



Completion Report

Project Number: 40061-013
Loan Numbers: 2619 and 8245
Grant Number: 0198
June 2017

Indonesia: Java–Bali Electricity Distribution Performance Improvement Project

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Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – Rupiah (Rp)

		At Appraisal (22 June 2010)	At Project Completion (30 November 2015)
Rp1.00	=	\$0.0001102	\$0.0000719
\$1.00	=	Rp9,078	Rp13,909

ABBREVIATIONS

ADB	–	Asian Development Bank
AFD	–	Agence Française de Développement
CEF	-	Clean Energy Fund
IDC	–	interest during construction
LED	–	light-emitting diode
LIBOR		London interbank offered rate
PIU	–	project implementation unit
PLN	–	Perusahaan Listrik Negara (State Electricity Company)
RRP	–	Report and Recommendation of the President
SAIDI	–	system average interruption duration index
SAIFI	–	system average interruption frequency index
VAT	–	value added tax

WEIGHTS AND MEASURES

GWh (gigawatt-hour)	–	1,000 megawatt-hours
kilovolt-amperes	–	kVA
kW	–	kilowatt
kWh (kilowatt-hour)	–	1,000 watt-hours
MVA	–	megavolt-amperes
MW (megawatt)	–	1,000 kilowatts
MWh (megawatt-hour)	–	1,000 kilowatt-hours
tCO ₂ eq	–	tons of carbon dioxide equivalent

GLOSSARY

SAIDI	–	The aggregate time (in minutes) that the average customer connected to the network is without supply over the measurement period (usually one year).
SAIFI	–	The number of supply interruptions that the average customer connected to the network experiences over the measurement period. Note: While the number of supply interruptions experienced by an individual customer must be an integer (i.e., a whole number), SAIFI is normally expressed as a real number due to the effect of averaging.

NOTES

- (i) The fiscal year (FY) of the Government of Indonesia and the State Electricity Company (PLN) ends on 31 December. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2009 ends on 31 December 2009.
- (ii) In this report, "\$" refers to US dollars.

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BASIC DATA

A. Loans and Grant Identification

1.	Country	Republic of Indonesia
2.	Loans and Grant Numbers	2619 (ADB financed) 8245 (AFD financed) 0198 (Multi-donor Clean Energy Fund (CEF) under Clean Energy Financing Partnership Facility (CEFPF))
3.	Project Title	Java–Bali Electricity Distribution Performance Improvement Project
4.	Borrower	Government of Indonesia
5.	Executing Agency	Perusahaan Listrik Negara (PLN)
6.	Amount of Loans and Grants	\$50 million (ADB Loan), \$50 million (AFD Loan), \$1 million (CEFPF Grant)
7.	Project Completion Report Number	1624

B. Loans and Grant Data

1.	Appraisal	
	– Date Started	5 June 2009
	– Date Completed	12 June 2009
2.	Loan Negotiations	
	– Date Started	25 January 2010
	– Date Completed	26 January 2010
3.	Date of Board Approval	
	(ADB Loan)	22 March 2010
	(AFD Loan)	30 September 2009
	(CEFPF Grant)	22 March 2010
4.	Date of Loans and Grant Agreement	
	(ADB Loan)	22 June 2010
	(AFD Loan)	3 June 2010
	(CEFPF Grant)	29 June 2010
5.	Date of Loans and Grant Effectiveness	
	(ADB Loan)	
	– In Loan Agreement	20 September 2010
	– Actual	25 April 2011
	– Number of Extensions	2
	(AFD Loan)	
	– In Loan Agreement	3 June 2010
	– Actual	3 June 2010
	– Number of Extensions	2
	(CEFPF Grant)	
	– In Grant Agreement	27 September 2010
	– Actual	25 April 2011
	– Number of Extensions	2
6.	Closing Date	
	(ADB Loan)	
	– In Loan Agreement	30 November 2012
	– Actual	25 April 2016

	– Number of Extensions (AFD Loan)	2
	– In Loan Agreement	30 November 2012
	– Actual	22 September 2015
	– Number of Extensions (CEFPF Grant)	2
	– In Grant Agreement	30 November 2012
	– Actual	25 November 2016
	– Number of Extensions	4
7.	Terms of Loan (ADB Loan)	
	– Interest Rate	LIBOR plus 0.6% less credit of 0.4%
	– Maturity (number of years)	25
	– Grace Period (number of years)	5
	(AFD Loan)	LIBOR \$6million plus 0.47%
	– Interest Rate	10
	– Maturity (number of years)	5
	– Grace Period (number of years)	
8.	Terms of Relending (ADB Loan)	
	– Interest Rate	ADB Interest Rate (LIBOR plus 0.6% less credit of 0.4%), plus 0.5% per annum including bank service worth 0.05% per annum
	– Maturity (number of years)	25
	– Grace Period (number of years)	5
	– Second-Step Borrower (AFD Loan)	PLN
	– Interest Rate	0.47% per annum (maximum 6.80% and minimum 0.25%), plus 0.5% per annum including bank service worth 0.05% per annum
	– Maturity (number of years)	10
	– Grace Period (number of years)	5
	– Second-Step Borrower	PLN
9.	Disbursements	
a.	Dates	

	Initial Disbursement	Final Disbursement	Time Interval
ADB Loan	6 November 2012	16 March 2016	40.3 months
AFD Loan	3 December 2012	6 July 2015	31.1 months
CEFPF Grant	13 November 2014	1 September 2016	21.6 months
	Effective Date	Original Closing Date	Time Interval
ADB Loan	25 April 2011	30 November 2012	19.2 months
AFD Loan	3 June 2010	30 November 2012	30.0 months
CEFPF Grant	25 April 2011	30 November 2012	19.2 months

b. Amount (\$ million)

ADB Loan

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
Main Equipment	26.65	22.19	–	22.19	22.12	0.07
Installation	16.95	27.11	–	27.11	16.70	10.41
Consulting Services	0.45	0.70	–	0.70	0.31	0.39
Unallocated	5.95	–	–	–	–	–
Total	50.00	50.00	–	50.00	39.13	10.87

– = zero.

AFD Loan

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed ^a	Undisbursed Balance ^a
Main Equipment	26.65	22.19	–	22.19	...	...
Installation	16.95	27.11	–	27.11	...	...
Consulting Services	0.45	0.70	–	0.70	...	...
Unallocated	5.95	0.00	–	0.00	...	...
Total	50.00	50.00	–	50.00	31.62	18.38

^a ADB does not maintain AFD's detailed disbursement data. The total disbursement data is obtained from AFD's data.

... = data not available, – = zero.

CEFPF Grant

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
Promotion and Distribution of Efficient Lighting	0.70	0.36	–	0.36	0.33	0.03
Consulting Support	0.20	0.64	–	0.64	0.64 ^b	0.00 ^b
Unallocated	0.10	–	–	–	–	–
Total	1.00	1.00	–	1.00	0.97	0.03

^b The disbursed amount in Consulting Support category is \$639,970.60, with undisbursed of \$29.40

– = zero.

10.	Local Costs (Financed)	
	- Amount (\$ million)	0.0
	- Percent of Local Costs	0.0%
	- Percent of Total Cost	0.0%

C. Project Data

1. Project Cost (\$ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	16.7	N/A
Local Currency Cost	103.3	N/A
Total	120.0	83.93

Note: As per ADB Operations Manual Section H3 issued on 15 March 2006, ADB no longer distinguishes between Foreign Exchange costs and Local Currency costs. Thus, in the actual implementation, no separation between the two types of cost was recorded.

N/A = not applicable.

2. Financing Plan (\$ million)

Cost	Appraisal Estimate	Actual
Investment Costs		
Borrower Financed	15.00	11.38
ADB Financed	50.00	39.13
AFD Financed	50.00	31.62
CEF Grant Financed	1.00	0.97
Sub Total (A)	116.00	83.10
FCDI Costs		
Borrower Financed	4.00	0.84
ADB Financed	–	–
AFD Financed	–	–
CEF Grant Financed	–	–
Sub Total (B)	4.00	0.84
Total (A + B)	120.00	83.94

ADB = Asian Development Bank, FCDI = financial charges during implementation, – = zero.

3. Cost Breakdown by Project Component (\$ million)

Component	Appraisal Estimate	Actual
Investment Costs		
Equipment	58.70	44.15
Installation	43.40	30.91
Efficient Lighting Pilot	0.90	0.97
Consulting Service	1.00	0.61
PLN Project Management	–	6.46
Contingencies	12.00	–
FCDI Costs	4.00	0.84
Total	120.00	83.94

FCDI = financial charges during implementation, PLN = State Electricity Company, – = zero.

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	28 February 2010	14 June 2012
Completion of Engineering Designs	–	–
Implementation Contracts		
Award of First Contract	30 March 2010	25 June 2013
Completion of Work	30 April 2012	6 November 2015
Equipment and Supplies		
Dates		
First Procurement	31 March 2010	25 August 2012
Last Procurement	31 January 2011	12 October 2012
Completion of Equipment Installation	30 April 2012	26 November 2015
Start of Operations		
Completion of Tests and Commissioning	–	–
Beginning of Start-Up	–	–
Other Milestones	–	–

5. Project Performance Report Ratings

Implementation Period	Ratings
From April 2011 to June 2011	On Track
From July 2011 to September 2011	Potential Problem
From October 2011 to December 2011	Actual Problem
From January 2012 to March 2012	Actual Problem
From April 2012 to June 2012	Potential Problem
From July 2012 to September 2012	Actual Problem
From October 2012 to December 2012	Potential Problem
From January 2013 to March 2013	Potential Problem
From April 2013 to June 2013	Potential Problem
From July 2013 to September 2013	Potential Problem
From October 2013 to December 2013	On Track
From January 2014 to March 2014	Actual Problem
From April 2014 to June 2014	Potential Problem
From July 2014 to September 2014	Potential Problem
From October 2014 to December 2014	Potential Problem
From January 2015 to March 2015	On Track
From April 2015 to June 2015	On Track
From July 2015 to September 2015	Potential Problem
From October 2015 to November 2015	Potential Problem

D. Data on Asian Development Bank Missions

Name of Mission	Start Date	No. of Persons	No. of Person-Days	Specialization of Members
Appraisal	5 Jun 2009	...	...	...
Inception Mission	9 Aug 2011	1	Intermittent	a,f
Special Project Administration Mission	3 Apr 2012	2	Intermittent	a
Mid-Term Review Mission	18 Sep 2013	2	Intermittent	a,b
Project Review Mission	30 Jun 2014	2	Intermittent	a,b
Project Review Mission	24 Nov 2014	3	Intermittent	a,b,c
Project Review Mission	28 May 2015	1	Intermittent	c
Project Review Mission	22 Sep 2015	1	Intermittent	c

a = project officer, b = procurement specialist; c = project analyst, d = energy economist; e = power engineer; f = international staff.
... = data not available.

I. PROJECT DESCRIPTION

1. At the time of appraisal, in 2009, the vertically integrated, state electricity company, Perusahaan Listrik Negara (PLN) had an ambitious plan to invest about \$1.2 billion in the electricity distribution sector between 2010 and 2014 to reduce distribution losses and carbon dioxide (CO₂) emissions. PLN intended that a large part of this plan would be financed by loans from bilateral and multilateral partners. The Java–Bali Electricity Distribution Performance Improvement Project supported this initiative by financing strategic distribution network augmentations within all distribution areas on the Java–Bali grid. The planned augmentations would reduce CO₂ emissions primarily by reducing losses, which in turn would reduce the quantity of electricity that must be generated to deliver a given amount of power to consumers. As most power in the Java–Bali grid is generated by burning hydrocarbons and PLN is increasing coal generation to reduce its reliance on imported oil, the marginal CO₂ emission rate¹ is high.

2. The augmentations were designed to reduce distribution losses by (i) reconfiguring electrical equipment by optimizing its location and size; (ii) reconductoring or replacing old low- and medium-voltage overhead distribution lines; (iii) replacing overloaded low- and medium-voltage transformers with new transformers of appropriate specifications; (iv) inserting additional transformers in long low-voltage overloaded distribution lines; (v) installing cubicles that operate within design parameters; and (vi) installing new switching stations and capacitors.

3. In addition to a reduction in CO₂ emissions, PLN anticipated that the project would increase the amount of energy that the distribution networks would be able to deliver to consumers and increase access to power by providing additional capacity to allow the connection of new customers. At the time of appraisal, there was a waiting list of more than 800,000 new consumers wanting to be connected to the Java–Bali network.²

4. The project also incorporated a pilot program—funded by a grant by the Clean Energy Fund (CEF)—to reduce the peak demand on island networks by promoting energy-efficient lighting solutions to residential consumers. At the time of appraisal, 50% of electricity consumption by residential consumers was for lighting, and they used predominantly incandescent lamps for lighting. Thus, reductions in electricity demand would be achieved if incandescent lamps were replaced by compact fluorescent lamps (CFLs) or equivalent light-emitting diodes (LEDs). The pilot program was intended to distribute about 500,000 CFLs in isolated grids and selected islands. Through a minor change, this component was reformulated as a pilot project to retrofit PLN substation switchyard lighting and municipal street lighting with energy-efficient LEDs. This component of the project is discussed in Appendix 10.

¹ The marginal CO₂ emission rate is the quantity of CO₂ emitted by each additional unit of electricity generated and fed into the grid.

² This is as stated in the Report and Recommendation of the President (ADB. 2010. *Report and Recommendation of the President to the Board of Directors. Proposed Loan and Administration of Loan and Grant Republic of Indonesia: Java–Bali Electricity Distribution Performance Improvement Project*. Manila.). However, PLN's published statistics (PLN. 2011. *Statistik PLN 2010*. Jakarta) stated that the waiting list for connection to the Java–Bali grid at the end of 2009 was only 347,000.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

5. At appraisal, a key focus of ADB's operations was to assist developing member countries in developing strategies and programs for their climate change mitigation and adaptation measures. To this end, ADB was working with new financing mechanisms and capacity building for energy efficiency improvements, renewable energy, waste to energy, sustainable transport, and other emission mitigation projects. These included the Energy Efficiency Initiative, the Carbon Market Initiative, and the Sustainable Transport Initiative.

6. In line with this theme, the primary intended impact of the project, as stated in the Report and Recommendation of the President (RRP)³, was to reduce CO₂ emissions by the energy sector. The RRP targeted an annual CO₂ reduction of around 330,000 tons over 15 years while demonstrating the ability to defer large investments in generation and distribution systems and earning revenues from the Clean Development Mechanism. Despite the small emission reduction target, the project was meant to serve as a pilot to larger, scaled-up operations. The reduction of CO₂ emission was in line with the government initiatives to implement energy conservation and energy efficiency policies to reduce emissions.

7. The project's design intent was to reduce CO₂ emissions by the Indonesian energy sector, while at the same time supporting Indonesia to also meet the increase in electricity demand. The reduction in CO₂ emissions was to be achieved primarily through a reduction in energy losses, which in turn would reduce the requirement for power generation and, hence, reduce CO₂ emissions. On the other hand, electricity demand in Indonesia is increasing, requiring investments to accommodate new connections. The project acknowledged the demand growth as shown in the increase in the waiting list for new connections. The project contributed to increasing energy access through the connection of additional transformer capacity to enable new low-voltage customers to be connected to the networks. This supported the government's National Electricity Development Plan, which aimed to address having the lowest electrification in the region by increasing the electrification ratio to 90% by 2020⁴. PLN plans to connect around 18 million new customers between 2017 and 2026 to achieve the government's commitment to increasing the electrification rate. While the connection of new customers will increase PLN's electricity sales, it will also create a requirement for additional power generation and increase CO₂ emissions.

8. As the additional sales exceeded loss reductions, and the project design had no provision for the installation of low-emission generation, these targets together indicated a net increase, rather than a reduction, in emissions. It is probable that the intention at appraisal was to consider only the reduction in CO₂ emissions from reduced losses in any assessment of emissions impact. The project design should have indicated a clear provision on the assumption for CO₂ emissions reduction calculation, especially on the potential CO₂ increase from incremental sales.

³ ADB. 2010. *Report and Recommendation of the President to the Board of Directors. Proposed Loan and Administration of Loan and Grant Republic of Indonesia: Java-Bali Electricity Distribution Performance Improvement Project*. Manila.

⁴ Ministry of Energy and Mineral Resources, Indonesia. 2011. *Rencana Usaha Penyediaan Tenaga Listrik PT Perusahaan Listrik Negara (Persero) Tahun 2011 s.d. 2020*. Jakarta.

9. ADB's Indonesia country strategy and program for 2006–2009⁵ and country operations business plan, 2009–2011⁶ supported a medium-term growth rate of 6% per annum and highlighted the importance of removing infrastructure bottlenecks in the power sector. Consistent with this strategy, the distribution network augmentations to be implemented under the project were designed to remove localized bottlenecks on the Java–Bali distribution networks.

B. Project Outputs

10. An assessment of the extent to which the project outcomes and outputs were achieved in part A of the project is given in Appendix 1. A comparison of the assets procured and installed by the project with the appraisal schedule is provided in Appendix 2.⁷ Equipment that was procured by the project but could not be installed before loan closure was retained by PLN and had been utilized fully by early 2017.

11. The primary intended impact of the project was to reduce CO₂ emissions by 330,000 tons per annum (paragraph 6). The targeted outputs, as specified in the project framework, included a saving of 400 gigawatt-hour (GWh) from a reduction in losses and additional sales of 635 GWh through the connection of new customers using the additional transformer capacity to be installed by the project. One of the project outcomes, i.e., the deferral of new distribution network investment, could not be assessed at the time of project completion. The project is designed to be a proactive initiative to reduce losses by expanding asset capacity. If further network investment is deferred, these gains will be eroded over time.

12. The project comprised multiple small-scale augmentations widely dispersed throughout the Java–Bali grid, to the extent that it resembled a program rather than a project.⁸ These augmentations were undertaken in parallel with PLN's ongoing (and much larger) network development program, and the project, therefore, had a relatively small impact on the overall performance of the distribution networks. For example, sufficient distribution transformer capacity was procured by the project to connect an additional 600,000 residential customers, but during the 2 years of project implementation (2014–2015), more than 4.5 million additional customers were connected to the Java–Bali distribution networks. The project outputs defined at appraisal were intangible, and are only measured by PLN at a network level for each distribution area. The extent to which changes in output at a distribution-area level were directly attributable to the project, rather than an outcome of work undertaken by PLN outside the project, could not be separately measured.

13. The distribution network augmentation component of the project comprised the following three types of investment:

- (i) **Distribution loss reduction through the installation of additional and larger conductors.** The conductors installed by the project represent 54% of the total length of additional medium voltage circuits installed on the Java–Bali distribution networks over the project implementation period. The medium voltage circuits installed under the project were targeted at load reduction on existing circuits and, subsequently, the reduction of distribution losses on the grid. A total of

⁵ ADB. 2006. *Country Strategy and Program (2006-2009)*. Manila.

⁶ ADB. 2008. *Country Operations Business Plan (2009-2011)*. Manila.

⁷ These were categorized as "investments" rather than outputs in the RRP.

⁸ A program is a series of small interventions, where individual interventions are not fully specified at the time of formulation. A project is a single large intervention that can be specified in more detail at formulation. Generally, a program is scalable and can be expanded or contracted during implementation to match the availability of funds.

3,751 circuit-kilometers (cct-km) of medium voltage circuit were installed and sufficient conductors for an additional 778 cct-km were procured but, at loan closure, had still to be installed. Distribution losses were reduced from 7.3% to 6.3% over the project implementation period. While an accurate assessment is not possible, it is estimated that based on the length of medium voltage circuit installed by the project, approximately half of the distribution losses in the grid can be directly attributed to the project.

- (ii) **Increased electricity sales through the installation of additional distribution transformer capacity.** The project design originally planned the installed transformers to also contribute to the loss reduction through replacements of overloaded transformers and feeder splitting in overloaded distribution lines. However, most of the installed transformers are utilized for network capacity expansion. Therefore, the benefit of the installed transformers is fully incorporated to the increase in electricity sales. The project installed a total of 359 megavolt-amperes (MVA) of additional distribution transformer capacity and a further 51 MVA was procured but could not be installed prior to loan closure. The capacity installed by the project was only 9% of the additional distribution transformer capacity installed on the Java–Bali distribution networks over the project implementation period. The installed transformer capacity was sufficient to increase electricity sales by 836 GWh per annum. The low voltage circuit installations are attributed mostly to the connection of new customers. Approximately 832 cct-km of low voltage circuit was installed by the project and material procured for the installation of a further 395 cct-km. However, this is only 3% of the additional low voltage circuit length installed on the Java–Bali networks over the period.
- (iii) **Improvement in the reliability of supply through the installation of covered conductors** in areas prone to outages caused by vegetation and through the reconfiguration of the network to allow supply to be restored sooner to customers not directly affected by a network fault. At appraisal, the reliability of supply was defined by the system average interruption duration index (SAIDI) and system average interruption frequency index (SAIFI), which are standard international indicators for measuring the reliability of electricity distribution systems. To accurately assess reliability using these measures, an accurate count of the number of customers affected by each individual interruption is required. At project commencement, PLN was assessing SAIDI and SAIFI using a manual estimate of the number of affected customers; however, at 2015, PLN is using its electronic customer information system to provide an accurate count. It found that its manual estimation approach significantly underestimated the number of customers affected by each interruption, to the extent that its reported SAIDI and SAIFI at the start of the project overstated the reliability of the network and cannot be considered accurate.⁹ Interruptions per 100 cct-km are, therefore, relied upon as a more accurate measure of reliability. This improved from 11.8 in 2013 to 8.5 in 2016.

⁹ In Central Java, the transition to the use of geographic information system (GIS) resulted in a significant deterioration in measured reliability using SAIDI and SAIFI, notwithstanding a substantial reduction in recorded faults per 100 cct-km. West Java had a similar outcome when it transitioned to GIS.

C. Project Costs

14. A breakdown of project costs is provided in Appendix 5. The actual project costs were approximately \$83.93 million including PLN costs charged to the project, compared to an appraisal cost estimate of \$120.00 million. A significant reason for this shortfall was the inability to install all the materials procured for installation by the project before loan closure. Loan disbursements would have increased by almost \$9 million if all procured materials had been installed. Materials not installed are being installed on the networks by PLN at its own expense.

15. Installation contract expenditure shortfalls were most apparent in the Jakarta and East Java distribution areas. In Jakarta, project delays necessitated the relocation and redesign of much of the work, as augmentations originally planned could not wait until equipment had been delivered. This problem was exacerbated by the need to rebid the contract because none of the original bidders were considered competent to undertake the work. In East Java, the contract also needed to be rebid as the original bid prices were materially higher than PLN's estimate. Despite this, PLN was unable to find a contractor with both experience in distribution construction work and the financial capacity to complete the contract. While the contractor eventually engaged had successfully completed transmission contracts, its lack of experience in planning and implementing the distribution work required by the project was an ongoing problem.

16. PLN's direct expenditure on the project was only \$12.22 million, compared to the \$19.00 million forecast at appraisal. The project became so closely integrated with PLN's parallel network development program, that many of its project-related costs were not captured in the project account. A visit to a distribution substation in Jakarta identified medium voltage circuit breakers that were supplied by PLN rather than by the project. A visit to a distribution substation in Surabaya also identified that it was supplied by a dedicated medium voltage spur line constructed by PLN rather than the project. In both these instances, the project assets could not have been commissioned without PLN's contribution.

D. Disbursements

17. A schedule of loan disbursements is included in Appendix 7. The first disbursement was made in November 2012, some months after the original project completion date in the RRP. This reflected the delays in project mobilization discussed in para. 18. The loans were extended twice due to the delays in project implementation and the undisbursed amount of \$10.87 million at the end of the project was canceled.

18. Both ADB and AFD loans contributed to the purchase of materials and payments to the installation contractors. Payments to the materials suppliers were shared equally by the ADB and ADF loans. PLN paid 15.04% of the total payments due to the installation contractors with the balance shared equally by the two loans. However, the physical closing date of the AFD loan of 30 June 2015 could not be extended further. When it became apparent that the project would extend beyond that date, an agreement was reached between ADB, AFD, and PLN whereby disbursements from the AFD loan would be front loaded, so that the final share of the project costs carried by the two loans would be equal, as agreed at appraisal. There was an issue with the minimum \$2 million disbursement requirement applied by AFD. This caused some delays in the payment of the incoming withdrawal applications and, eventually, PLN had to pre-finance some of the invoices to be reimbursed by AFD. PLN has raised concerns on various requirements being applied by co-financiers that resulted in additional administration and financial burden.

E. Project Schedule

19. A comparison of the actual project schedule as prepared at appraisal compared with actual implementation schedule is provided in Appendix 8. The RRP was approved on 22 March 2010 and the loan agreements were both signed on 22 June 2010. The project completion date in both agreements was 31 May 2012. However, ADB loan 2619 became effective on 25 April 2011 and AFD loan 8245 became effective on 3 June 2010, due to the time it took the government and ADB to reach an agreement as to whether legal opinion was required under the subsidiary loan agreement between the government and PLN. Prior to the approval of the project, ADB management approved the advance action for the procurement of goods and related services and retroactive financing with a ceiling of \$5 million. Nonetheless, the five materials procurement contracts were only signed between August and October 2012, more than 12 months after the loans became effective. PLN intended to implement the advance procurement action by preparing the specific bidding document for the package at an early stage during project processing, however, materials procurement was delayed due to the extended review process for bidding documents. The real bidding only took place after the project was declared effective. Therefore, advance procurement action and retroactive financing were not implemented under the project. The materials procurement process should have been completed before loan effectivity to allow the materials supply contracts to be ready for signing shortly after the loans became effective.

20. While the loan effectivity delay could not have been foreseen at the time of project approval, the appraisal schedule did not allow sufficient time for equipment delivery. The appraisal schedule provided for ADB approval of equipment procurement contracts to extend through to January 2011, while installation contractor mobilization was scheduled to commence as early as July 2010, just three months after Board approval. Equipment quantities were sufficiently large to require special manufacturing runs, so delivery times of 6 to 12 months after the signing of equipment supply contracts should have been allowed for. The nature of the project was such that the installation contractors did not need to complete extensive civil works before electrical materials could be installed. Furthermore, most project sites would have required equipment from more than one contract before work at that site could be completed. At project completion, ADB and PLN considered that the 2-year implementation schedule incorporated into the loan agreements was unrealistic.

21. The first of the six installation contracts was not signed until 25 June 2013. Three of these contracts were rebid either due to lack of bidders that met the technical requirements or because the lowest bid price was considered high. Installation delays were caused by a number of factors including (i) the delay between the identification of the works to be undertaken by the project and the signing of the installation contract necessitated the reallocation of work to the project because of the dynamic environment in which a distribution network is managed;¹⁰ (ii) delays in getting agreement from landowners and other required permits for the project works;¹¹ and (iii) contractor inexperience in undertaking the type of work required.

22. While PLN contracts out much of its distribution installation work in implementing its own network development plan, it does so in much smaller packages. Hence, local contractors generally do not have the capacity to successfully undertake contracts of the project size.

¹⁰ Much of the work originally allocated to the project became so urgent that it had to be implemented by PLN.

¹¹ An issue in some areas was a local government requirement that underground cable be installed by horizontal boring rather than using open cut trenches as originally proposed.

Consequently, the contractors engaged for the project generally specialized in power transmission and their lack of experience in electricity distribution led to delays in most project areas.

F. Implementation Arrangements

23. PLN was the executing agency for the project, which was managed by the Head of the Java–Bali Distribution Directorate in PLN headquarters, supported by a project management unit (PMU) that was responsible for overall project coordination. Installation works were delegated to project implementation units (PIUs) in each of the five distribution areas, which together covered all distribution networks on the Java–Bali grid. The project managers in each distribution area coordinated the project activities within their area through the project director but reported to their regional general manager.

24. In 2015, the final year of the loan, PLN was restructured and the functional directorates, such as distribution, that were responsible for managing the Java–Bali power system, were replaced by three regional directorates. Following this restructuring, the PMU became part of corporate planning and the five PIUs were restructured so that there was a PIU in each of the three regional directorates. The staff in the original PMU remained heavily involved in project implementation even though, in most cases, they were assigned to a regional directorate and therefore no longer responsible for overseeing project implementation across all the Java–Bali distribution networks.

25. This structure was complemented by an implementation consultant whose intended role was to support the design and procurement process and to assist PLN to coordinate the installation works dispersed across the Java–Bali islands. However, by the time the implementation consultant was recruited, the procurement of project materials was well advanced, and the design and procurement component on the original terms of reference was therefore not included in the final scope of works. Nevertheless, the consultant was mobilized to assist with project management and coordination. While project implementation was not completed by the contract expiry date, the consultant's contract was not extended and PLN undertook all project coordination and reporting from that time on.

G. Conditions and Covenants

26. The status of compliance with the loan conditions and covenants by the government and PLN is shown in Appendix 3. The loans did not become effective until approximately 12 months after loan signing due to differences of interpretation on the issuance of legal opinion for the subsidiary loan agreement (SLA). The legal opinion to the SLA was finally agreed to be issued by the Head of Ministry of Finance's Legal Bureau. The internal coordination issue was not systemic and in subsequent SLA projects it no longer persists.

27. PLN complied with its financial covenants through to 2013, but these were waived by ADB in 2014–2015, suggesting that there had been no improvement in its financial performance. Waivers of financial covenants were due to delayed or lower amount of subsidy payment from the government to PLN. There was no impact to the performance of the project. The Ministry of Finance requested the waivers with an assurance that the government would ensure that PLN, as a quasi-sovereign body, would be in a situation to serve its obligation. PLN is continuing to gradually change its generation mix to reduce its reliance on imported oil in favor of indigenous coal and remains heavily reliant on a government subsidy, although this reliance is gradually

declining. The total subsidy due in 2015 was Rp73.15 trillion, down from Rp98.18 trillion in 2011.¹²

28. The other concern identified in Appendix 3 was the regularity and quality of PLN's quarterly progress reports and the lack of a project director in the final year of the loan due to PLN restructure. Some reports were not provided and ADB considered there was a need for PLN to improve its administrative practices (e.g., periodic reporting, information recording and/or tracking) and monitoring during construction to ensure conformity with good engineering practice. PLN had kept detailed records of the physical progress of the project and PLN's final project completion report is comprehensive. PLN was relying on the project implementation consultant to provide these reports and was under-resourced when the consultant's contract was not extended. ADB also noted that the reports focused on physical progress and did not report against the project framework or provide measurements of the social, financial, and institutional aspects of the project. To mitigate the lack of progress reports and project director, ADB and PLN conducted more frequent meetings to discuss updated implementation status and agreed on actions to expedite implementation progress. The project was so closely integrated with the larger network development program being undertaken in parallel by PLN that is not practical to isolate the impacts that are directly attributable to the project.

H. Consultant Recruitment and Procurement

29. The contract between PLN and the project implementation consultant did not become effective until 14 June 2012, more than 2 years after loan approval, and only 2 months before the first equipment procurement contract was signed. This delay was caused because consultant recruitment only commenced after the loan became effective. As a result, the provision for consultancy time was reduced to 10 months' international consultancy work (from 15) and 60 months' local (from 90), and work relating to the preparation of bidding documents and design review was not included in the terms of reference. The delay may have impacted the performance of the consultants, which can be less effective when they are not mobilized until well after work critical to the success of a project has already been completed.

I. Performance of Consultant, Contractors, and Suppliers

30. The implementation consultant's primary role was to monitor and record the work undertaken by the implementation contractors, who were nevertheless managed by PLN. The consultant's quarterly progress reports provide only a superficial summary of the project status, with no insight into the causes of delays to project implementation or planned corrective action. PLN advised that, in its view, the project implementation consultant provided little added value and that, notwithstanding the ongoing project delays, its contract was not extended for this reason. ADB had to perform frequent and direct supervision meetings and discussions during implementation to compensate for the lack of quality consultant progress reports.

31. Installation of the materials procured by the project presented significant project management challenges for both the installation contractors and for PLN. While the installation work required at individual project sites was relatively straightforward, except perhaps for the installation of underground cable in built-up urban areas, the project management challenge arose from the number and spread of different sites in each distribution area. The difficulty for PLN was to ensure that individual sites were ready when required by the installation contractor. This challenge was exacerbated by the fact that distribution networks are dynamic, particularly

¹² As reported in PLN's annual reports.

when demand growth is high, and need to be continually developed in response to customer demand. Delays in the availability of materials and the award of installation contracts meant that some work initially planned to be undertaken under the project could not wait and PLN often found it difficult to provide alternative sites to the contractor, largely because of difficulties in securing landowner agreement and necessary permits before a site could be released.

32. The installation contract in Central Java was the only one to be completed in a timely manner. While in this case the contractor performed well, it was by far the smallest of the six contracts. The fact that all work in Central Java was overhead distribution lines, as opposed to underground lines, meant that PLN had less difficulty finding alternative sites for the installation of project materials when this became necessary.

33. Installation works in Jakarta and East Java could not be completed before loan closure, and the uninstalled materials were left with PLN for later installation. In both cases, the contracts needed to be rebid, which reduced the available contract implementation time and increased the number of project sites that needed to be relocated. In East Java, contractor performance did not meet expectations and warning letters needed to be issued, although PLN has not suggested this was the only problem in this distribution area. In Jakarta, the contractor's performance was better, even though PLN did not consider it entirely satisfactory. PLN also acknowledged that it had difficulty making project sites available in a timely manner, due largely to the extent of the underground works required and the highly built-up nature of this densely populated urban area. As a result, both ADB and AFD loans were closed with large undisbursed amounts. The AFD loan was physically closed earlier (30 June 2015) than ADB loan (30 November 2015). Invoices between 30 June and 30 November 2015 were fully covered by the ADB loan. Considering the above issues, the performance of consultants, contractors, and suppliers is rated *less than satisfactory*.

J. Performance of the Borrower and the Executing Agency

34. There was a delay of more than 12 months before the loan became effective due to the time it took ADB and the Government to reach agreement as to whether a legal opinion was required for the subsidiary loan agreement between the Borrower and PLN. The nature of the project was such that this delay had a significant flow-on effect, as work planned during appraisal could not wait and new sites for the installation of project materials had to be identified and made available to the contractor. The high rate of growth in the demand for network capacity meant that all implementation delays exacerbated this problem. Little substantive progress in preparing for project implementation was made during this initial delay, and [who] considers that it would have been helpful if the time had been used to advance the processes for the procurement of materials and the recruitment of the implementation consultant to the point where contracts were ready for signing shortly after the loans became effective.

35. Nevertheless, PLN's management of the distribution networks connected to the Java–Bali transmission grid is highly effective. Between 2009 and 2015, the year in which the project was completed, sales to customers connected to the distribution networks increased by 44,690 GWh (47%) and the number of connected customers increased by almost 13 million (49%). Distribution losses in 2013, before the commencement of the project, were 7.3%, a level comparable to that in many more developed countries, down from 9.63% in 2009. These rates of growth are challenging, and PLN's ability to accommodate them while at the same time achieving a significant reduction in distribution network losses is an impressive performance.

36. The performance of both the borrower and executing agency is rated *satisfactory*. While the project was not fully completed before loan closure, the rating acknowledges the difficult circumstances in which it was undertaken. It also takes account of the flow-on effect of the delay at the beginning of the project, which should have been avoided.

K. Performance of the Asian Development Bank

37. There are some issues in the project, specifically in the calculation of CO₂ impact and with one of the outcome indicators on the deferral of new distribution network investment (paras. 7, 8, and 11). In addition, the defined project outputs cannot be directly measured as a result of the project investment only. While PLN measures these outputs and publishes them annually, the measured outputs were a result of both the project investment and the larger network development investments undertaken by PLN in parallel with the project. The project should have been formulated in such a way that the extent to which the project achieved its outputs could be directly measured.

38. Notwithstanding the above issues, ADB managed to provide effective support to assist PLN in addressing the problems encountered in implementing the project, especially those that were related to ADB procedures. Despite the turnover in ADB project officers, ADB was able to provide continuous and effective support throughout loan implementation. ADB demonstrated flexibility in responding to AFD's administrative requirements by providing extended support beyond AFD's closing date to finalize the delayed civil work packages. The delegation of the project to the Indonesia Resident Mission at an early implementation stage was instrumental in maintaining effective and timely communication channels with PLN in relation to project implementation. Overall, ADB's performance is rated as *satisfactory*.

III. EVALUATION OF PERFORMANCE

A. Relevance

39. This section assesses the extent to which (i) the intended outcomes of the project were strategically aligned with Indonesia's development priorities, (ii) the intended outcomes were aligned with ADB's country and sector strategies, and (iii) the design of the project was appropriate for achieving the intended outcomes.

40. The intended outcomes of the project were well aligned with Indonesia's development priorities and with ADB's country and sector strategies at the time of appraisal. The project design was appropriate for increasing the capacity of the network and providing for the connection of additional customers. The project was well aligned with ADB's country strategy for Indonesia, which had a strong focus on infrastructure development and particularly on energy sector development including energy efficiency. Energy loss reduction is still a very relevant challenge for PLN as it is included in the electricity distribution plan in PLN's electricity supply plan (RUPTL), 2017–2026¹³. The project contributed to this target by providing the necessary investments for reducing the overall grid distribution losses from 7.33% in 2013 to 6.30% in 2016. The project also contributed in removing localized bottlenecks on the Java–Bali distribution networks.

¹³ Ministry of Energy and Mineral Resources, Indonesia. 2017. *Rencana Usaha Penyediaan Tenaga Listrik PT Perusahaan Listrik Negara (Persero) Tahun 2017 s.d. 2026*. Jakarta.

41. The intended primary impact of the project was a reduction in CO₂ emissions through offsetting the additional generating capacity, primarily, by reducing distribution network losses. The project could have been improved by describing the factors influencing CO₂ emissions reduction in consideration of the potential emission increase from increasing electricity sales. One of the project outcomes, the deferral of future investment, will not be assessed as the lack of ongoing investments on system improvement will undo any loss reductions achieved by the end of the project. Nevertheless, the project is rated *relevant* as the other project outcomes, specifically, the loss reduction and distribution network reliability, are considered relevant to Indonesia's long-term plan. The project also incorporated energy conservation activities (i.e., the energy efficient pilot projects), which are effective strategies for reducing CO₂ emissions.

B. Effectiveness in Achieving Outcome

42. This assessment rates the extent to which the project achieved the outcomes and outputs in the project framework. In this project, the assessment of the outcomes and outputs of the project cannot be measured directly and a judgment must be made regarding the contribution of the project towards the achievement of these higher-level outputs.

43. The project is rated *effective*. As described in Appendix 1, the measured network outcomes and outputs were all favorable, and all targets were comfortably met across the full range of reasonable assumptions regarding the contribution made by the project towards the achievement of these network outcomes.

C. Efficiency in Achieving Outcome and Outputs

44. The standard approach to assessing the efficiency of a loan-funded project is to recalculate the economic internal rate of return (EIRR) used at appraisal based on actual economic costs and benefits. This analysis typically evaluates the net benefits of a project by comparing the economic cost of implementing the project with the quantified economic benefits that stakeholders derive from the project. The EIRR is estimated at 22.9%, indicating a satisfactory level of economic efficiency (Appendix 9). However, this EIRR is lower than that calculated at appraisal (35.9%). This is mostly due to the benefits of additional users being attributed to the project after the event (actual), which proved to be lower than the benefits calculated at appraisal (estimates).

45. At appraisal in 2009, total annual sales on the distribution networks connected to the Java–Bali grid were 94,500 GWh and total distribution losses were 9.63%. By 2013, the year before project installation work commenced, sales had increased to more than 129,000 GWh per year, while losses had reduced to 7.33%. At the same time, more than 8.3 million additional customers had been connected to the Java–Bali grid. Waiting lists had been reduced from around 800,000 in 2008 (as reported in the RRP) to 267,000 at the end of 2013. Clearly, over this period there was substantial expenditure in the development of the distribution network outside the project, and this expenditure continued during project implementation. It is not clear whether the loan funding allowed PLN to increase its level of capital expenditure on the Java–Bali distribution networks or whether it was used as an alternative source of finance that allowed investment in the grid to continue at existing levels. Whatever the case, the project works were very closely integrated with network development being undertaken by PLN at the same time outside the project.

46. The project took three and a half years longer than estimated at appraisal; however, the original project schedule did not consider the possible implementation complexities. Because of

the implementation delays, additional design and development work was required in many areas to make project sites available to the contractors; however, that work was not wasted, as all augmentations would eventually have been required to support the ongoing development of the networks.

47. Procurement was competitive, and equipment prices during bid evaluation are noted by PLN procurement committee to be efficient. However, the large sizing of the procurement package prohibited smaller contractors with distribution experience to be qualified to bid due to their inability to meet the qualifications. Hence, some of the contractors selected were the larger ones with experience mostly in transmission lines. This created implementation inefficiencies. Expenditure was also incurred on an implementation consultant that added little value.

48. Challenges arose from the one-off project structure when—given the nature of the work, the dynamic implementation environment, and PLN's proven effectiveness in managing the networks—it would have been more efficient to have seamlessly integrated the project into PLN's existing network development program. PLN is an effective distribution network manager. The resources needed to accommodate the project structure imposed by ADB could have been more efficiently had the project been integrated into PLN's ongoing network development program. ADB now recognizes this and is currently financing distribution network development in other areas of Indonesia using a results-based structure.

49. Despite the implementation delay and contractor performance issue, economic analysis has confirmed the economic efficiency of the project. Overall, the project is assessed as *efficient*.

D. Preliminary Assessment of Sustainability

50. The sustainability assessment focuses on the likelihood that project outcomes and outputs will be maintained over the economic life of the project. It can be assessed on a quantitative or qualitative basis. The financial analysis (Appendix 10) has indicated a financial internal rate of return (FIRR) of 26.1%, which confirms the financial sustainability of the project. However, sensitivity analysis does suggest that under adverse contingency scenarios the FIRR of PLN's ongoing network development investments could be reduced significantly to a level similar to PLN's estimated weighted average cost of capital.

51. The provision of additional distribution transformer capacity to allow new customers to connect to the network at low voltage is highly sustainable, as it is extremely unlikely that PLN will allow the network to deteriorate to the extent that it cannot continue to supply customers that are already connected to the network.¹⁴ Project interventions, such as the installation of feeder interconnections and the installation of insulated conductors, which are targeted at improving reliability, are also unlikely to be undone, and so can be considered highly sustainable. However, the level of network reliability could deteriorate in the future, for example, as a reduction in the level of maintenance of the network or other factors.

52. The reduction in electricity losses resulting from the project will only be sustained if network development investment continues in line with the growth in demand for electricity supplied by the network. If this does not occur, the additional capacity installed by the project to reduce network losses will be used up over time and losses will increase as a result. For this reason, the deferral of new network investment was not a valid project outcome. However, there is no suggestion that the current level of network investment will decline. PLN achieved a

¹⁴ This does not consider any potential for non-supply due to a shortage of generation as this is not a network issue.

significant reduction in overall network losses in the years leading up to project implementation and remains very focused on improving the performance of the network. The project's energy-efficient pilot project component is also considered as sustainable. As discussed in Appendix 11, the project has identified several lessons that will be highly useful for replication and scaling up. The Directorate of Energy Conservation of the Ministry of Energy and Mineral Resources responded positively to the lessons identified and action plans were discussed in the project's final workshop.

53. The Project is assessed as *most likely sustainable*.

E. Impact

54. The impact of the project is to be considered in the context of other investment in the development of the distribution by PLN that were concurrent with but separate from the project. The project is assumed to have contributed to approximately half of the reduction of distribution losses in the network and, thus, to CO₂ emissions reduction (Appendix 1). The reduction in CO₂ emissions due to the reduction in losses at 1.17 million tons per year. From project appraisal in 2009 to project completion in 2015, the number of customers connected to the Java-Bali distribution networks increased by 12.9 million or 49%, distribution sales increased by 44,690 GWh or 47%, the number of interruptions per 100 km of line more than halved from 17.7 to 8.5, and distribution network losses declined from 9.6% to 6.3%. These achievements are impressive and the project has made a useful contribution.

55. The environmental impact of the project was small, as most assets were installed overhead on roads or other public property, and only after agreement with the controlling authority. There was some temporary disruption during the installation of underground cables, but all affected land was reinstated to its original condition on completion of the works.

56. The quantifiable economic benefit to consumers that can connect to the grid is assessed in Appendix 9. Non-quantifiable benefits include the installation of labor-saving devices, which make women's lives easier and give them more opportunity to work outside the home, contributing to their independence and economic well-being. Households that are connected to the grid also benefit from better lighting, making it easier for children to study and for everybody in the household to participate in more stimulating leisure activities, such as watching television. The project targeted not only households, as many of the transformers installed supplied schools and businesses. A better quality and more reliable power supply underpins economic development by increasing productivity and creating employment opportunities, as well as increasing educational access and the quality of education through availability of lights for evening study and use of electronic media in schools.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

57. Overall, the project is rated *successful*. The project is deemed relevant, effective and efficient in achieving outputs and outcomes, and likely to be sustainable. While the project experienced some delays, the adverse impact of these delays was minimized as the project was closely aligned with PLN's larger network development program; thus, project work that was affected by the delay was transferred to PLN's own network development program and replaced with other work from that program that did not require immediate implementation. While not all equipment procured by the project was installed before project closure, equipment that was not

installed was retained by PLN for installation as part of its ongoing network development program.

58. The project experienced some inefficiencies in project implementation, primarily related to the effectiveness of installation contractors, which arose largely because the project structure was designed around a well-defined investment undertaken in a relatively static environment and was not well suited to implementing a program that required many small investments within a very dynamic, high-growth environment.

B. Lessons

59. Projects or programs designed to achieve loss reductions in electricity networks may provide only a temporary reduction in CO₂ emissions. Such projects generally achieve their emissions-reduction objective by increasing the capacity of the network to reduce asset utilization. Any loss reductions achieved by such a project will be eroded, and emissions will again increase, if a subsequent reduction in investment results in the additional capacity being utilized to accommodate new load. Energy conservation initiatives, such as the efficient lighting pilot program, are a more effective emissions-reduction intervention because they are more likely to be sustainable. This is particularly true of interventions involving the replacement of existing assets with more energy-efficient alternatives, as sustainability is less likely to be dependent on human behavior.

60. In designing and formulating loan projects, ADB should ensure that project outputs are technically sound and well aligned with the project objective. In situations where it is not possible to fully align each individual output with the objective, the relative impacts of the different outputs should be calibrated to ensure that, taken together, the outputs will produce an outcome that is consistent with the intended project impact. Risks should be assessed to ensure that this consistency is unlikely to be disrupted during project implementation. Where project outputs are difficult to be directly measured, the assumptions made and the basis on which the outputs are derived should be fully described in the RRP or its supplementary appendixes.

61. At appraisal, ADB should ensure that project schedules are realistic and allow adequate time for procurement, equipment delivery, and implementation, taking due account of procurement and delivery times typically achieved on ADB loan projects. When delays arise, ADB should be proactive in helping governments and executing agencies take appropriate action to minimize the impact of those delays on project delivery. For example, when advance procurement or recruitment is approved, milestones could be agreed with the executing agency and regularly reviewed to ensure that these activities occur in accordance with the approval. This is particularly important for the recruitment of international consultants since a consultant generally needs to be mobilized at the beginning of a project to be fully effective.

62. ADB's standard project implementation model is not well suited to distribution network loans where the work involves large numbers of relatively small interventions that cannot be fully defined at the time of appraisal, particularly where the work is to be undertaken in a high-growth environment. Such work has the characteristics of a program rather than a project and needs to be managed accordingly. Therefore, results-based financing structure is likely better suited for projects that support distribution network augmentation.

C. Recommendations

63. PLN should continue to monitor the performance of the Java–Bali distribution network to ensure that improvements that have been achieved since 2009 with the help of this project are not eroded through a lack of ongoing investment in network development or a deterioration in the quality of maintenance. PLN should also continue to publish annual statistics on the performance of its power system, which includes the data that needs to be monitored.

64. Project performance evaluation report may only necessary if ADB's future monitoring indicates a deterioration in the overall performance of the Java–Bali distribution networks. The project was so closely aligned with PLN's own network development program, to the extent that the work undertaken under the project is not readily distinguishable from similar investments funded outside the project,

65. The midterm review of a project should be comprehensive. In addition to assessing progress made in implementing the project investments, it should look at the continuing relevance of project objectives. It should also evaluate the project against the project framework to assess the extent to which baselines have been established and the extent to which it will be possible to measure intangible outcomes and outputs when the project is completed. The review should also consider whether changes could be made cost effectively to increase the relevance of the project, improve the efficiency of project delivery, or to ensure that data will be available to allow a better assessment of outcomes once the project has been completed.

PROJECT FRAMEWORK

Design Summary from RRP	Performance Targets and Indicators from RRP	Achievements / Status
<p>Impact</p> <p>Reduced CO₂ emissions by the Indonesian power sector.</p>	<p>CO₂ emissions reduced by about 330,000 tons per year.</p> <p>Project receiving certified emissions reductions (CER) for the avoided CO₂ emissions and being able to sell the CERs in international markets.</p>	<p>The project has contributed to the reduction of distribution losses across five networks and, thus, to the reduction of CO₂ emissions. While an accurate assessment is not possible, approximately half of the distribution loss reduction can be directly attributed to the project, mostly due to the installation of additional medium voltage circuits. The corresponding reduction in CO₂ emissions is approximately 1.17million tons per year. However, assuming all the transformers procured under the project are fully utilized, additional power generation enabled by this project will result in a net increase of CO₂ emissions of 370,000 tons a year.</p> <p>The project does not qualify for CERs. The intensity of carbon emissions from the Java–Bali electricity system continues to increase because of the replacement of imported oil with indigenous coal as power generation fuel, but the project mitigated some of this increase.</p>
<p>Outcome</p> <p>Contribute to PLN's overall power distribution efficiency and quality of power supply.</p>	<p>By 2013: Deferral of new distribution network investment by \$100 million.</p>	<p>Due to implementation delays, the project implementation period is 2014-2015. The after-project achievements are assessed with 2016 figures (if available) or 2015 figures, compared to 2013 figures (before project).</p> <p>If assessed, this could be a negative project outcome. The project was a proactive initiative to reduce losses by</p>

Design Summary from RRP	Performance Targets and Indicators from RRP	Achievements / Status
	<p>Overall distribution loss reduced to 7% from 8.4% in 2008.</p> <p>SAIFI reduced to 3.0 times per year per customer from 6.8 in 2008.</p>	<p>increasing asset capacity. If further network investment is deferred, these gains will be eroded over time.</p> <p>Overall distribution loss was reduced to 7.3% in 2013 and to 6.3% in 2016.</p> <p>Automation of this measurement has shown the manual assessment of SAIDI and SAIFI used for the project was unreliable. Interruptions per 100 circuit km is a more accurate measure of relative network reliability. This has declined from 11.77 in 2013 to 8.54 in 2016.</p>
<p>Outputs</p> <p>1. Reduced distribution losses in selected areas.</p> <p>2. Incremental sales.</p> <p>3. Increased access to power.</p>	<p>By 2012, a total of 400GWh saved.</p> <p>By 2012, additional sales of 635 GWh.</p> <p>By 2015, 1.2 million additional customers connected to the grid using saved energy.</p>	<p>The loss factor on the Java–Bali grid declined from 7.33% in 2013 to 6.30% in 2016. This represents savings of more than 1,400 GWh based on 2013 demand.</p> <p>Annual distribution sales on the Java–Bali grid (excluding directly connected transmission customers) increased by over 10,000 GWh (8%) between 2013 and 2015. Transformers procured by the Project have the potential to increase sales by more than 950 GWh per year after they have all been installed.</p> <p>A total of 4.5 million additional customers were connected to the Java–Bali grid over the 2-year period 2013–2015 with the number of connected customers reaching almost 39.5 million at the end of 2015.</p> <p>Under the project, sufficient additional transformer capacity was procured to connect almost 600,000 new</p>

Design Summary from RRP	Performance Targets and Indicators from RRP	Achievements / Status
<p><i>Original RRP</i> 4. Reduced peak demand and increased awareness of efficient lighting options in isolated grids and selected islands.</p> <p><i>Minor Change Memo – 31 January 2013</i> 4. Reduced peak demand and increased awareness of efficient lighting options in isolated grids and selected islands.</p>	<p><i>Original RRP</i> By 2013, reduce evening peak by 0% to 30% in pilot areas: about 300kW in Nusa Penida from current maximum peak demand of 1,900kW.</p> <p><i>Minor Change Memo – 31 January 2013</i> By 2015, reduce evening peak by 20% to 30% in pilot areas: about 300kW in Java–Bali from the current maximum peak demand of 1,900kW.</p>	<p>residential customers.</p> <p>The pilot project achieved an average of 50% reduction in the energy consumption of the outdoor luminaires changed under the program without any significant drop in lighting levels. The contribution to the reduction of evening peak cannot be measured as the baseline of 1,900 kW was not updated during the minor change to reflect the actual peak demand of the pilot project area. The target of 20% to 30% reduction also does not seem to be well-calibrated to the scope of the pilot project.</p> <p>The project has contributed to the increased awareness of efficient lighting through (i) a benchmark study with Thailand’s electricity authority, and (ii) a workshop on energy-efficient street lighting. A knowledge product is also being produced from lessons learned from this program. Details are available in Appendix 11.</p>
<p>5. Efficient project implementation.</p>	<p>At least 50% of the contracts were awarded by September 2010.</p>	<p>The first materials procurement contract was awarded in August 2012 and the final installation contract was not awarded until July 2014.</p>

CO₂ = carbon dioxide, CER = certified emissions reductions, GWh = gigawatt-hours, kW = kilowatt, PLN = Perusahaan Listrik Negara, SAIDI = system average interruption duration index, SAIFI = system average interruption frequency index.

SCHEDULE OF MATERIALS PROCURED AND INSTALLED

Procurement Contract	Description	Unit	Planned (RRP)	Procured	Installation Contract						Not Installed	
					Jakarta	West Java 1	West Java 2	Central Java	East Java 1	East Java 2		Bali
1.	Supply of MV cable 240 mm ²	km	520	503	142	170	150				4	37
	Supply of MV cable 300 mm ²	km	110	103	3	48	51					1
	Supply of MV cable 150 km ²	km	8	10	-				3	3	4	-
2.	Supply of A3C 150 mm ²	km	2,460	1,926					535	651		740
	Supply of A3CS 150 mm ²	km	2,120	1,480		340	247		341	438	114	-
	Supply of A3C 240 mm ²	km	180	507				507				-
	Supply of A3C 70 mm ²	km	400	-								
3.	Supply of LV 70 mm ²	km	1,550	1,227	24	87	131		252	328	10	395
4.	50 kVA transformer	No.	160	118					88	23		7
	100 kVA transformer	No.	1,210	1,096		197	159		402	236	114	102
	160 kVA transformer	No.	295	190		15	20		60	41	40	54
	200 kVA transformer	No.	89	25			6		2	6	9	11
	250 kVA transformer	No.	57	24			5		2		17	17
	315 kVA transformer	No.	25	2			2					-
	400 kVA transformer	No.	164	164	58	2						104
	630 kVA transformer	No.	82	26	12		2					12
1,000 kVA transformer	No.	15	-								-	
5.	1-phase transformer 50 kVA	No.	2,900	3,408				3,408				-

A3C = All Aluminium Alloy Conductors, A3CS = All Aluminium Alloy Conductors and XLPE Insultation, kVA = kilo-volt ampere, LV = low voltage, MV = medium voltage.

STATUS OF COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference	Status of Compliance
Loan Agreement		
<p>The Borrower shall cause PLN to carry out the Project with due diligence and efficiency and in conformity with sound administrative, financial, engineering, environmental and electricity distribution practices.</p>	Section 4.01 (a)	Complied with, but with a note that PLN needs to improve its administrative practices (e.g., periodic reporting, information recording and tracking) and monitoring during construction to ensure compliance with good engineering practices.
<p>(b) In the carrying out of the Project and operation of the Project facilities, the Borrower shall perform, or cause to be performed, all obligations set forth in Schedule 5 to this Loan Agreement and the Schedule to the Project Agreement.</p>	Section 4.01 (b)	Complied with. Please refer to the compliance status in Schedule 5.
<p>The Borrower shall make available to PLN, promptly as needed and on terms and conditions acceptable to ADB, the funds, facilities, services and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.</p>	Section 4.02	Complied with.
<p>The Borrower shall ensure that the activities of its departments and agencies with respect to the carrying out of the Project and operation of the Project facilities are conducted and coordinated in accordance with sound administrative policies and procedures.</p>	Section 4.03	Complied with.
<p>The Borrower shall take all action which shall be necessary on its part to enable PLN to perform its obligations under the Project Agreement, and shall not take or permit any action which would interfere with the performance of such obligations.</p>	Section 4.04	Complied with.
<p>The Borrower shall exercise its rights under the Subsidiary Loan Agreement, in such a manner as to protect the interests of the Borrower and ADB and to accomplish the purposes of the Loan.</p>	Section 4.05	Complied with.
<p>The Borrower shall not assign, amend, abrogate or waive any of its rights or obligations under the</p>	Section 4.05	Complied with.

Covenant	Reference	Status of Compliance
<p>Subsidiary Loan Agreement without prior discussion and mutual agreement with ADB.</p> <p>The Borrower shall appoint PLN as the Project Executing Agency and assume overall responsibility over the implementation of the Project.</p>	Schedule 5, Para. 1	Complied with.
<p>The Borrower shall cause PLN to provide adequate budgetary allocation of the required counterpart funds in a timely manner to ensure proper implementation of the Project.</p>	Schedule 5, Para. 2	Complied with.
<p>The Borrower shall ensure that the implementation of the Project shall be conducted in a manner consistent with: (a) the Borrower's environmental laws and regulations; and (b) ADB's Environment Policy (2002).</p>	Schedule 5, Para. 3	Complied with. Any environmental impacts were minor.
<p>The Borrower shall ensure that the implementation of the Project shall not require any land acquisition and involuntary resettlement. In the event that a certain activity will cause land acquisition and/or involuntary resettlement, the Borrower and PLN shall promptly prepare a resettlement plan and undertake other requirements set out in the ADB's <i>Involuntary Resettlement Policy</i> (1995).</p>	Schedule 5, Para. 4	Complied with. No land acquisition or resettlement required.
<p>The Borrower shall cause PLN to: (a) undertake necessary measures to create and sustain a corruption-free environment for activities under the Project; (b) institute, maintain and ensure compliance with internal procedures and controls for activities under the Project, following international best practice standards for the purpose of preventing corruption, money laundering activities, and the financing of terrorists, and shall require all relevant ministries and agencies to refrain from engaging in any such activities; (c) comply with ADB's <i>Anticorruption Policy</i> (1998, as amended to date); and (d) where appropriate, ensure that relevant provisions of ADB's Anticorruption Policy are included in all bidding documents for the Project.</p>	Schedule 5, Para. 5	Complied with.

Covenant	Reference	Status of Compliance
<p>The Borrower (a) acknowledges ADB's right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive and coercive practices relating to the Project, and (b) agrees to cooperate fully with, and cause PLN to cooperate fully with, any such investigation and to extend all necessary assistance, including providing access to all relevant books and records, as may be necessary for the satisfactory completion of any such investigation. All external costs related to such investigations shall be met by the Project resources.</p>	<p>Schedule 5, Para. 6</p>	<p>Complied with.</p>
Project Agreement		
<p>Section 2.01. (a) PLN shall carry out the Project with due diligence and efficiency, and in conformity with sound administrative, financial, engineering, environmental and electricity distribution practices.</p>	<p>Section 2.01 (a)</p>	<p>Complied with.</p>
<p>(b) In the carrying out of the Project and operation of the Project facilities, PLN shall perform all obligations set forth in the Loan Agreement to the extent that they are applicable to PLN and all obligations set forth in the Schedule to this Project Agreement.</p>	<p>Section 2.01 (b)</p>	<p>Complied with.</p>
<p>PLN shall make available, promptly as needed, the funds, facilities, services, equipment, land and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.</p>	<p>Section 2.02</p>	<p>Complied with.</p>
<p>In the carrying out of the Project, PLN shall employ competent and qualified consultants and contractors, acceptable to ADB, to an extent and upon terms and conditions satisfactory to ADB.</p>	<p>Section 2.03</p>	<p>Complied with.</p>
<p>Except as ADB may otherwise agree, all Goods, Works and consulting services to be financed out of the proceeds of the Loan shall be procured in accordance with the provisions of Schedule 4 to the Loan Agreement. ADB may refuse to finance a contract where Goods, Works or consulting services have not been procured under procedures substantially in accordance with those agreed between the</p>	<p>Section 2.03</p>	<p>Complied with.</p>

Covenant	Reference	Status of Compliance
<p>performance of its obligations under this Project Agreement, or the accomplishment of the purposes of the Loan.</p>		
<p>ADB and PLN shall from time to time, at the request of either party, exchange views through their representatives with regard to any matters relating to the Project, PLN and the Loan.</p>	Section 2.07	Complied with.
<p>PLN shall furnish to ADB all such reports and information as ADB shall reasonably request concerning (i) the Loan and the expenditure of the proceeds thereof; (ii) the Goods, Works and consulting services financed out of such proceeds; (iii) the Project; (iv) the administration, operations and financial condition of PLN; and (v) any other matters relating to the purposes of the Loan.</p>	Section 2.08	Complied with.
<p>Without limiting the generality of the foregoing, PLN shall furnish to ADB quarterly reports on the execution of the Project and on the operation and management of the Project facilities. Such reports shall be submitted in such form and in such detail and within such a period as ADB shall reasonably request, and shall indicate, among other things, progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and proposed program of activities and expected progress during the following quarter.</p>	Section 2.08	Partly complied with. Progress reports were not provided for all quarters due to the underperformance of the project implementation consultant. ADB performed frequent and direct supervision meetings and discussions during implementation to compensate for the lack of progress reports.
<p>Promptly after physical completion of the Project, but in any event not later than three (3) months thereafter or such later date as ADB may agree for this purpose, PLN shall prepare and furnish to ADB a report, in such form and in such detail as ADB shall reasonably request, on the execution and initial operation of the Project, including its cost, the performance by PLN of its obligations under this Project Agreement and the accomplishment of the purposes of the Loan.</p>	Section 2.08	Partly complied with. PLN's Project Completion Report (PCR) was submitted to ADB in March 2017. The delay was due to the underperformance of the project implementation consultant recruited under the loan and PLN had to recruit another consultant (under PLN's budget) to prepare the report.
<p>PLN shall (i) maintain separate accounts for the Project; (ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related</p>	Section 2.09	Complied with.

Covenant	Reference	Status of Compliance
<p>statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB; and (iii) furnish to ADB, promptly after their preparation but in any event not later than six (6) months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the Loan proceeds and compliance with the covenants of the Loan Agreement, all in the English language). PLN shall furnish to ADB such further information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request.</p>		
<p>PLN shall enable ADB, upon ADB's request, to discuss PLN's financial statements and its financial affairs from time to time with the auditors appointed by PLN pursuant to Section 2.09(a) here above, and shall authorize and require any representative of such auditors to participate in any such discussions requested by ADB, provided that any such discussion shall be conducted only in the presence of an authorized officer of PLN unless PLN shall otherwise agree.</p>	Section 2.09	Complied with.
<p>PLN shall enable ADB's representatives to inspect the Project, the Goods and Works financed out of the proceeds of the Loan and any relevant records and documents.</p>	Section 2.10	Complied with.
<p>PLN shall, promptly as required, take all action within its powers to maintain its corporate existence, to carry on its operations, and to acquire, maintain and renew all rights, properties, powers, privileges and franchises which are necessary in the carrying out of the Project or in the conduct of its business.</p>	Section 2.11	Complied with.
<p>PLN shall at all times conduct its business in accordance with sound administrative, financial, environmental and electricity distribution practices, and under the supervision of competent and experienced management and personnel.</p>	Section 2.11	Complied with.

Covenant	Reference	Status of Compliance
<p>PLN shall at all times operate and maintain its plants, equipment and other property, and from time to time, promptly as needed, make all necessary repairs and renewals thereof, all in accordance with sound administrative, financial, engineering, environmental, electricity distribution, and maintenance and operational practices.</p>	Section 2.11	Complied with.
<p>Except as ADB may otherwise agree, PLN shall not sell, lease or otherwise dispose of any of its assets which shall be required for the efficient carrying on of its operations or the disposal of which may prejudice its ability to perform satisfactorily any of its obligations under this Project Agreement.</p>	Section 2.12	Complied with.
<p>Except as ADB may otherwise agree, PLN shall apply the proceeds of the Loan to the financing of expenditures on the Project in accordance with the provisions of the Loan Agreement and this Project Agreement, and shall ensure that all Goods, Works and consulting services financed out of such proceeds are used exclusively in the carrying out of the Project.</p>	Section 2.13	Complied with.
<p>Except as ADB may otherwise agree, PLN shall duly perform all its obligations under the Subsidiary Loan Agreement, and shall not take, or concur in, any action which would have the effect of assigning, amending, abrogating or waiving any rights or obligations of the parties under the Subsidiary Loan Agreement</p>	Section 2.14	Complied with.
<p>PLN shall promptly notify ADB of any proposal to amend, suspend or repeal any provision of its Articles of Association and shall afford ADB an adequate opportunity to comment on such proposal prior to taking any action thereon.</p>	Section 2.15	Complied with.
<p><i>Project Implementation</i> PLN shall nominate its Deputy Director of Distribution and Commercial Java Bali to be responsible for the implementation of the Project. The Deputy Director of Distribution and Commercial Java Bali shall, in turn, nominate a Project director who shall be supported by qualified staff. The Project director and staff shall: (a) monitor the progress of the Project; (b) supervise the consultants and contractors under</p>	Schedule, Para. 1	Partly complied with, but with a note that in the final year of the loan, there was a period with no project director in charge due to the reorganization of PLN (splitting Java-Bali operations into three directorates). ADB performed frequent and direct supervision meetings and

Covenant	Reference	Status of Compliance
<p>the Project; (c) submit the necessary documentation to ADB for the withdrawal of Loan proceeds; (d) prepare periodic reports to ADB, including the Project completion report and annual audited project accounts report; (e) manage the Project accounts and financial records for auditing; and (f) monitor the socioeconomic impact of the Project.</p>		discussions during implementation to compensate for the lack of project director.
<p>PLN shall nominate the regional manager in each Project Region to be responsible for the implementation of the Project at the regional level. The general manager shall, in turn, nominate a Project manager who shall be supported by qualified staff. The Project manager and staff shall: (a) carry out the procurement activities in the region; (b) supervise the contractors working in the region; (c) provide support to the consultants recruited under the Project; and (d) prepare the necessary documentation for the withdrawal of Loan proceeds. Each Project manager shall (a) coordinate the day-to-day Project activities with the Project director in the PLN headquarters; and (b) report on their overall activities to their respective regional manager.</p>	Schedule, Para. 2	Complied with.
<p><i>Counterpart Funding</i> PLN shall ensure that throughout the implementation of the Project, adequate budgetary allocation of the required counterpart funds is approved and released in a timely manner to ensure proper implementation of the Project</p>	Schedule, Para. 3	Complied with.
<p><i>Financial Ratios</i> PLN shall perform all actions necessary to ensure that, beginning 1 January 2012, it shall achieve a self-financing ratio of at least 15 (fifteen) percent. Except as ADB shall otherwise agree, PLN shall produce, for each of its fiscal years after fiscal year ending on 31 December 2011, cash from internal sources equivalent to not less than 15 (fifteen) percent of the annual average of PLN's capital expenditures incurred, or expected to be incurred, for that year and the succeeding fiscal years.</p>	Schedule, Para. 4	Complied with: 2012–2013. Waived by ADB: 2014–2015.
<p>Except as ADB shall otherwise agree, PLN shall</p>	Schedule,	Complied with: 2012–2013.

Covenant	Reference	Status of Compliance
<p>perform all actions necessary to ensure that it shall not incur any debt, unless its net revenues for the twelve (12) months prior to the date of such incurrence shall be; (a) at least 1.2 (one point two) times for the period beginning 1 January 2011; and (b) at least 1.5 (one point five) times for the period beginning 1 January 2012, of its estimated maximum debt service requirements for any succeeding fiscal year on all its debt, including the debt to be incurred.</p>	Para. 5	Waived by ADB: 2014–2015.
<p>Except as ADB shall otherwise agree, PLN shall maintain, for its fiscal year ending on: (a) 31 December 2011, a ratio of total operating expenses to total operating revenue not higher than 87 (eighty seven) percent; and (b) 31 December 2012, a ratio of total operating expenses to total operating revenue not higher than 80 (eighty) percent.</p>	Schedule, Para. 6	Complied with: 2012–2013. Waived by ADB: 2014–2015.
<p>Prior to 30 June of each fiscal year and on the basis of a forecast satisfactory to ADB, PLN shall review whether it would meet the [above financial ratio] requirements in respect of such year and the next following fiscal year, and shall furnish to ADB the results of such review upon its completion.</p>	Schedule, Para. 7	Partly complied with: PLN sent an early request for a financial ratio waiver for FY 2014 and 2015. ADB requested PLN to furnish projections for the subsequent quarters, but they were never furnished. ADB approved the waiver request because this was an SLA loan.
<p>PLN shall continue their cost reduction initiatives by changing generation mix and improvement of energy efficiency. PLN shall have (a) gradual increase on the amount of its cost of operation that can be recovered from its customers; and (b) gradual decrease on its reliance on the subsidies from the Borrower.</p>	Schedule, Para. 8	Complied with. The proportion of electricity generated from indigenous coal continues to increase. The government's subsidy to PLN in 2015 (including accruals) was Rp73.15 trillion, down from Rp93.18 trillion in 2011.
<p>PLN shall ensure that the implementation of the Project shall be conducted in a manner consistent with (a) the Borrower's environmental laws and regulations; and (b) ADB's <i>Environment Policy</i> (2002).</p>	Schedule, Para. 9	Complied with.
<p>PLN shall ensure that the implementation of the Project shall not require any land acquisition and involuntary resettlement. Nevertheless, in the event that a certain activity will cause land</p>	Schedule, Para. 10	Complied with.

Covenant	Reference	Status of Compliance
<p>acquisition and/or involuntary resettlement, PLN shall promptly prepare a resettlement plan and other requirements set out in the ADB's <i>Involuntary Resettlement Policy</i> (1995).</p>		
<p>PLN shall, by July 2010, publicly disclose on its website the breakdown by customer class of its electricity supply cost for the fiscal year 2009 into three (3) components, namely generation, transmission and distribution and make similar disclosure in July of the succeeding years for the relevant fiscal year.</p>	Schedule, Para. 11	Complied with. PLN has published comprehensive annual statistics of its operations since 2009.
<p>PLN shall publicly disclose on its website information on how the Loan proceeds are being used. Insofar as they relate to the procurement contract, PLN shall disclose: (a) the list of participating bidders; (b) the name of the winning bidder; (c) the basic details on bidding procedures adopted; (d) the amount of the contract awarded; (e) the list of goods and services purchased; and (f) the intended and actual utilization of Loan proceeds under each contract being awarded.</p>	Schedule, Para. 12	Not complied with. The disclosures are made instead on ADB's website through the disclosure of the procurement plan and contract awards.
<p>Notwithstanding the generality of Section 2.08 of this Project Agreement, PLN shall prepare quarterly progress reports and submit them to ADB within twenty (20) days of the end of the quarter. The reports shall be prepared in a format acceptable to ADB and include, among others, the following: (a) Project progress in each region; (b) the status of institutional development activities; (c) delays and problems encountered and actions taken to resolve them; (d) compliance with the covenants under the Loan Agreement; and (e) expected progress during the next six (6) months. Within six (6) months of the Project's physical completion, PLN shall prepare and submit to ADB a Project completion report in ADB's standard format, including costs and status of compliance with the covenants under the Loan Agreement.</p>	Schedule, Para. 13	Partly complied with. PLN provided progress reports but not periodically and not to the extent that was required due to the lack of capacity of the project implementation consultant. ADB performed frequent and direct supervision meetings and discussions during implementation to compensate for the lack of progress reports.
<p>Within three (3) months of the Effective Date, PLN shall develop a Project performance management system based on the Project design and monitoring framework to examine the technical performance of the Project,</p>	Schedule, Para. 14	Partly complied with. PLN provided reports on loan disbursements and physical progress. It did not provide progress reports against the

Covenant	Reference	Status of Compliance
<p>evaluate delivery of Project facilities, assess achievement of Project objectives, and measure the social, economic, financial and institutional impacts of the Project.</p>		<p>project framework or measurements of the social, economic, financial, and institutional aspects of the project due to the lack of capacity of the project implementation consultant. ADB performed frequent and direct supervision meetings and discussions during implementation to compensate for the lack of progress reports.</p>
<p>PLN and ADB shall conduct a semi-annual review to: (a) assess implementation performance and achievement of Project outcomes and objectives; (b) review financial progress; and (c) identify issues and constraints affecting the Project and work out a time-bound action plan for their resolution. Within one (1) year of Project implementation, PLN and ADB shall undertake a midterm review to: (a) assess implementation status; (b) review Project parameters; and (c) take necessary measures including modifying the scope and implementation arrangements, and reallocating Loan proceeds, as appropriate given implementation experience, to achieve the Project objectives.</p>	<p>Schedule, Para. 15</p>	<p>Complied with.</p>
<p>Notwithstanding the generality of Section 2.09 of [the Project] Agreement, PLN shall, within six (6) months after the end of the fiscal year, submit: (a) audited annual Project account; and (b) audited annual financial statements. The annual Project account shall contain detailed descriptions of the sources of receipts and expenditures. The annual financial statements shall consist of income statement, balance sheet, statement of cash flows and related notes to the financial statements. The annual financial statements shall be consolidated for all PLN's operations.</p>	<p>Schedule, Para. 16</p>	<p>Complied with.</p>
<p>PLN shall ensure that the auditors to be appointed for the purposes of the Project shall be independent and selected in accordance with competitive selection procedures acceptable to ADB. PLN shall ensure that its accounts and</p>	<p>Schedule, Para. 17</p>	<p>Complied with.</p>

Covenant	Reference	Status of Compliance
<p>financial statements shall be prepared in accordance with sound accounting principles and procedures.</p> <p>PLN shall ensure that the auditors provide an opinion on PLN's compliance with the financial covenants set out in this Agreement and indicate the details of the actual calculation for all ratios.</p>	Schedule, Para. 18	Complied with.
<p>PLN shall (a) undertake necessary measures to create and sustain a corruption-free environment for activities under the Project; (b) institute, maintain and ensure compliance with internal procedures and controls for activities under the Project, following international best practice standards for the purpose of preventing corruption, money laundering activities, and the financing of terrorists, and shall require all relevant ministries and agencies to refrain from engaging in any such activities; (c) comply with ADB's <i>Anticorruption Policy</i> (1998, as amended to date); and (d) where appropriate, ensure that relevant provisions of ADB's Anticorruption Policy are included in all bidding documents for the Project.</p>	Schedule, Para. 19	Complied with.
<p>PLN (a) acknowledges ADB's right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive and coercive practices relating to the Project; and (b) agrees to cooperate fully with any such investigation and to extend all necessary assistance, including providing access to all relevant books and records, as may be necessary for the satisfactory completion of any such investigation. All external costs related to such investigations shall be met by the Project resources.</p>	Schedule, Para. 20	Complied with.

ADB = Asian Development Bank, PCR = Project Completion Report, PLN = *Perusahaan Listrik Negara*, SLA = Subsidiary Loan Agreement.

STATUS OF COMPLIANCE WITH GRANT COVENANTS

Covenant	Reference	Status of Compliance
Grant Agreement		
Article 4 Particular Covenant		
In the carrying out of the Project and operation of the Project facilities, the Recipient shall perform, or cause to be performed, all obligations set forth in Schedule 3 to this Grant Agreement.	Section 4.01	Please refer to compliance status in Schedule 3.
The Recipient shall (i) maintain, or cause to be maintained, separate accounts for the Project; (ii) have such accounts and related financial statements audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB; (iii) furnish to ADB, as soon as available but in any event not later than six (6) months after the end of each related fiscal year, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the Grant proceeds and compliance with the financial covenants of this Grant Agreement, all in the English language); and (iv) furnish to ADB such other information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request.	Section 4.02 (a)	Complied with, but with a note that the grant was closed on 31 August 2016. The audited financial statement for 2016 fiscal year was not available at the time of PCR preparation and will be available only on 30 June 2017.
The Recipient shall enable ADB, upon ADB's request, to discuss the Recipient's financial statements for the Project and its financial affairs related to the Project from time to time with the auditors appointed by the Recipient pursuant to Section 4.02(a) hereabove, and shall authorize and require any representative of such auditors to participate in any such discussions requested by ADB, provided that any such discussion shall be conducted only in the presence of an authorized officer of the Recipient unless the Recipient shall otherwise agree.	Section 4.02 (b)	Complied with.

Covenant	Reference	Status of Compliance
The Recipient shall enable ADB's representatives to inspect the Project, the goods financed out of the proceeds of the Grant, and any relevant records and documents.	Section 4.03	Complied with.
Schedule 3: Execution of Project; Financial Matters		
The Recipient shall nominate its Deputy Director of Distribution and Commercial Java Bali to be responsible for the implementation of the Project. The Deputy Director of Distribution and Commercial Java Bali shall, in turn, nominate a Project director who shall be supported by qualified staff. The Project director and staff shall: (a) monitor the progress of the Project; (b) supervise the consultants under the Project; (c) submit the necessary documentation to ADB for the withdrawal of Grant proceeds; (d) prepare periodic reports to ADB, including the Project completion report and annual audited project accounts report; (e) manage the Project accounts and financial records for auditing; and (f) monitor the socioeconomic impact of the Project.	Project Implementation Para 1.	Partly complied with, but with a note that in 2015 there was a period with no project director in charge due to the reorganization of PLN (splitting Java–Bali operations into three directorates). ADB performed frequent and direct supervision meetings and discussions during implementation to compensate for the lack of project director.
The Recipient shall nominate the regional manager in each Project Region to be responsible for the implementation of the Project at the regional level. The general manager shall, in turn, nominate a Project manager who shall be supported by qualified staff. The Project manager and staff shall: (a) carry out the procurement activities in the region; (b) provide support to the consultants recruited under the Project; and (c) prepare the necessary documentation for the withdrawal of the Grant proceeds. Each Project manager shall (a) coordinate the day-to-day Project activities with the Project director in the headquarters of the Recipient; and (b) report on their overall activities to their respective regional manager.	Project Implementation Para 2.	Complied with.
The Recipient shall ensure that throughout the implementation of the Project, adequate budgetary allocation of the required counterpart funds are approved and released	Counterpart Funding Para 3.	Complied with.

Covenant	Reference	Status of Compliance
in a timely manner to ensure proper implementation of the Project.		
The Recipient shall prepare quarterly progress reports and submit them to ADB within twenty (20) days of the end of the quarter. The reports shall be prepared in a format acceptable to ADB and include, among others, the following: (a) Project progress; (b) delays and problems encountered and actions taken to resolve them; (c) compliance with the covenants under this Grant Agreement; and (d) expected progress during the next six (6) months. Within six (6) months of the completion of the Project, the Recipient prepare and submit to ADB a Project completion report in ADB's standard format, including costs and status of compliance with the covenants under this Grant Agreement.	Project Report and Review Para 4.	Partly complied with. The progress reports were not received every quarter. The project completion report was submitted by PLN in March 2017 (7 months after the grant closing date). ADB performed frequent and direct supervision meetings and discussions during implementation to compensate for the lack of progress reports.
Within three (3) months of the Effective Date, the Recipient shall develop a Project performance management system based on the Project design and monitoring framework to examine the technical performance of the Project, evaluate delivery of Project facilities, assess achievement of Project objectives, and measure the social, economic, financial and institutional impacts of the Project.	Project Report and Review Para 5.	Partly complied with. PLN provided progress reports, but not periodically. It did not provide progress reports against the project framework or measurements of the social, economic, financial, and institutional aspects of the project due to the lack of capacity of the project implementation consultant. ADB performed frequent and direct supervision meetings and discussions during implementation to compensate for the lack of progress reports.
The Recipient and ADB shall conduct a semi-annual review to: (a) assess implementation performance and achievement of Project outcomes and objectives; (b) review financial progress; and (c) identify issues and constraints affecting the Project, and work out a time-bound action plan for their resolution. Within one (1) year of Project implementation, the Recipient and ADB shall	Project Report and Review Para 6.	Complied with.

Covenant	Reference	Status of Compliance
undertake a midterm review to: (a) assess implementation status; (b) review Project parameters; and (c) take measures, as appropriate given implementation experience, to achieve the Project objectives.		
The Recipient shall ensure that the methodology for CFL distribution shall be in accordance with the approved methodology of the UNFCCC and in mutual agreement with ADB.	Distribution of CFL Para 7.	Not applicable. Given the high penetration rates of CFLs, minor changes memo was approved in 2015 to utilize the grant for efficient municipal street lighting and PLN's power plants and substations lighting system through retrofitting to LED (Light Emitting Diode). LED street lights have been installed in Semarang city and Batang district under the project.
The Recipient shall (a) distribute the CFLs to customers free of charge in exchange for the collection of the working incandescent bulbs; and (b) have the process of the collection of the incandescent bulbs validated by independent professionals in accordance with the relevant UNFCCC guidelines.	Distribution of CFL Para 8.	Not applicable. See note in Para. 7.
The Recipient shall (a) undertake necessary measures to create and sustain a corruption-free environment for activities under the Project; (b) institute, maintain and ensure compliance with internal procedures and controls for activities under the Project, following international best practice standards for the purpose of preventing corruption, money laundering activities, and the financing of terrorists, and shall require all relevant ministries and agencies to refrain from engaging in any such activities; (c) comply with ADB's <i>Anticorruption Policy</i> (1998, as amended to date); and (d) where appropriate, ensure that relevant provisions of ADB's <i>Anticorruption Policy</i> are included in all bidding documents for the Project.	Anti-Corruption Para 9.	Complied with.

Covenant	Reference	Status of Compliance
The Recipient (a) acknowledges ADB's right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive and coercive practices relating to the Project; and (b) agrees to cooperate fully with any such investigation and to extend all necessary assistance, including providing access to all relevant books and records, as may be necessary for the satisfactory completion of any such investigation. All external costs related to such investigations shall be met by the Project resources.	Anti-Corruption Para 10.	Complied with.

ADB = Asian Development Bank, CFL = compact fluorescent lamp, LED = light emitting diode, PCR = Project Completion Report, PLN = *Perusahaan Listrik Negara*, UNFCCC = United Nations Framework Convention on Climate Change.

ADB, AFD, and CEF ACTUAL PROJECT COSTS

ITEM	ADB	AFD	CEF Grant	PLN		TOTAL
	Amount	Amount	Amount	Amount	Tax	
EQUIPMENT						
MV Underground Cables	9,205,501.00	9,205,501.00	-	-	-	18,411,002.00
MV Overhead Conductor	3,166,908.50	3,166,908.50	-	-	-	6,333,817.00
LV Conductor	1,819,332.50	1,819,332.50	-	-	-	3,638,665.00
Single Phase Transformers	3,538,658.16	3,422,523.77	-	-	-	6,961,181.93
Three Phase Transformers	4,393,274.52	4,415,449.68	-	-	-	8,808,724.20
Subtotal Equipment	22,123,674.68	22,029,715.45	-	-	-	44,153,390.13
INSTALLATION						
Installation – Jakarta	3,108,468.08	359,504.02	-	587,737.05	58,773.71	4,114,482.86
Installation – West Java 1	2,829,332.23	2,335,494.57	-	897,710.80	89,771.08	6,152,308.68
Installation – West Java 2	2,859,534.89	2,156,199.39	-	855,411.50	85,541.15	5,956,686.93
Installation – Bali	550,380.73	539,078.01	-	185,734.86	18,573.49	1,293,767.09
Installation – East Java	3,225,682.86	1,501,470.97	-	815,879.58	81,587.96	5,624,621.37
Installation – East Java	2,867,745.85	1,161,566.43	-	704,240.77	70,424.08	4,803,977.12
Installation – Central Java	1,254,433.30	1,235,692.48	-	426,579.93	42,657.99	2,959,363.71
Subtotal Installation	16,695,577.94	9,289,005.87	-	4,473,294.49	447,329.45	30,905,207.75
Consulting Service	307,407.02	302,953.65	-	-	-	610,360.67
Pilot for Efficient Lighting	-	-	965,587.80	-	-	965,587.80
PLN Management Cost	-	-	-	6,462,484.06	-	6,462,484.06
IMPLEMENTATION COSTS	39,126,659.64	31,621,674.97	965,587.80	10,935,778.55	447,329.45	83,097,030.41
FINANCIAL CHARGES DURING IMPLEMENTATION (FCDI)						
Interest During Construction – ADB Loan	-	-	-	178,806.12	-	-
Interest During Construction – AFD Loan	-	-	-	352,835.43	-	-
Commitment Fees – ADB Loan	-	-	-	304,176.28	-	-
Subtotal FCDI	-	-	-	835,817.83	-	-
Total	39,126,659.64	31,621,674.97	965,587.80	11,771,596.38	447,329.45	83,932,848.24

ADB = Asian Development Bank, AFD = *Agence Française de Développement*, CEF = Clean Energy Fund, FCDI = financial charges during implementation, LV = low voltage, MV = medium voltage.

CARBON DIOXIDE EMISSIONS

1. The impact of the project on carbon dioxide (CO₂) emissions is assessed using the approach developed by the World Bank for assessing the impact of transmission and distribution projects on CO₂ emissions.¹ This approach identifies all factors that impact CO₂ emissions and quantifies the impact of each identified factor independently, taking care to avoid double counting. Impacts from factors that reduce CO₂ emissions are offset against those that increase emissions to assess the net emissions impact of the project. This can be positive or negative, with a negative value representing a reduction in emissions. The baseline for the analysis is the level of emissions that would have existed if the project had not been implemented. Impacts for which relevant quantitative data is not available or that are not considered material are ignored and not included in the analysis.
2. For this analysis, two project impacts were analyzed: (i) the reduction in technical losses driven primarily by the installation of larger conductors, and (ii) the connection of new customers made possible by the transformers installed under the project.² Other impacts such as CO₂ emissions during the manufacture of the equipment installed during the project and emissions from the additional electricity sales resulting from the improved reliability of supply were not analyzed.
3. Electricity supplied to the Java–Bali grid is for the most part generated by the burning of hydrocarbons and the project's impact on CO₂ emissions is primarily a result of its impact on the quantity of electricity generation. On the one hand, the reduction in losses reduces the demand for electricity and, hence, CO₂ emissions. Conversely, the installation of additional transformer capacity allows more customers to be connected to the grid thereby increasing the demand for electricity and, hence, CO₂ emissions.
4. Perusahaan Listrik Negara (PLN)'s published annual statistics include both the total fuel consumption and the total electricity generated for the Java–Bali grid. This has allowed the marginal carbon emission factor (expressed as kg CO₂ per kilowatt-hours (kWh) generated) to be readily calculated. The latest fuel consumption data available at the time of writing this report was for 2015 and the marginal emission factor was estimated to be 1.47kg CO₂ per kWh, based on the incremental fuel consumption and electricity generation over the period 2013–2015. This is significantly higher than the average emissions factor (estimated to be 0.91 kg CO₂ per kWh in 2013 and 0.96 in 2015) because PLN is currently replacing diesel generation with coal to reduce its reliance on imported oil, as noted in the RRP.³
5. The project was implemented in 2014–2015. The analysis considers the CO₂ emissions from the Java–Bali grid before and after the project (i.e., between 2013 and 2016). This change in total emissions will be a consequence not only of the project but also of the larger network development program implemented by PLN at the same time. Data for 2013 has been taken from PLN's published statistics. As the 2016 statistics were not available for this analysis, the analysis was based on preliminary performance information for each distribution area provided by PLN.

¹ World Bank. 2010. *Impact of Transmission and Distribution Projects on Greenhouse Gas Emissions. Review of Methodologies and a Proposed Approach in the Context of World Bank Lending Operations*. Washington.

² The impact of the efficient lighting pilot project on emissions is assessed in Appendix 12.

³ ADB. 2010. *Java–Bali Electricity Distribution Performance Improvement Project. Report and Recommendation of the President to the Board of Directors*. Manila.

6. Between 2013 and 2016, distribution losses across all five networks were reduced from 7.3% to 6.3%. In 2013 distribution network sales were 129,200 gigawatt-hours (GWh). The reduction in network losses for this level of sales were calculated at 1,430 GWh and the savings in generation to supply these losses as 1,470 GWh.⁴ The annual reduction in CO₂ emissions from this reduction in generation was calculated to be 2,157,000 tons. As the project was active during this period, it has contributed to the reductions in distribution losses and CO₂ emissions. This contribution was due to the installation of additional medium voltage circuits by the project. The project installed 54% of the additional medium voltage circuit length installed over the project implementation period. Consequently, while an accurate assessment is not possible, it is estimated that approximately half of this emissions reduction can be directly attributed to the project.

7. In 2015, medium- and low-voltage sales on the Java–Bali grid were 139,360 GWh, an increase of 10,100 GWh over 2013. Assuming 6.3% distribution losses and 2.5% transmission losses, supplying this load would require 11,100 GWh of additional generation with calculated carbon emissions of 16,300,000 tons. This represents a net increase in emissions of 14,100,000 tons.

8. The project purchased a total of 410 mega-volt ampere (MVA) of distribution transformer capacity. Based on PLN's average transformer utilization in 2013, before project installation work commenced, when installed and fully utilized, these transformers have the capacity to support annual sales of approximately 950 GWh, equating to additional CO₂ emissions of 1,535,000 tons.

9. This analysis is summarized in Table A6.1. It shows the net impact of PLN's network development program (including the Project) on CO₂ emissions over the period of the project installation works. The savings in CO₂ emissions from the reduction in losses is offset against the CO₂ emissions from the additional load connected over the period. The other analysis focuses on the project and shows the CO₂ emissions impact of the project after the transformer capacity procured under the Project is fully utilized.

Table A6.1 Estimated CO₂ Emissions Impacts

	Generation (GWh per annum)	Emissions (tons CO ₂ per annum)
Java–Bali Distribution Networks (2013–2015)		
Total reduction in losses ^a	(1,431)	(2,157,252)
Additional electricity demand	10,118	16,279,639
Net	8,687	14,112,388
Assume 54% loss reduction attributed to the project		
Reduction in losses from Project	(773)	(1,164,916)
Additional electricity supplied through project transformers	954	1,535,210
Net	181	370,294

CO₂ = carbon dioxide, GWh = gigawatt-hours

^a Impact of reduction in loss factor to 6.3% assuming 2013 sales.

⁴ The difference is due to the reduction in transmission losses, which are assumed to be 2.5%.

ACTUAL QUARTERLY ADB AND AFD LOAN DISBURSEMENT SCHEDULE

Table A7.1: Actual Quarterly ADB and AFD Loan Disbursement Schedule - Q4 (Oct-Dec) 2012 – Q2 (Apr-Jun) 2014

		Oct-Dec 2012	Jan-Mar 2013	Apr-Jun 2013	Jul-Sep 2013	Oct-Dec 2013	Jan-Mar 2014	Apr-Jun 2014
Consulting Services	ADB	56,123.61	10,966.31	31,216.35	52,850.42	30,359.66		
	AFD	21,940.45	35,431.44	43,722.45	23,888.84	56,530.23		51,321.08
Equipment Procurement								
Medium Voltage Underground Cable	ADB	316,690.85		1,156,155.60		1,377,371.20		316,690.85
	AFD	316,690.85		518,825.60	637,330.00	1,377,371.20	316,690.85	
Medium Voltage Overhead Conductor	ADB	181,933.25		1,049,851.60		405,614.40		181,933.25
	AFD	181,933.25		312,052.00	737,799.60	405,614.40	181,933.25	
Low Voltage Cable	ADB	920,550.10		3,457,057.60		1,860,692.80		2,967,200.50
	AFD		920,550.10	1,556,748.80	1,900,308.80	1,860,692.80	2,967,200.50	
Single Phase Distribution Transformers	ADB		398,369.71	678,226.68	736,196.94	1,391,573.16		334,291.67
	AFD		404,731.28		686,131.36	2,151,184.85	180,476.28	
Three Phase Distribution Transformers	ADB		504,182.29	816,025.73		2,642,798.05		430,268.45
	AFD		202,305.87	317,490.50	826,111.94	2,636,166.34	433,375.03	
Installation Works								
Bali	ADB					121,315.70		
	AFD					122,573.30		518,527.03
Central Java	ADB					50,391.44		
	AFD					51,291.57		385,137.15
West Java -2	ADB							236,009.84
	AFD						238,851.81	
Jakarta	ADB							
	AFD							

		Oct–Dec 2012	Jan–Mar 2013	Apr–Jun 2013	Jul–Sep 2013	Oct–Dec 2013	Jan–Mar 2014	Apr–Jun 2014
West Java – 1	ADB							
	AFD							
East Java – Lot 1	ADB							
	AFD							298,958.26
East Java – Lot 2	ADB							
	AFD							279,582.77
Subtotals	ADB	1,475,297.81	913,518.31	7,188,533.56	789,047.36	7,880,116.41	-	4,466,394.56
	AFD	520,564.55	1,563,018.69	2,748,839.35	4,811,570.54	8,661,424.69	4,318,527.72	1,533,526.29
Totals		1,995,862.36	2,476,537.00	9,937,372.91	5,600,61.90	16,541,541.10	4,318,527.72	5,999,920.85

ADB = Asian Development Bank, AFD = Agence Française de Développement Insert explanations for all abbreviations used, in alphabetical order, immediately below the table (i.e., in this position).

Table A7.2: Actual Quarterly ADB and AFD Loan Disbursement Schedule - Q3 (Jul-Sep) 2014 – Q1 (Jan-Mar) 2016

		Jul–Sep 2014	Oct–Dec 2014	Jan–Mar 2015	Apr–Jun 2015	Jul–Sep 2015	Oct–Dec 2015	Jan–Mar 2016	Total
Consulting Services	ADB	53,832.06	50,968.15		21,090.46				307,407.02
	AFD	48,911.19	21,207.97						302,953.65
Equipment Procurement									
Medium Voltage Underground Cable	ADB								3,166,908.50
	AFD								3,166,908.50
Medium Voltage Overhead Conductor	ADB								1,819,332.50
	AFD								1,819,332.50
Low Voltage Cable	ADB								9,205,501.00
	AFD								9,205,501.00
Single Phase Distribution Transformers	ADB								3,538,658.16
	AFD								3,422,523.77
Three Phase	ADB								4,393,274.52

		Jul-Sep 2014	Oct-Dec 2014	Jan-Mar 2015	Apr-Jun 2015	Jul-Sep 2015	Oct-Dec 2015	Jan-Mar 2016	Total
Distribution Transformers	AFD								4,415,449.68
Installation Works									
Bali	ADB	533,492.10	542,961.09		56,664.41				1,254,433.30
	AFD	537,462.20		57,129.95					1,235,692.48
Central Java	ADB	398,188.58	77,221.21		24,579.50				550,380.73
	AFD	77,905.04		24,744.25					539,078.01
West Java -2	ADB				1,914,734.16		708,790.89		2,859,534.89
	AFD		958,862.29	958,485.29					2,156,199.39
Jakarta	ADB		361,303.87				2,747,164.21		3,108,468.08
	AFD	359,504.02							359,504.02
West Java – 1	ADB				2,315,440.47		513,891.76		2,829,332.23
	AFD		1,038,224.36	1,297,270.21					2,335,494.57
East Java – Lot 1	ADB	63,948.23	232,300.81				2,982,289.59	-52,855.77	3,225,682.86
	AFD			1,202,512.71					1,501,470.97
East Java – Lot 2	ADB		276,921.50				2,678,749.92	-87,925.57	2,867,745.85
	AFD			881,983.66					1,161,566.43
Subtotals	ADB	1,049,460.97	1,541,676.63	-	4,332,509.00	-	9,630,886.37	(140,781.34)	39,126,659.64
	AFD	1,023,782.45	2,018,294.62	4,422,126.07	-	-	-	-	31,621,674.97
Totals		2,073,243.42	3,559,971.25	4,422,126.07	4,332,509.00	-	9,630,886.37	-140,781.34	70,748,334.61

ADB = Asian Development Bank, AFD = Agence Française de Développement.

PROJECT SCHEDULE

Sub Project	2009	2010				2011				2012				2013				2014				2015					
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Project Implementation Consultant			[Light Shade]									[Dark Shade]															
Procurement Contract			[Light Shade]																								
Package 1												[Dark Shade]															
Package 2											[Dark Shade]																
Package 3											[Dark Shade]																
Package 4											[Dark Shade]																
Package 5											[Dark Shade]																
Construction Contract			[Light Shade]																								
Package 6																		[Dark Shade]									
Package 7 & 8																		[Dark Shade]									
Package 9																[Dark Shade]											
Package 10																			[Dark Shade]								
Package 11															[Dark Shade]												
Efficient Lighting Contract			[Light Shade]															[Dark Shade]									

Note: light shade indicates original schedule; dark shade indicates actual implementation schedule.

ECONOMIC ANALYSIS

1. As outputs directly attributable to the project cannot be measured, this analysis assesses the economic benefits of PLN's larger network development program over the period of project implementation (2014–2015). As the project was a component of this broader program and work packages were seamlessly interchanged between both programs, the economic performance of the PLN investment program in the distribution network is a reasonable proxy for the economic performance of the project.

2. The main project investments were (i) additional medium voltage circuits, (ii) additional low voltage circuits, and (iii) additional distribution transformer capacity. The quantities of each of these asset classes installed on the Java–Bali network over the 2-year project implementation period are available from the network statistics published annually by PLN. As PLN was not able to provide complete information on its costs to install these assets, its capital costs were estimated using unit costs developed by analyzing the project's cost data. The costs of equipment purchased by the project but not installed by loan closure were set aside for the analysis, so the unit costs were based on the installed cost of assets financed by the loan that were in service at the time of loan closure. For this analysis, a 30% margin was added to these unit costs to provide for PLN's overheads.

3. The basis for the analysis was as follows:

- (i) The capital costs did not include taxes and duties and were assumed to be spread uniformly over the 2-year project implementation period;
- (ii) Like the appraisal analysis, the project was analyzed over a 25-year project life, and no residual values were assumed;
- (iii) There were no non-traded goods in the project, and it was assumed there were no significant distortions in the wage rate for skilled labor. The component of unskilled labor was small, so no standard conversion factor or shadow wage rate for unskilled labor was required; and
- (iv) Operating and maintenance costs were estimated at 3% of capital costs.¹

4. The two major economic benefits identified in the appraisal economic analysis were (i) the reduction in the distribution losses, and (ii) the benefits to consumers from being able to buy less costly electricity from the grid rather than using electricity produced by captive diesel generators. These are also the benefits quantified for this analysis. Loss reduction has additional climate protection effects as less CO₂ is emitted. As this effect was not considered in the economic analysis at appraisal, it wasn't considered here either. Consequently, this analysis underestimates the economic benefits.

5. Based on information provided by PLN, the distribution losses on the Java–Bali networks in 2016 (after the Project) were 6.3%, down from reported 7.3% in 2013 (before the Project). The benefit to PLN from reduced distribution losses is the savings in the generation cost of each kilowatt-hour (kWh) saved from reduced losses. The appraisal analysis calculated the economic value of these reduced losses using the costs saved from reduced electricity generation as less electricity is lost. The average cost of generation on the Java–Bali grid was Rp711 per kWh in 2015, and transmission losses were assumed to be 2.5%, typical of PLN's transmission networks.

¹ This was the rate used in the appraisal analysis, even though the body of the Appendix 12 (Economic Analysis) of the Report and Recommendation of the President (RRP) said 2.5%.

6. Sustaining these savings over the life of the project will require ongoing investment in network development to ensure that load growth does not increase asset utilization above current levels. The analysis has assumed that this investment will occur and that the annual economic value of the loss reduction experienced over the period of project implementation will be unchanged for the life of the project.

7. Over the 2-year project implementation period, additional transformer capacity was added to the network, which enabled additional sales to consumers. Without this additional capacity, the electricity consumption would be restricted by a distribution bottleneck. Some consumers would need to rely on captive power from diesel generation or from other energy sources. Therefore, the economic benefit of these additional customers can be added to the balance of the project, as long as the additional costs are also considered. These benefits have been valued at their willingness-to-pay (their costs of alternative electricity, e.g., through diesel generators), and the costs are assumed to have been valued at the average PLN costs for electricity distribution projects.

8. At a network level, distribution transformer utilization does not change significantly over time. While a new transformer may not be highly utilized when first installed, this is offset by the higher utilization of existing transformers as new customers are connected in other locations. It is, therefore, valid to assume that the ability of PLN to connect new customers is constrained by the available distribution transformer capacity, particularly when there is a waiting list of customers wanting to connect.

9. The following inputs were used in analyzing the economic benefit to customers of PLN's network development program over the 2-year project implementation period.

- (i) Each kilovolt-ampere (kVA) of new distribution transformer capacity has enabled an additional 2,300 kWh of electricity sales, based on an analysis of PLN's transformer utilization.
- (ii) The cost of captive power generation is estimated to be approximately Rp1,800 per kWh and, as in the appraisal analysis, this was taken as a proxy for customers' willingness to pay. The estimate is based on the price of diesel paid by PLN, the typical fuel efficiency of a medium-size generator in average conditions, and a margin to allow for capital and maintenance costs. The current estimate is significantly less than the cost assumed at appraisal, largely due to the low oil price in 2017.
- (iii) As a proxy for the generation costs, PLN's average 2015 selling price to low-voltage consumers connected to the Java–Bali grid is used, marked up by the government subsidy per kWh.

10. The total economic benefit to consumers from the ability to purchase electricity from the grid is the incremental sales to customers as a result of connecting to the grid, valued at the difference between the captive power price and the unsubsidized cost of purchasing electricity from PLN. Additional benefits that have not been quantified are a reduction in CO₂ emissions and the improvement in supply reliability due to the reduction in the number of faults per 100 cct-km.

11. The analysis in Table A9.1 shows an economic internal rate of return (EIRR) of 22.9% and a net present value of around Rp5.1 billion, assuming a 12% discount rate. The analysis confirms that providing consumers with a grid connection delivers significant economic benefits. Achieving loss reductions of the magnitude achieved over the project implementation period will become increasingly costly in the future due to increasing complexity of the grid, and eventually reach a point where initiatives aimed at further loss reduction become uneconomic.

Table A9.1: Economic Analysis

Year	Investment Costs Rp million	O&M Costs Rp million	Total Costs Rp million	Loss Reduction GWh	Incremental Sales GWh	Loss Reduction Rp million	Incremental Sales Rp million	Total Benefits Rp million	Net Benefits Rp million
2014	4,156,725	124,702	4,281,427	358	579	260,878	237,563	498,442	(3,782,985)
2015	4,156,725	249,404	4,406,129	1,073	1,738	782,635	712,690	1,495,325	(2,910,803)
2016		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2017		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2018		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2019		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2020		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2021		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2022		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2023		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2024		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2025		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2026		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2027		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2028		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2029		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2030		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2031		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2032		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2033		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2034		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2035		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2036		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2037		249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363

2038	249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363
2039	249,404	249,404	1,431	2,318	1,043,513	950,254	1,993,767	1,744,363

Based on the costs and benefits listed in the above table, with discount rate of 12%, the EIRR and NPV is calculated as follows:

EIRR 22.9%

NPV Rp5,127 million

Table A9.2: Sensitivity Analysis

Sensitivity Parameter	Percentage Change	EIRR (%)
Base case		22.9
(i) Loss Reduction	-100	7.0
(ii) Increase in PLN sales price	+10	15.7
(iii) Combination of (i) an (ii)		(3.2)

FINANCIAL ANALYSIS

1. This analysis will assess the financial viability of the Project by considering the aggregate costs and benefits of the Project. The financial internal rate of return (FIRR) analysis will assess the project return by comparing it to the cost of capital of the project. The costs of the Project include the capital costs of the development program plus the ongoing maintenance costs, assumed to be 3% as in the economic analysis.
2. Financial benefits of the Project were measured by:
 - (i) the cost savings from the reduction in the generation needed to supply network losses. Average generation costs to supply the Java–Bali grid were estimated to be Rp711 per kWh based on PLN's published statistics for 2015; and
 - (ii) the operating profit margin on the revenue, including subsidy, from the incremental sales of electricity made possible by the additional capacity installed by PLN's network development program over the period of the project.
3. PLN's 2015 annual report data was used to determine the operating profit margin of electricity sales. PLN's revenue from the sales of electricity was Rp66,400 billion and its net operating income was Rp27,600 billion, giving an operating margin of 10.4%. This margin was applied to the estimated revenue from the incremental sales from the extra capacity installed by the development program to determine the financial benefit of the development program to PLN.
4. The selling price used in the analysis was the PLN's average selling price for low-voltage electricity supplied through the Java–Bali grid, together with an allowance for the electricity subsidy.
5. The base case analysis calculated the financial internal rate of return (FIRR) as 26.1% and an NPV of Rp6.62 billion, assuming a 12% discount rate. The FIRR was higher than at appraisal, due to the current assumption that revenue from incremental sales would be achieved immediately, rather than gradually, due to the unchanging network-wide transformer utilization as transformer capacity is incrementally added to accommodate additional load. If the loss reduction benefits are removed, on the basis that a 1% reduction in network losses over a single year is not sustainable going forward, the FIRR is reduced to 10.4%, which is marginally below PLN's estimated cost of capital. A 10% reduction in sales profitability results in 2 percentage points reduction in the FIRR.

Table A10.1: Financial Analysis

Year	Investment Costs Rp million	O&M Costs Rp million	Total Costs Rp million	Loss Reduction GWh	Incremental Sales GWh	Loss Reduction Rp million	Incremental Sales Rp million	Total Benefits Rp million	Net Benefits Rp million
2014	4,156,725	124,702	4,281,427	358	2,301	260,878	290,755	580,708	(3,729,794)
2015	4,156,725	249,404	4,406,129	1,073	6,903	782,635	872,264	1,742,125	(2,751,230)
2016		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2017		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2018		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2019		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2020		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2021		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2022		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2023		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2024		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2025		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2026		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2027		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2028		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2029		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2030		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2031		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2032		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2033		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2034		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2035		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2036		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2037		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2038		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128
2039		249,404	249,404	1,431	9,204	1,043,513	1,163,018	2,322,833	1,957,128

Based on the costs and benefits listed in the above table, with discount rate of 12%, the FIRR and NPV is calculated as follows:

FIRR 26.1%
NPV Rp6.62 billion

Table A10.2: Sensitivity Analysis

Sensitivity Parameter	Percentage Change	FIRR (%)
Base case		26.1
(i) Loss Reduction	-100	10.4
(ii) Reduction in profit margins	-10	24.4
(iii) Combination of (i) an (ii)		8.6

EFFICIENT LIGHTING PILOT PROGRAM

1. The project incorporated a pilot program, funded by a grant from the Clean Energy Fund, to reduce peak demand on island networks by promoting energy-efficient lighting solutions to residential consumers. At the time of appraisal, incandescent lamps were predominantly used for lighting by residential consumers and, as 50% of the electricity consumption by such consumers was for lighting, reductions in electricity demand would be achieved if incandescent lamps were replaced by compact fluorescent lamps (CFLs) or equivalent light-emitting diodes (LEDs). The pilot program was intended to distribute about 500,000 CFLs in selected isolated and island grids.

2. When this pilot program came to be implemented in 2014], some 4 years after appraisal, there was already a high penetration of CFL lamps in the target areas. The program was therefore reformulated to replace mercury vapor and high-pressure sodium streetlights with LED luminaires in two pilot cities. It was subsequently found that government regulations would have prevented the transfer of the assets provided to PLN under the Clean Energy Fund grant to the local government entities that owned the lighting, so the program was reformulated a second time to replace the existing switchyard lighting within PLN substations and power stations with LEDs. Additional financing was obtained under Indonesia Resident Mission delegated portion in regional TA 8483 to finance the procurement of LED street lights.¹ The LED street lights were procured by ADB, transferred to the Ministry of Energy and Mineral Resources, and further transferred to the municipal governments. This reformulated pilot program would still reduce CO₂ emissions because the LED lamps supplied under the project use significantly less energy than the lamps they replaced.

3. A total of 433 luminaires were retrofitted with LEDs in PLN's outdoor switchyards and a further 500 were procured for subsequent installation by PLN. The lamps procured directly by ADB's Indonesia Resident Mission (IRM) were significantly below the cost estimate, resulting in multiple rounds of procurement. The cost estimate was originally derived from the commercial market price. The pilot nature of this project, with potential nationwide replication and upscaling, was expected to incentivize bidders to provide a special promotional price for the lamps.

4. Measurements taken by the consultant indicated a reduction in consumption of approximately 150 watts/hour per retrofit. If each lamp is assumed to be operational for 8 hours a night, this represents annual savings of 438 kWh per lamp, which corresponds to an annual emissions reduction of 671 kg CO₂ per annum. A total of 933 lamps were installed under the program, indicating potential savings of 626 tons of CO₂ per annum for the whole program. Not all the lamps were operational at the time of the retrofit.

5. Under TA 8483², 516 LED streetlight luminaires were procured for self-installation by the municipalities in Batang and Semarang. The outcomes measured by the consultant were similar to those measured in the PLN switchyards, which was to be expected, as the nature of the two trials was very similar.

6. The efficient lighting pilot program demonstrated the relevance of energy conservation as a sustainable approach to achieving the overarching objectives of the project, including meaningful and permanent reductions in carbon dioxide emissions. The pilot project achieved an average 50% reduction in the energy consumption of the retrofitted luminaires without any significant change in lighting levels. Contribution to the reduction of evening peak cannot be measured as the baseline of 1,900 kW was not updated during the minor change to reflect the actual peak demand of the

¹ ADB, 2013. *Asia Energy Efficiency Accelerator*. Manila.

² ADB, 2013. *Asia Energy Efficiency Accelerator*. Manila.

pilot project area. The target of 20% to 30% reduction also does not seem to be well-calibrated to the scope of the pilot project. The replacement of existing luminaires with more energy efficient devices was a particularly effective and efficient approach to reducing CO₂ emissions in that the reductions achieved are permanent and, unlike loss reduction in a distribution network, cannot be undone. Sustainability is further increased by the 10–12-year life of the LED lamps. Lighting is a significant component of the electrical load on any network and the programs have demonstrated the potential for energy conservation in general, and the widespread roll-out of energy-efficient lighting in particular, to release capacity on the network for other uses and achieve meaningful reductions in carbon dioxide emissions.

7. The project has contributed to the increased awareness of efficient lighting through (i) a benchmark study inviting officials from Ministry of Energy and Mineral Resources, PLN, and municipal governments of Batang and Semarang to discuss the energy efficient street lighting with Thailand's electricity authority, and (ii) a workshop on the lessons learned and scaling-up plan for the energy efficient street lighting. In mid-2017, a knowledge product is produced from lessons learned from this program.

8. PLN raised a concern on the performance of the consultant hired under this grant. The consultant did not conduct the assessment of the project's contribution towards the target of reducing the evening peak demand. It was further noted by ADB and PLN that the baseline and the target themselves were not updated and well-calibrated.

9. The project also identified lessons learned and recommendations for scaling-up: (i) fully implement street lighting electricity costs based on actual kWh consumption to realize the energy cost reductions, (ii) establish capacity and knowledge development solutions, (iii) develop project-based financing products, and (iv) consider energy services companies (ESCOs) services for implementation of [what]. The lessons learned were disseminated and discussed in a final workshop held on 24 May 2016 in close coordination with the Directorate of Energy Conservation of the Ministry of Energy and Mineral Resources.