western region. This also suggests that a more effective power supply system was established by enabling the utilization of excess generating capacity in the Central/Eastern region as power source for the Western region.

Table 6 Trend in power demand for the Java-Bali Grid

Indicator	2006	2007	2008
Installed capacity (MW)	22,275	22,385	22,445
Net installed capacity (MW)	18,402	20,559	20,309
Aggregate demand (GWh)	101,661	107,975	110,354
Gross generation (GWh)	105,727	112,294	114,769
Reserve margin (%)	41	34	34
Peak demand (MW)	15,954	16,840	16,892

Source: PLN

(2) Contribution to correct power supply/demand balance between the Eastern and Western regions

The purpose of this project was to improve power transmission of Java-Bali Grid by expanding the grid network between the Eastern and Western regions. Table 7 shows trends in transmission volume and peak load for both the South and North routes and the project area (South route).

Table 7 South Route transmission status for the Java-Bali Grid

	2004	2005	2006	2007	2008	2009*
(1) Transmission volume (Unit: GWh)						
1) New Klaten – New Tasikmalaya			6,649	8,497	8,392	2,841
2) New Tasikmalaya - Depok III			3,679	6,658	9,701	2,161
3) Gross transmission through North-South route	**6,123**	**6,123**	**15,768**	**15,943**	**16,153**	**N/A**
4) Gross demand of metropolitan area/Western Java	**57,163**	**60,413**	**62,608**	**66,510**	**69,170**	**N/A**
5) Power transmission ratio from Central/Eastern Java (%)	**10.7**	**10.1**	**25.2**	**24.0**	**23.4**	**N/A**
(2) Peak load (MW)						
1) New Klaten – New Tasikmalaya			759	970	958	973
2) New Tasikmalaya - Depok III			420	760	765	740
3) North-South route totals	**700**	**700**	**1,800**	**1,820**	**1,844**	**1,840**

Source: PLN Note: 2009 figures are actual achievement as of April 30.

The above table suggests that the capacity of the entire Java-Bali Grid was enhanced by completion of the South route in 2006. The South route was established to drastically increase transmission volume and peak load from the Eastern/Central Java to the Western Java. The volume transmitted from the Eastern/Central Java via the North-South route in 2008 actually accounted for

nearly 23% (16,153 GWh) of total consumption volume for West Java and the Jakarta metropolitan district (69,170 GWh).

As stated above, the project can be evaluated highly since it contributed greatly to correct the imbalance in power source distribution, responding to increased demand, and improving the efficiency of the power supply by boosting power transmission volume from the Central/Eastern Java where there was excess power to the Western Java.

Therefore, this project has largely produced the planned effects, and its effectiveness is high.

2.4 Impact

2.4.1 Contribution to industrial development in West Java

In recent years, economic growth in West Java and the metropolitan area has been stable at about 6%. This is the power supply target area for this project. South Jakarta, where power is supplied primarily by the Depok III substation, shows a similar trend.

Table 8 Growth in economic activities in West Java and the metropolitan area

(Unit: millions of rupiah)

		2005	2006	2007
West Java	GRDP[7] (current price)	389,244,654	473,187,293	526,220,225
Jakarta metropolitan district	GRDP (current price)	433,860,253	501,771,731	566,449,345
West Java	GRDP (fixed price of 2000)	242,883,882	257,499,446	273,995,145
	Growth rate	5.6%	6.0%	6.4%
Jakarta metropolitan district	GRDP (fixed price of 2000)	295,270,544	312,826,713	332,971,263
	Growth rate	6.0%	5.9%	6.4%
South Jakarta	GRDP (fixed price of 2000)	65,772,296	69,896,626	74,377,052
	Growth rate	5.8%	6.3%	6.4%

Source: Statistik Indonesia 2008/Jakarta in Figures 2008

Further, among the principal sectors of the Jakarta metropolitan district, the manufacturing sector requires large amount of power and sustains high growth rates of 5% to 7%.

[7] GRDP=Gross Regional Domestic Production

Table 9 Growth in the Jakarta metropolitan district by primary sector

(Unit: millions of rupiah)

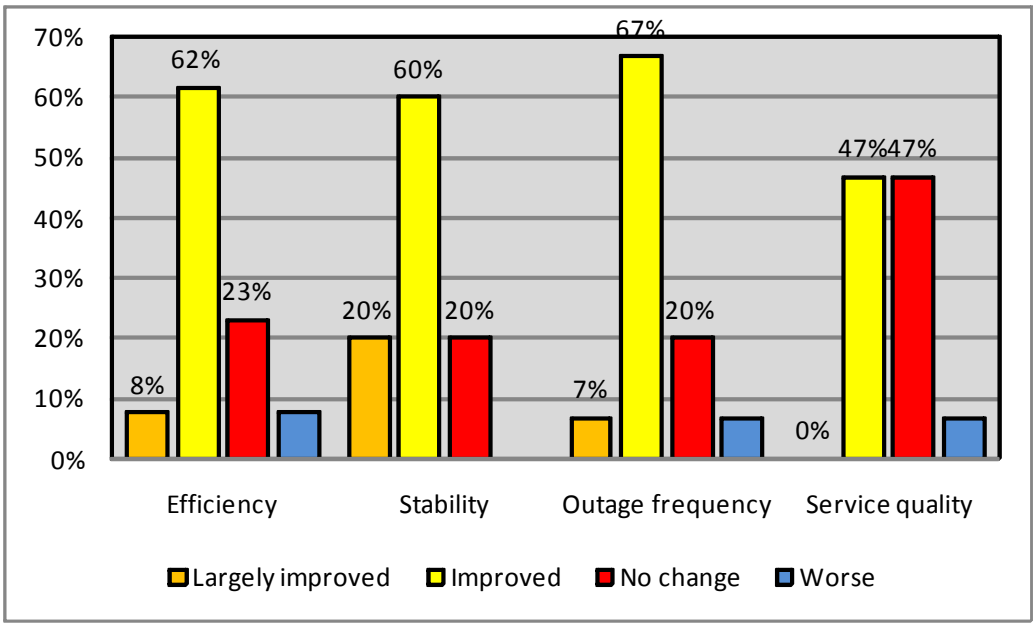
	2005	2006	2007
GRDP (current price)	**433,860,253**	**501,771,731**	**566,449,345**
Manufacturing industry	69,293,543	79,991,300	90,446,591
Construction industry	45,570,841	56,071,975	63,448,564
Commercial/service industry	87,662,729	100,548,869	115,311,319
GRDP (fixed price of 2000)	**295,270,544**	**312,826,713**	**332,971,255**
Growth rate	6.0%	5.9%	6.4%
Manufacturing industry	**51,177,800**	**53,646,724**	**56,195,163**
Growth rate	**5.1%**	**4.8%**	**4.8%**
Construction industry	29,094,580	31,166,114	33,600,764
Growth rate	5.9%	7.1%	7.8%
Commercial/service industry	63,492,894	67,897,897	72,249,706
Growth rate	7.9%	6.9%	6.4%

Source: Statistik Indonesia 2008/Jakarta in Figures 2008

In order to measure the degree of contribution of this project in terms of creating an efficient power supply system, a questionnaire survey of corporations (mainly manufacturing companies) in the project area[8] was conducted. Table 8 shows respondents' answers to the question "How has power supply service changed before and after project execution?" For most of the questions, including those on stability of the power supply, the results of the survey show nearly 70 to 80% of respondents realized the improvement by the project.

[8] The companies surveyed were fifteen manufacturing companies in West Java and the Jakarta metropolitan area. The survey was conducted in the form of a questionnaire, and asked about the status of the power supply and the business environment following project execution.

Table 8 Changes on power supply before (before 2005) and after the project



Further, the questionnaire asked whether the improvement in service impacted their business activities. Their answers are as follows:

- 100% of respondents answered that business climate improvements were sustained after 2006, and the newly stable power supply was indispensable in this improvement.
- 80% of respondents answered that the power supply had become more stable in comparison to project execution (around 2005), allowing stable factory operation and reduction in the frequency of their use of private power generation.
- In terms of current power supply conditions, about 60% of the respondents answered that conditions were “satisfactory”, while 40% answered that they were “reasonable”. This suggests that user dissatisfaction remains for power supply stoppage or power charges.

Although the above results were obtained from limited number of respondents, we can measure, to an extent, the perception and evaluation of industries on the project. Since various factors are involved in economic growth, it is difficult to measure the direct contribution of the stabile power supply by this project. Nonetheless, since the economy in West Java and the metropolitan area has grown steadily in recent years and a number of answers from beneficiaries (local enterprises) support the recent improvement of power supply, it is reasonable to assume that the project performed some role in strengthening the fundamental structure of the local economy.

The number of beneficiaries for this project is assumed to be the approximately 50 million people living in the Jakarta metropolitan district and West Java.

2.4.2 Impacts to the Environment, resident relocation and land acquisition

No particular problems have been reported in terms of adverse effects on the environment. As stated in 2.2 “Efficiency”, problems such as changes in the transmission line installation route and additional site acquisition for constructing substations did occur. The acquisition of land and ROW ultimately resulted in negotiations with about 50,000 families (transmission tower: 1,379, ROW: 587km). However, thirteen families out of 50,000 have yet to reach agreement over compensation.

2.5 Sustainability (Rating: b)

2.5.1 Executing agency

2.5.1.1 Structural aspect of Operation and Maintenance

In 1994, the executing agency of this project (PLN) changed their management style to become a state-run corporation called PERSERO (wholly owned by Indonesian government). However, operation and maintenance of the Java-Bali Grid (including the facilities involved with this project) is still under the control of the Distribution and Load Control Center for Java-Bali (P3B); therefore, no major changes were made to the actual system following appraisal. The overall organization has about 47,000 employees, including 15.6% engineers with a bachelor’s degree.

2.5.1.2 Technical aspects of Operation and Maintenance

In terms of maintenance, preventative maintenance is carried out periodically and corrective maintenance is conducted when trouble occurs. Furthermore, operation and maintenance manuals provided by the materials and equipment suppliers are used. These daily maintenance activities are carried out without major trouble.

The Depok III substation where the evaluator visited during site inspection, has nine full-time employees. Eight of them (the chief operator and his staff) work in shifts. Their average length of service is twelve years, and all of them are PLN-qualified workers.

The New Klaten substation (where the evaluator visited) keeps a record of problems and their countermeasure based on an in-house maintenance plan. Since the record is reflected in the annual maintenance plan, it is obvious that the substation has established a procedural flow for countermeasures and problem monitoring. Local industry professionals who also visited the substation at the time of appraisal conducted a public meeting and stated that the PLN staff has sufficient professional knowledge and business performance. Therefore, there were no major technical difficulties in the maintenance of this project.

2.5.1.3 Financial aspects of Operation and Maintenance

The PLN faced financial difficulties in the late 1990s and this status has been the same until now. Over the last four years, the PLN recorded a current-account deficit. Because of its nature as public service and political consideration, electricity tariff in Indonesia has been kept low. To compensate

for the loss, the government subsidizes the PLN and these subsidies account for 30 to 50% of total revenue. Further, a surge in fuel costs and electric power purchase expenses from IPP have also deteriorated financial conditions at the PLN. In 2008, the PLN suffers from even harsher financial circumstances due to an upsurge in fuel costs, and receives government subsidies for almost 50% of its total revenue.

According to a deputy director of accounting, tax and insurance, the PLN had planned to start the first Crush Program (a plan to develop a new 10,000MW power source by 2011) in 2006. The plan would reduce costs by switching from a heavy oil to coal-fired power generation system. However, they are aware that they need at least several years to obtain this result. At the present moment, it is not clear how far these improvements will go.

Table 10 PLN Profit/Loss Statement (last four years)

(Unit: million rupiah)

	2005	**2006**	**2007**	**2008**
Revenue from electric power sales	63,246,221	70,735,151	76,286,195	84,249,726
Government subsidies	12,510,960	32,909,148	36,604,751	78,577,390
Other revenue	786,143	1,082,237	1,151,741	1,381,394
Business earnings	**76,543,324**	**104,726,536**	**114,042,687**	**164,208,510**
Fuel costs	37,355,450	63,401,080	65,559,977	107,782,838
Electric power purchase expenses	13,598,167	14,845,421	16,946,723	20,742,905
Administrative and maintenance expenses	6,511,004	6,629,065	7,269,142	7,619,854
Labor costs	5,508,067	6,719,746	7,064,316	8,344,224
Allowance for depreciation	9,722,315	10,150,985	10,716,237	11,372,849
Miscellaneous expenses	3,328,598	3,481,853	3,949,560	4,735,081
Operating cost expenses	**76,023,601**	**105,228,150**	**111,505,955**	**160,597,751**
Business profits	519,723	(501,614)	2,536,732	3,610,759
Non-operating income (expenses)	(2,694,282)	(583,721)	(5,634,798)	(15,801,927)

Profit before taxes	**(2,174,559)**	**(1,085,335)**	**(3,098,066)**	**(12,191,168)**
Deferred income tax	(2,746,035)	(2,972,508)	(2,547,041)	(112,548)
Current profit	**(4,920,594)**	**(4,057,843)**	**(5,645,107)**	**(12,303,716)**
Extraordinary profit (expenses)	0	2,129,987	0	0
Net profit	**(4,920,594)**	**(1,927,856)**	**(5,645,107)**	**(12,303,716)**

Source: PLN

Since the PLN is a state-owned company, it continuously receives federal funding (subsidies) because of the strategic importance of the national economy. Consequently, there is no major concern over the sustainability of the PLN in immediate future. However, it is true that the ongoing deficit may deteriorate frontline maintenance (as described later); for example, in securing spare parts. Moreover, the PLN depends on development funds (such as various credits) as a source of capital for new equipment investment. This leads to a persistent increase in their debt ratio and is therefore considered to be a critical long-term finance issue in terms of interest and similar costs.

Table 11 Major financial indicators

	2005	2006	2007	2008
Working capital ratio	68.0%	104.0%	107.0%	107.3%
Gross margin ratio	82.6%	67.5%	66.9%	51.3%
Cost per kWh (Rp)	774.4	1034.2	1081.9	N/A

Source: PLN

2.5.2 Current status of Operation and Maintenance

Table 12 shows the number of problems that have previously occurred in the project area. According to an interview with P3B, the major causes of failure in the project area power transmission system can be categorized into two types: planned outrages due to replacement/cleaning of insulators and stringing construction in the substation, and mechanical outrages due to corona discharge[9], circuit breaker failure, or problems due to lightning strikes. However, these failures do not occur frequently, and operational status can be considered good.

[9] A phenomenon causing electric discharge where ambient air insulation around the transmission line becomes unstable, causing transmission loss (extracted from Tokyo Electric Power Co., Inc.'s website: Glossary of Electricity and Power)

Table 12 Number of power failures

		2006	2007	2008
New Klaten – New Tasikmalaya				
1	Number of problems	10	8	7
2	Duration of power failure (minutes/household)[10]	0	388	2308
New Tasikmalaya - Depok III				
1	Number of problems	12	2	6
2	Duration of power failure (minutes/household)	162	0	0

Source: PLN

Meanwhile, another interview was carried out at various substations to find out the current status of preventive maintenance, particularly securing spare parts. At the interview, the respondent pointed out the difficulty of securing sufficient spare parts. According to substation staff, the PLN has a policy to secure spare parts for power transmission equipment at a volume of 2-3% of the equipment. However, since applications for spare parts must go through the PLN headquarters, supply status fluctuates depending on the budget situation at headquarters. Amidst the chronically unhealthy financial status of the PLN, it is not always easy to secure sufficient stock. Spare parts are no exception.

Another issue is the existence of residents who refuse to agree the compensation for land acquisition or ROW (as described in 2.3 “Effectiveness”). Because the number of such residents is very limited and prospect of expanding the opposition is low, it is not a major concern in terms of transmission line operation. Therefore, it is not a major concern in terms of sustainability of the project.

Given this situation, it can be said at this time that maintenance status of the executing agency is fairly good, since there are no significant problems in terms of its organization and level of technology. Though some problems have been observed in terms of their constant and severe financial situation and its possible adverse effects for long-term maintenance systems such as the stable supply of spare parts, sustainability of this project is fair.

[10] The resulting figure is zero (0), because no power failure occurs if power is supplied from an alternative source, even if a problem occurs in a particular area.

3. Conclusion, Lessons Learned and Recommendations

3.1 Conclusion

Although the efficiency of this project is relatively low due to delays in the project schedule, it contributed significantly to creating efficient power supply in the Java-Bali Grid. Since the project further contributed to industrial development and local economy promotion, the purpose of the project can be considered successful. No major sustainability concerns have been found as obstacles to the project goal, while some minor concerns exist regarding the financial status of the executing agency.

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

3.2 Lessons Learned

(for executing agency)

Although the effectiveness and impact of this project can be evaluated highly, delay of land acquisition and ROW resulted in increased costs and project duration due to additional construction. When a project requires large-scale land acquisition like this, more precise project execution is needed; for example, prior investigation of assumed routes and public meetings with local residents, although it may be too difficult to launch land acquisition prior to project commencement.

3.3 Recommendations

(for executing agency)

Although it is minor issue in terms of project operation, some local residents have still not reached compensation agreement. Since a legal system for compensation has been established, it is necessary to endeavor to find a point of mutual agreement, such as reconsideration of compensation.

Comparison of the Original and Actual Scope

Item	Original	Actual
Project Outputs		
(1) 500kV transmission line	New Klaten – New Tasikmalaya: 296km New Klaten - Rawalo Baru : 195km Rawalo Baru – New Tasikmalaya: 111km New Tasikmalaya – Depok III: 255km Depok III substation leading wire 1km	304km 195km 109km 272km 3.5km
(2) 150kV transmission line	New Tasikmalaya – Tasikmalaya: 25km New Bahat - Bahatt: 20km	Cancelled Cancelled (self-financed)
(3) Substation	Depok III substation (newly built) Rawalo Baru substation (newly built)	Same as planned Cancelled
(4) Consulting service	Total: 526M/M International consultant: 200M/M Indonesian consultant: 326M/M	Total: 683M/M International consultant: 288M/M Indonesian consultant: 395M/M
Project Period	December 1995 – August 2000 (57 months)	December 1995 – November 2006 (132 months)
Project Cost Foreign currency Local currency Total Japanese ODA Loan Portion Exchange rate	 31,475 million yen 13,546 million yen (260.6 billion rupiah) 45,021 million yen 30,795 million yen 1 rupiah＝0.052 yen 1 USD=123.1 yen (April 1997, at the time of appraisal of Phase III project)	 23,474 million yen 10,637 million yen (846 billion rupiah) 34,111 million yen 20,563 million yen 1 rupiah＝0.0126 yen 1 USD=116.25 yen 1 GBP=192.91 yen (Average between January 2001 and December 2006)