Completion Report

Project Number: 26237
Loan Number: 1271
July 2008

Indonesia: Power XXIII Project

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – rupiah (Rp)

		At Appraisal	At Project Completion
		November 1993	September 2006
Rp1.00	=	$0.000477	$0.000110
$1.00	=	Rp2,097	Rp9,222.5

ABBREVIATIONS

ADB	–	Asian Development Bank
CFL	–	compact fluorescent lamp
DP	–	direct purchase
DSM	–	demand side management
FIRR	–	financial internal rate of return
GSM	–	global system for mobile communication
HPS	–	hydropower scheme
ICB	–	international competitive bidding
JBIC	–	Japan Bank for International Cooperation
LCB	–	local competitive bidding
PCR	–	project completion report
PLN	–	Perusahaan Listrik Negara (National Power Company)
UCS	–	utility communication system

WEIGHTS AND MEASURES

km (kilometer)	–	1,000 meters
kV (kilovolt)	–	1,000 volts
kWh (kilowatt hour)	–	1,000 watt hours
GWh (gigawatt hour)	–	1billion watt hours
m^3/sec	–	cubic meters per second
MW (megawatt)	–	1 million watts

NOTES

(i) Before 2000, the fiscal year (FY) of the Government of Indonesia ended on 31 March. Since 2000, the fiscal year has ended on 31 December. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY 2003 ends in December 2003. The FY of Perusahaan Listrik Negara ends on 31 December.

(ii) In this report, "$" refers to US dollars.

Vice President	C. Lawrence Greenwood, Jr., Operations Group 2
Director General	Arjun Thapan, South East Asia Department (SERD)
Director	John R. Cooney, Infrastructure Division, SERD
Team leader	Anthony J. Jude, Principal Energy Specialist, SERD
Team member	E. Festejo, Project Officer, SERD

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APPENDIXES

BASIC DATA

A. Loan Identification

1.	Country	Indonesia
2.	Loan Number	1271-INO
3.	Project Title	Power XXIII Project
4.	Borrower	Republic of Indonesia
5.	Executing Agency	Perusahaan Umum Listrik Negara (PLN)
6.	Amount of Loan	$275.0 million
7.	Project Completion Report No.	

B. Loan Data

1.	Appraisal	
	– Date Started	15 June 1993
	– Date Completed	02 July 1993
2.	Loan Negotiations	
	– Date Started	30 September 1993
	– Date Completed	05 October 1993
3.	Date of Board Approval	25 November 1993
4.	Date of Loan Agreement	18 January 1994
5.	Date of Loan Effectiveness	
	– In Loan Agreement	18 April 1994
	– Actual	26 May 1994
	– Number of Extensions	2
6.	Closing Date	
	– In Loan Agreement	31 December 2000
	– Actual	18 December 2006
	– Number of Extensions	2
7.	Terms of Loan	
	– Interest Rate	Pool-based variable lending rate system for US dollar loans and a commitment charge of 0.75 per cent per annum in accordance with current Bank policy.[1]
	– Maturity (number of years)	20
	– Grace Period (number of years)	6
8.	Terms of Relending (if any)	
	– Interest Rate	Interest rate equal to the variable lending rate applicable to the Bank loan plus margin equal to an annual service charge of 1 per cent plus the annual percentage change in the value of the rupiah against the US dollar, average over the previous 3-year period.
	– Maturity (number of years)	20
	– Grace Period (number of years)	6

[1] The Loan Agreement was amended on 2 December 2002 to reduce the loan amount to $201.890 million, of which $100.212 million was to remain as a pool-based loan, and $101.678 million became a London interbank offered rate-based Loan.

9. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
28 November 1994	18 December 2006	145 months
Effective Date	**Original Closing Date**	**Time Interval**
26 May 1994	31 December 2000	79 months

b. Amount ($ million)

Category or Subloan[2]	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
I. Civil Works	**86.200**	**62.626**	**23.574**	**62.626**	**62.626**	**0.000**
A. Part A	12.200	9.935	2.265	9.935	9.935	-
B. Part B	74.000	52.691	21.308	52.691	52.691	-
II. Equipment	**104.200**	**70.406**	**33.794**	**70.406**	**70.406**	**0.000**
A. Part A	14.200	8.282	5.918	8.282	8.282	-
B. Part B	30.000	11.756	18.244	11.756	11.756	-
C. Part C	33.000	18.879	14.121	18.879	18.879	-
D. Part D	22.300	0.000	22.300	0.000	0.000	-
E. Part E	4.700	1.698	3.002	1.698	1.698	-
F. Part F		15.171	(15.171)	15.171	15.171	-
G. Part G		14.620	(14.620)	14.620	14.620	-
III. Consulting Services	**35.000**	**37.133**	**(2.133)**	**37.133**	**37.133**	**0.000**
A. Part A	5.200	5.985	(0.785)	5.985	5.985	-
B. Part B	20.000	24.676	(4.676)	24.676	24.676	-
C. Part C	2.900	2.181	0.719	2.181	2.181	-
(a) Construction Supervision of 150kVfacilities	*2.000*	*1.027*	*0.973*	*1.027*	*1.027*	-
(b) Engineering Design of 275 kV facilities	0.900	1.154	(0.254)	1.154	1.154	-
D. Part D	0.800	0.416	0.384	0.416	0.416	-
E. Part E	1.400	0.413	0.987	0.413	0.413	-
F. Part F	4.700	3.462	1.238	3.462	3.462	-
IV. Unallocated	**49.600**	**0.000**	**49.600**	**0.000**	**0.000**	**0.000**
V. Earthquake and Tsunami Emergency Rehabilitation		**5.077**	**(5.077)**	**5.079**	**5.079**	**0.000**
Total	**275.000**	**175.242**	**99.758**	**175.242**	**175.242**	**0.000**

10. Local Costs (Financed)

- Amount ($) -
- Percent of Local Costs -
- Percent of Total Cost -

[2] Part A–Tanggari II Hydropower Scheme; Part B–Musi Hydropower Scheme; Part C–Southern Sumatra Transmission Lines; Part D–Diesel Waste Heat Recovery; Part E–Detailed Side Management Pilot Programs; Part F–E/S for Meringan Hydropower Scheme; Part G-Turbines and Generators for Part B.

C. Project Data

1. Project Cost ($ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	398.00	252.89
Local Currency Cost	203.60	167.51
Total	601.60	420.40

2. Financing Plan ($ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	155.30	116.83
ADB Financed	275.00	175.25
Other External Financing[3]	49.00	--
Total	**479.30**	**292.08**
IDC Costs		
Borrower Financed	122.30	128.32
ADB Financed	--	--
Other External Financing	--	--
Total	**122.30**	**128.32**

ADB = Asian Development Bank, IDC = interest during construction.

3. Cost Breakdown by Project Component ($ million)

Component	Appraisal Estimate	Actual
Part A: Tanggari II Hydropower Scheme (HPS)	45.10	30.13
Part B: Musi HPS	262.40	223.63
Part C: Southern Sumatra Transmission Lines	41.20	25.27
Part D: Diesel Waste Heat Recovery	26.30	0.50
Part E: DSM Pilot Programs	7.60	2.53
Part F: E/S for Merangin HPS	6.10	4.16
Earthquake and Tsunami Emergency Rehabilitation[4]	**--**	5.84
Total Base Cost	**388.70**	**292.08**
Physical Contingencies	36.50	--
Price Contingencies	54.10	--
Total Contingencies	**90.60**	--
IDC on Bank Loan	115.30	128.32
IDC on other Loan	7.00	
Total	**601.60**	**420.40**

DSM = demand side management, E/S = engineering study, IDC = interest during construction.

[3] During loan appraisal, PLN envisaged obtaining co-financing for the turbines and generators from Austria for Part B. However, during the Asian financial crisis, co-financing did not materialize and the turbines and generators for Musi hydropower project were financed from the savings under parts A and B.

[4] The Tsunami Emergency Fund was not part of the original project scope. The Government requested assistance following the 2004 tsunami, and $5.84 million was set aside from the project's contingency funds.

4. Project Schedule

Item	Appraisal Estimate	Actual
Part A: Tanggari II HPS[5]		
Consultants		
- Bidding (including prequalification)/ Invitation of Proposals	Jul 1993–Sep 1993	
- Evaluation, Contract Negotiation and Letter of Credit (L/C)	Oct 1993–Nov 1993	Mar 1995
- Consulting Services	Dec 1993–Feb 1998	Dec 1993–Oct 1998
Civil Works		
- Bidding(including prequalification) / Invitation of Proposals	Nov 1993–May 1994	May 1994–Aug 1994
- Evaluation, Contract Negotiation and L/C	Jun 1994–Jan 1994	Aug 1994–Feb 1995
- Construction/Erection	Feb 1995–Feb 1998	May 1995–Jul 1998
Equipment[2]		
- Bidding(including prequalification) / Invitation of Proposals	Jun 1994–Jul 1994	Jul 1994–May 1996
- Evaluation, Contract Negotiation and L/C	Aug 1994–Mar 1995	Oct 1994–Sep 1996
- Manufacture, Delivery and Installation	Apr 1995–Feb 1998	Jun 1995–Oct 1998
Part B: Musi HPS[6]		
Consultants		
- Bidding (including prequalification)/ Invitation of Proposals	Jul 1993–Sep 1993	Dec 1993–May 1994
- Evaluation, Contract Negotiation and L/C	Oct 1993–Nov 1993	Jun 1994–Jul 1994
- Consulting Services	Dec 1993–Jun 2000	Sep 1994–Apr 2007
Civil Works		
- Bidding(including prequalification) / Invitation of Proposals	Jan 1994–Jul 1994	Aug 1994–Aug 1995
- Evaluation, Contract Negotiation and L/C	Aug 1994–Mar 1995	Aug 1995–Mar 1996
- Construction/Erection	Apr 1995–Jun 2000	Jul 1996–Mar 2003
Equipment[7]		
- Bidding(including prequalification) / Invitation of Proposals	Nov 1995–Jan 1996	Sep 1996–Feb 2004
- Evaluation, Contract Negotiation and L/C	Feb 1996–Sep 1996	Jan 1997–Nov 2004
- Manufacture, Delivery and Installation	Oct 1996–Jun 2000	Apr 1998[8]–Jul 2006
Part C: Reinforcement of Transmission Networks in Southern Sumatra		
(i) Reinforcement of 150 kV Transmission Networks		
Consultants		
- Bidding (including prequalification)/ Invitation of Proposals	Nov 1993–Dec 1993	Jan 1994–Mar 1994
- Evaluation, Contract Negotiation and L/C	Jan 1994–Sept 1994	Apr 1994–Mar 1995
- Consulting Services	Oct 1994–Dec 1996	Jan 1995–Sep 1998
Equipment[2]		
- Bidding(including prequalification) / Invitation of Proposals	Nov 1993–Jan 1994	Nov 1993–Jan 1994
- Evaluation, Contract Negotiation and L/C	Feb 1994–Oct 1994	Feb 1994–Oct 1994
- Manufacture, Delivery and Installation	Nov 1994–Apr 1994	Oct 1994–Dec 1996
- Erection	May 1995–Nov 1996	Jul 1996–Sep 1998
(ii) Engineering Design of 275 kV Transmission Line		
Consultants		
- Bidding (including prequalification)/ Invitation of Proposals	Nov 1993–Dec 1993	Jan 1994–Aug 1994
- Evaluation, Contract Negotiation and L/C	Jan 1994–Jun 1994	Sep 1994–Jun 1995
- Consulting Services	Jul 1994–Mar 1995	Jul 1995–Aug 1996
Part D: Diesel Waste Heat Recovery		
Consultants		
- Bidding (including prequalification)/ Invitation of Proposals	Nov 2003–Dec 2003	Jan 1994–Mar 1994

[5] Source: Consultant's Construction Report, October 1998.
[6] Source: Consultant's Project Completion Report, August 2006.
[7] Multiple contracts.
[8] Order to Proceed for Metal Works (Lot II) was recalled by PLN, and then reissued in March 1999.

Item	Appraisal Estimate	Actual
- Evaluation, Contract Negotiation and L/C	Jan 1994–Jun 1994	Apr 1994–Apr 1995
- Consulting Services	Jul 1994–Jan 1997	Apr 1995–Jul 1998
Equipment		
- Bidding(including prequalification) / Invitation of Proposals	Mar 1995–Apr 1995	Canceled
- Evaluation, Contract Negotiation and L/C	May 1995–Dec 1995	
- Construction/Erection	Jan 1996–Jan 1997	
Part E: DSM Pilot Programs		
Consultants		
- Bidding (including prequalification)/ Invitation of Proposals	Nov 1993–Dec 1993	Jan 1994–Sep 1994
- Evaluation, Contract Negotiation and L/C	Jan 1994–Jun 1994	Oct 1994–Apr 1995
- Consulting Services	Jul 1994–Jan 1997	Apr 1995–Jul 1998
Equipment		
- Bidding(including prequalification) / Invitation of Proposals	Jul 1994–Aug 1994	Jun 1996–Jul 1996
- Evaluation, Contract Negotiation and L/C	Sep 1994–Dec 1994	Aug 1996–Jul 1997
- Manufacture, Delivery and Installation	Jan 1995–Aug 1995	May 1998–Oct 1999
- DSM Program Implementation	Jan 1995–Jan 1997	Canceled
Part F: Engineering Design of Merangin HPS		
Consultants		
- Bidding (including prequalification)/ Invitation of Proposals	Nov 1993–Dec 1993	Mar 1994–Dec 1994
- Evaluation, Contract Negotiation and L/C	Jan 1994–Aug 1994	Jan 1995–Dec 1995
- Consulting Services	Sep 1994–Feb 1997	Dec 1995–Mar 1998

DSM = demand side management, HPS = hydropower scheme, kV = kilovolt, L/C = letter of credit.

5. Project Performance Report Ratings

	Ratings	
Implementation Period	**Development Objectives**	**Implementation Progress**
From 31 January 1999 to 28 February 1999	PS	S
From 31 March 1999 to 30 June 2000	PS	PS
From 31 July 2000 to 31 July 2000	S	PS
From 31 August 2000 to 30 November 2000	PS	PS
From 31 December 2000 to 28 February 2005	PS	S
From 31 March 2005 to 31 January 2007	S	S

PS = partly satisfactory, S = satisfactory.

D. Data on Asian Development Bank Missions

Name of Mission [a]	Date	No. of Persons	No. of Person-Days [b]	Specialization of Members [c]
Reconnaissance	08 Oct 1992	3	3	a,
Fact-Finding	20 Nov–11 Dec 1992	5	105	a, b, c, d, e
Appraisal	15 Jun–03 Jul 1993	7	126	2a, b, c, d, 2i
Review 1	10–29 Oct 1994	1	4	C
Review 2	14–24 Nov 1995	2	4	2c
Review 3	06–23 May 1996	2	12	f, j
Review 4	19–30 Aug 1996	2	6	f, j
Review 5	02–13 Dec 1996	2	6	F
Review 6	01 to 15 Apr 1997	3	9	f, g, j
Review 7	28 Oct–11 Nov 1997	2	6	f, j

Name of Mission [a]	Date	No. of Persons	No. of Person-Days [b]	Specialization of Members [c]
Review 8	13–27 Feb 1998	2	6	f, j
Review 9 (Comprehensive Portfolio Review)	14–24 Apr 1998	2	4	f, j
Review 10 (Spring Cleaning)	06–11 Jul 1998	2	4	f, j
Review 11	24 Nov–05 Dec 1998	2	6	f, j
Review 12 (Special Loan Review)	24 Feb–3 Mar 1999	1	3	F
Review 13	24–30 Jun 1999	1	3	F
Review 14 (Spring Cleaning)	10–12 Aug 1999	2	2	f, d
Review 15	10–17 Jul 2000	2	4	2h,
Review 16 [d]	19–23 Mar 2001	2	4	2h
Review 17	28 Feb–07 Mar 2002	1	4	F
Review 18	08–12 Sep 2003	1	1	F
Review 19	15–25 Mar 2004	3	6	a, f, j
Review 20	29 Nov–03 Dec 2004	2	2	a, f
Review 21	17–20 Jan 2006	4	8	a, 2i, j
Project Completion Review [e]	19–27 May 2007	1	8	I

No. = number

[a] Most of these missions were undertaken in conjunction with review of other INO projects

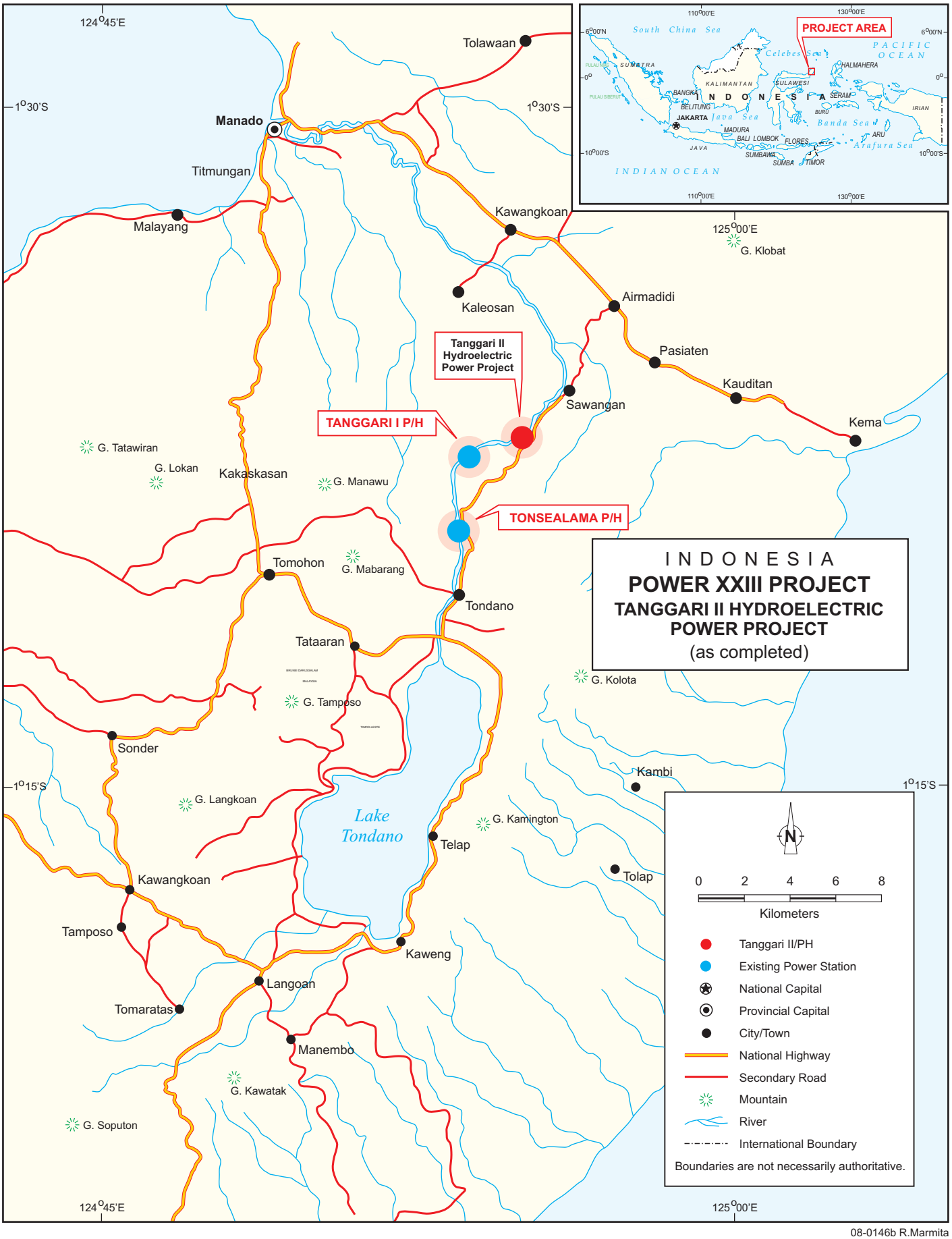
[b] Number of days fielded for Loan 1271-INO

[c] a=Project Economist, b=Environment Specialist, c=Project Engineer, d=Program Officer, e=Financial Analyst, f=Energy Specialist, g=Social Development Specialist, h=Power Sector Specialist, i=Staff Consultant, j=Project Analyst

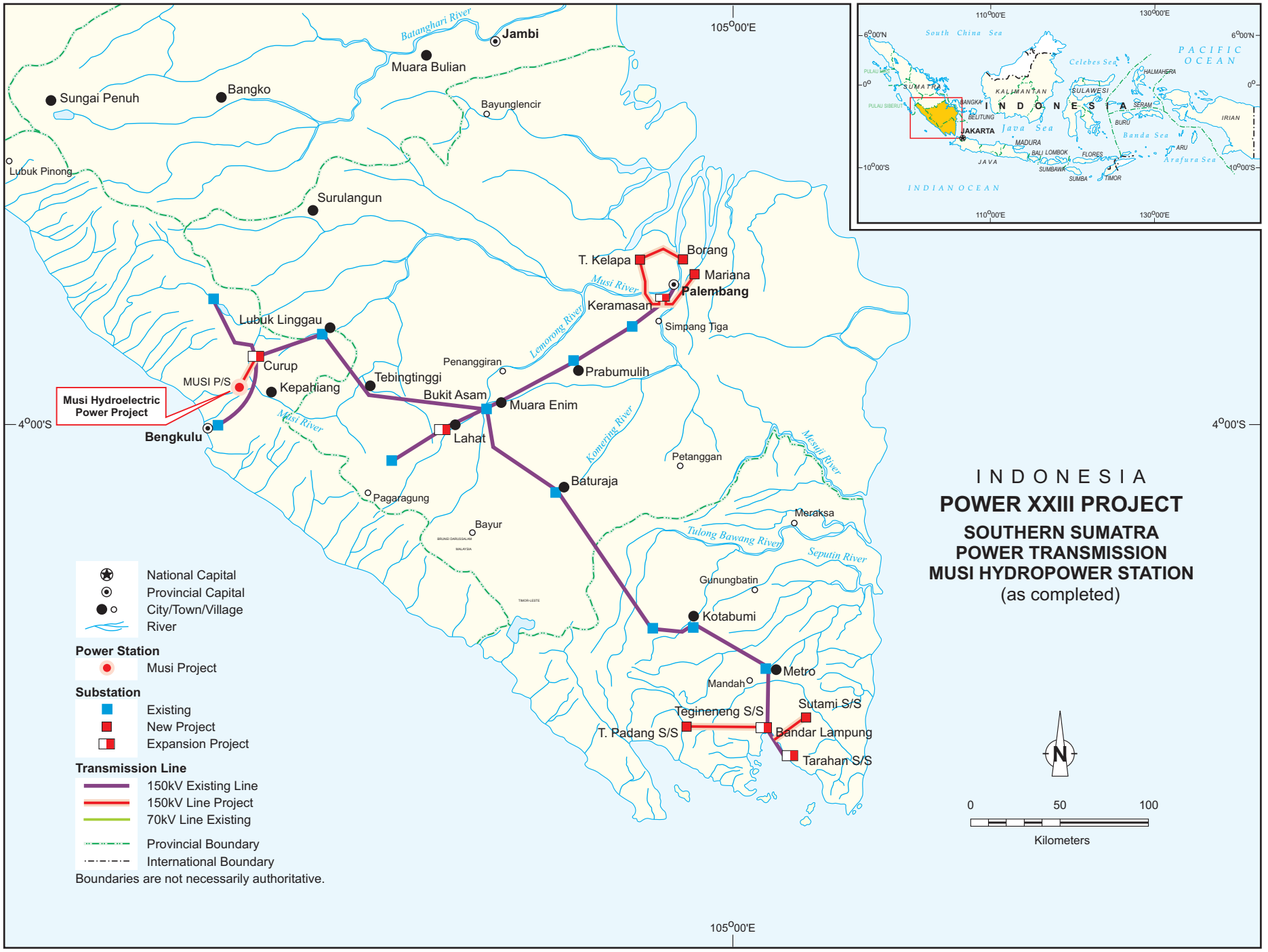
[d] In conjunction with the Country Portfolio Review Mission and Country Programming Mission.

[e] The project completion report was prepared with assistance from a staff consultant and E. Festejo, project officer, Infrastructure Division, under the guidance of Anthony J. Jude, Principal Energy Specialist, Infrastructure Division.

Map 1



08-0146b R.Marmita


Batanghari River
Jambi
Muara Bulian
Bayunglencir
Sungai Penuh
Bangko
Lubuk Pinong
Surulangun
105°00'E
T. Kelapa
Borang
Mariana
Palembang
Musi River
Keramasan
Simpang Tiga
Lemorong River
Lubuk Linggau
Curup
Penanggiran
Prabumulih
Tebingtinggi
MUSI P/S
Kepahiang
Bukit Asam
Muara Enim
Musi Hydroelectric Power Project
Bengkulu
Musi River
Lahat
Komering River
Petanggan
Baturaja
Meksil River
Pagaragung
Bayur
Meraksa
Tulong Bawang River
Seputin River
Gunungbatin
Kotabumi
Metro
Mandah
Tegineneng S/S
Sutami S/S
T. Padang S/S
Bandar Lampung
Tarahan S/S
4°00'S
National Capital
Provincial Capital
City/Town/Village
River
Power Station
Musi Project
Substation
Existing
New Project
Expansion Project
Transmission Line
150kV Existing Line
150kV Line Project
70kV Line Existing
Provincial Boundary
International Boundary
Boundaries are not necessarily authoritative.
110°00'E
130°00'E
6°00'N
0°
10°00'S
South China Sea
Celebes Sea
PACIFIC OCEAN
SUMATRA
KALIMANTAN
SULAWESI
INDONESIA
JAKARTA
Java Sea
Banda Sea
Arafura Sea
JAVA
INDIAN OCEAN
0
50
100
Kilometers
INDONESIA
POWER XXIII PROJECT
SOUTHERN SUMATRA
POWER TRANSMISSION
MUSI HYDROPOWER STATION
(as completed)
08-0146 RM
Map 2

I. PROJECT DESCRIPTION

1. The Indonesian electricity sector as a whole grew rapidly throughout the 1970s and 1980s, although regional imbalances existed. During the period 1973 to 1992 energy sales grew at about 16% per annum, while installed generation capacity increased by about 15%. Impressive growth in energy sales was recorded across all consumer categories (residential 13.4%, industrial 20.1%, commercial 15.2% and public 11.6%). However, annual per capita electricity consumption of 255 kilowatt-hours (kWh) was at that time low by regional standards, pointing to the possibility for further continuation of impressive growth in the sector. The Government's policy at the time of project appraisal aimed to (i) provide adequate additional power supplies to support economic growth and increase public welfare; and (ii) curb growth of domestic oil consumption, promote energy conservation and develop alternative energy sources, such as hydropower, geothermal and other renewable sources.

2. At appraisal, the Project covered (i) construction of the 19 megawatt (MW) Tanggari II hydropower scheme (HPS) in North Sulawesi; (ii) construction of the 210 MW Musi HPS in the southern part of Sumatra; (iii) reinforcement of transmission networks in the southern part of Sumatra; (iv) installation of waste heat recovery equipment in selected diesel power stations outside Java; (v) implementation of demand side management (DSM) pilot projects; and (vi) engineering design of the 340 MW Merangin HPS in the southern part of Sumatra.

3. To help meet the increasing power demand and rationalize the Government's energy sector policy, the Asian Development Bank (ADB) first identified the Project in its 1993 Country Program for Indonesia. The Project supported the Government's efforts to meet increasing power demand by tapping energy sources other than oil by providing a total of 229 MW of hydropower capacity in North Sulawesi (19 MW) and the southern part of Sumatra (210 MW), and by preparing the detailed design for another 340 MW HPS in southern Sumatra. The Project also supported the Government's efforts to improve the (i) electricity supply system's efficiency and reliability through system interconnection and waste heat recovery, and (ii) load pattern and end-use efficiency through pilot DSM programs.

4. Following the Asian financial crisis in 1997, the Government reassessed the Project and reprioritized certain project components. This process led to delays in completion of some portions of the Project (mainly the Musi HPS).In addition, some project components were canceled, namely implementation of the DSM pilot programs and installation of the waste heat recovery equipment in selected diesel power plants.

5. Despite the reduced scope, the Project supported efforts to meet increasing power demand by:

(i) adding 210 MW hydropower generation in Sumatra and 19 MW in Sulawesi, respectively; and

(ii) contributing to increased reliability of the electricity supply in southern Sumatra by (a) constructing a 150 kilovolt (kV) ring system around the city of Palembang, and 150 kV lines from Tegineneng to Talang Padang and from Kawasan Industri to Sri Bawono, and (b) expanding the Lahat and Tarahan substations.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

6. The Project was listed in the Bank's 1991 Country Program for Indonesia during the Country Programming Mission in January 1991. The components of the project were identified during a reconnaissance mission in October 1992. The Loan Fact-Finding Mission and

Appraisal Mission were conducted in November and December 1992, and June and July 1993, respectively. The loan negotiations were held from 30 September–5 October 1993 and the loan was approved on 25 November 1993. Loan signing took place on 18 January 1994 and the loan became effective on 26 May 1994, following two extensions. The Loan Agreement was amended on 2 December 2002 to reduce the loan amount to $201.890 million, of which $100.212 million was to remain as a pool-based loan, while $101.678 million became a London interbank offered rate (LIBOR)-based loan. The actual loan closing date was 18 December 2006, following two extensions. The final loan amount was $175.242 million. Refer to Appendix 1 for additional key dates relating to implementation of the various parts of the Project.

A. Relevance of Design and Formulation

7. The Project was designed to support Government's policy objectives by (i) expanding the country's electricity supply, based on a least-cost system expansion program; (ii) diversifying the generation mix away from oil; (iii) improving supply efficiency and reliability; and (iv) intensifying energy conservation efforts. In combination with the design of the Merangin HPS, the hydropower projects and engineering design components added 210 MW and 19 MW of hydropower generation in Sumatra and Sulawesi, respectively and supported items (i) and (ii) above. The reinforcement of the transmission networks in southern Sumatra supported item (iii) above. The diesel heat recovery project supported items (i), (ii), (iii) and (iv) above. The DSM programs, although only pilot projects, in the long term were designed to support item (iv) above.

8. The 19 MW Tanggari II HPS, located in the Minahasa[9] area of North Sulawesi, is the third run-of-river cascade scheme on the Tondano River. With a high value of firm energy output due to the large regulating capacity of the Lake Tondano, the scheme was part of the least-cost development plan for the Minahasa system developed by Perusahaan Listrik Negara (PLN). The 210 MW Musi HPS is a run-of-river facility with about 1 million cubic meters (m^3) of effective pondage located in the southern part of Sumatra. The project was designed as a peaking power addition to the system. This scheme was also part of PLN's least-cost development plan.

9. The 150 kV transmission facilities in the southern part of Sumatra were intended to relieve existing facility overloading, displace diesel generation in isolated areas, increase system reliability and meet increasing demand. Based on demand forecasts prevalent at the time of project appraisal, these 150 kV transmission line and substation components were technically justified and part of PLN's least-cost transmission development program.

10. The subcomponent of the transmission portion of the Project involving the engineering design of the 275 kV transmission link from Lubuk Linggau to Bukit Asam would lead, when implemented, to interconnection of the Bengkulu system[10] and the interconnected South Sumatra and Lampung systems, to form part of the 275 kV inter-regional interconnection between PLN's Region III and Region IV.

11. The installation of waste heat recovery equipment at selected diesel generating facilities sought to provide additional electricity generation without increasing the country's oil

[9] The Minahasa area includes Manado City, Bitung City and Minahasa district, Katamobagu, Branch for Bolaang Mongondow district, Tahuna Branch for Sangihe Talaud district.

[10] This transmission interconnection was accomplished under Power XXIV and the Lubuk Linggau-Bukit Asam steam power plant form part of the 275 kV inter-regional interconnection between PLN's Region III and Region IV.

consumption, and to improve the efficiency of those stations. The capacity gain of the five candidate stations was estimated at 12% (19 MW).

12. The DSM pilot program's components included (i) design and implementation of residential and commercial lighting pilot programs and industrial DSM pilot programs, including innovative rate and power purchase programs; and (ii) procurement and installation of a utility communication system for 150 to 200 major industrial consumers for implementation of the industrial DSM pilot programs.

13. The engineering design component was to help the country utilize its hydropower energy resource and reduce its oil dependency. The 340 MW Merangin HPS in southern Sumatra formed an integral part of PLN's long-term, least-cost power development program and aimed at meeting the Government's balanced regional development objectives.

14. The financial crisis in 1997 caused the Government to curtail PLN's investment budget for 1998–1999 implementation, and led to a comprehensive portfolio review by the Government and ADB of its ongoing projects in 1998 and 1999. This review led to the cancellation of several project components as PLN was unable to raise counterpart funds due to the financial crisis. The cancelled components included: (i) the procurement and installation of waste heat recovery equipment at the selected diesel generating station where design work had been completed; (ii) implementation of the designed residential and commercial lighting pilot DSM programs; and (iii) implementation of designed industrial DSM pilot programs, including the innovative rate and power purchase programs.

15. In the course of the 1998–1999 review, the Musi hydropower plant development was put on hold from November 1997 to May 2000 while the Government reviewed the priority of this component. The component was eventually reinstated, with a significant change in scope, and with a significant delay (see paras. 21 and 48, and Appendix 5). Despite cancellation of some project components, the Project's remaining generation, transmission and design components were consistent with ADB's revised country strategy, and remained relevant to the objectives of (i) expanding the electricity supply in the country on the basis of the Government's least-cost system expansion program, (ii) diversifying the generation mix away from oil, and (iii) improving supply efficiency and reliability.

B. Project Outputs

16. At appraisal, the Project included the following outputs:

(i) **Part A: Tanggari II HPS.** Construction of the 19 MW Tanggari II HPS in North Sulawesi.

(ii) **Part B: Musi HPS.** Construction of the 210 MW Musi HPS in the southern part of Sumatra.

(iii) **Part C: southern Sumatra transmission lines.** Reinforcement of 150 kV transmission lines in southern Sumatra, including the South Sumatra system and the Lampung system, and engineering design of the 275 kV transmission line from Lubuk Linggau to Bukit Asam SPP.

(iv) **Part D: waste heat recovery in diesel power stations outside Java.** Recovery of up to 19 MW of electricity supply as the result of installation of waste heat recovery equipment at selected diesel power stations outside Java (after a detailed economic analysis of six candidate stations).

(v) **Part E: Demand Side Management pilot programs.** Customer market research work, detailed design and implementation of industrial, commercial and

residential DSM pilot programs (including a utility communications system for the industrial pilot programs).

(vi) **Part F: engineering design of the Merangin HPS.** Design of the 340 MW Merangin hydropower plant in the southern part of Sumatra.

17. All project components were to have been completed by 30 June 2000, but the implementation period was instead extended, due to the Asian financial crisis and altered government priorities. The project was completed in June 2006. The outcome of Part A was satisfactory. The station was completed in August 1998, about 4 months behind schedule, and went into commercial operation on 23 October 1998.

18. The outcome of the Part B was partly satisfactory as it was put into operation about 6 years late. Early implementation delays were attributed to technical issues and poor contractor performance but were overcome in a timely manner. However, the impact of the financial crisis led to the Government to cut PLN's budget for FY 1998–FY 1999. The subsequent cancellation of co-financing arrangement for the turbines and generators as well as PLN's inability to access adequate local funds caused commercial operation to be significantly delayed. In addition, the envisaged financial closing of the Project was delayed due to significant claims made by the civil works contractor on the tunneling works, which required lengthy mediation to resolve.

19. The outcome of the construction of Part C was satisfactory. For the South Sumatra system, construction of a 150 kV transmission line (double circuit) surrounding the existing 70 kV system around the city of Palembang, including three new substations and the expansion of two existing substations, was completed in December 1998. The Lampung system was completed a few months ahead of the Palembang system, and entailed: (i) construction of a 150 kV transmission line (single circuit) from Tegineneng to T. Padang, including the construction of a new substation and the expansion of an existing substation; and (ii) construction of a 150 kV transmission line (double circuit) from Kawasan Industri to Sribawono, including the construction of one new substation and the expansion of one existing substation. All portions of the work were completed and in operation by January 1999, roughly 2 years behind schedule. Appendix 1 details transmission line length and segments at appraisal and as implemented.

20. The waste heat recovery from diesel power stations under Part D of the Project was cancelled in mid-1998, reflecting a change in the Government's priorities with the onset of the Asian financial crisis. At the time of cancellation, the detailed design for the waste heat recovery systems for the Tanjung Karang Diesel Power Station (4 x 7.6 MW), Mataram had been completed (December 1997). This station was the only one of the original six stations studied where implementing the waste heat recovery system was considered economically viable. The five other sites were rejected early in the feasibility studies, as they were operating at plant factors of less than 45%. Appendix 1 details the stations and their potential for waste heat recovery at appraisal and as actually implemented. The Government's priorities changed with respect to the Project's components for two reasons: (i) onset of the financial crisis in the region slowed economic growth, resulting in reduced demand for electricity from the grid; and (ii) the diesel power stations were used primarily as peaking stations rather than base load power plants. Combining these plants with a waste heat recovery system would have forced them to be operated as base load stations, which the system did not need.

21. The DSM pilot program under Part E of the Project was altered by the Government following some preliminary work. The customer market research and detailed designs for the industrial, commercial and residential DSM pilot programs were completed in June 1997. The findings of the market research study resulted in implementation of the pilot program for

residential lighting being postponed, because it was uneconomical due to low residential tariffs. After a significant delay the project did procure and install the Utility Communications System (completed in early 1999), to be used primarily to administer (i) load research; (ii) theft detection; (iii) automatic meter reading; (iv) generation request and confirmation (i.e., requesting consumers with in-house generation capability to begin generating, and confirming that generation had begun); and (v) curtailment alert and confirmation (i.e., requesting customers to reduce their load and confirming compliance). In 1998, the Government canceled the DSM pilot projects for the commercial and industrial consumers, having determined that they were not a priority, given the financial crisis. Appendix 1 details the deliverables envisaged for this portion of the Project at appraisal and as actually implemented.

22. The Project Completion Review Mission revealed that PLN had implemented expanded versions of some aspects of the DSM programs envisaged by the Project. By 2006, PLN had funded installation of some 60 million compact fluorescent lamps (CFLs) in the country. A tariff for load management was implemented in 2004. A new tariff structure is under consideration, which will provide peak power usage disincentives to the commercial and industrial sector. The utility communication system provided by the Project is in use, primarily for automatic meter reading of large industrial customers. Recently, automatic meter reading using GSM (Global System for Mobile Communications) technology of some 20,000 more customers in the Java region of the country has been implemented, with more installations underway.

23. The engineering design of the Merangin hydropower project (Part F) was judged successful in that PLN was left with a completed design for a significant hydropower station, with the design overseen by a panel of experts, and without any major concerns emerging. The design was completed after a one-year delay due to a delay in the signing of consultancy contracts.

24. The revised scope of work for the Project as actually implemented was as follows:

(i) **Part A: Tanggari II HPS.** No change and no significant delay.

(ii) **Part B: Musi HPS.** No change, delayed completion.

(iii) **Part C: southern Sumatra transmission lines.** No change, completed with a two-year delay.

(iv) **Part D: waste heat recovery in diesel power stations outside Java.** A detailed economic analysis was undertaken on the viability of installing waste heat recovery equipment at six selected diesel power stations. The study identified the viability of undertaking an engineering design for waste heat recovery that would provide up to 6 MW of addition electricity supply as the result of installing the waste heat recovery equipment at the Tanjung Karang Diesel Power Station (4 x 7.6 MW), Mataram.

(v) **Part E: Demand-side management pilot programs.** Provision of a customer market research study leading to the design of the industrial and commercial DSM pilot programs (a residential lighting replacement program was judged not viable by the market research study). Implementation of a utility communications system for the industrial pilot programs.

(vi) **Part F: engineering and design of the Merangin HPS.** No change and completed after a one-year delay.

C. Project Costs

25. At the time of appraisal in 1993, the project cost was estimated at $601.6 million equivalent, consisting of $398.0 million in foreign exchange costs (66.2% of the appraised

estimated total project cost) and $203.6 million equivalent in local currency costs (33.8%). The loan was for 45.7% of the appraised estimated cost ($275.0 million, all in foreign exchange, and accounting for 69.1% of the total foreign exchange). At loan closing in 2006, the actual project cost was $420.4 million equivalent, consisting of $252.9 million in foreign exchange costs (60.2% of total project cost) and $167.5 million equivalent in local currency costs (39.8%of total project cost). Table A2.1 in Appendix 2 provides a breakdown of appraisal and actual loan amounts for the various project components, in both foreign and local costs. Table A2.2 in Appendix 2 provides a more detailed breakdown of these costs. The final loan was $175.2 million, all in foreign exchange, representing 41.7% of the actual project cost, and 69.3% of the foreign exchange costs.

26. In August 1997, approved changes to the cost of consulting services for Parts A and B resulted in a reallocation of $2.1 million from the unallocated portion of the loan. For Part A, the increase in consulting services was $1.1 million, due mainly to a 5.5 month delay in the completion of work on the turbine and generator. For Part B, the increase in consulting services was $1.0 million, due to fluctuations in exchange rates between US dollar and the Japanese yen.

27. A partial cancellation and reallocation of loan funds was made in July 1998, following the onset of the financial crisis. The cancelled portion amounted to $34.29 million, reducing the loan amount to $240.71 million. The savings resulted primarily from fine-tuning of the following budget components: (i) equipment for Part A (reduction of around $6 million); (ii) civil works for Part B (reduction of around $32 million); (iii) equipment for Part C (reduction of $14 million); and (iv) equipment for Part D (reduction of $23 million). These savings were reallocated to (i) civil works for Part A (increase of around $6 million), and (ii) equipment for Part B (increase of around $86 million). The bulk of the $86 million added to the equipment budget for Musi was to finance the turbines and generators for that project, as PLN was unable to acquire co-financing for the equipment as originally planned.

28. A second partial cancellation and reallocation of loan funds was made in September 1999. $38.820 million was cancelled, reducing the loan to $201.890 million, with savings attributed to cancellation of some unallocated portions of the loan (reduction of around $26 million) and further fine-tuning of the following budget components: (i) civil works for Part A (reduction of around $10 million); (ii) metal works for Part A (reduction of around $6 million); and (iii) DSM equipment for Part E (reduction of around $3 million), due to the Government's cancellation of most of this portion of the Project in 1998. Those loan savings that were not cancelled were primarily reallocated to (i) equipment for Part A (increase of about $7 million); and (ii) construction supervision of Parts A, B and C (increase of about $1 million).

29. In August 2000, the Government agreed to ADB financing the turbines and generators for the Musi portion of the Project. As a result, the scope of the ADB's financial involvement in the Musi project was increased by reallocating loan proceeds. The approved changes included: (i) equipment for Part B (Musi, an increase of around $10 million); and (ii) construction supervision for Part B (Musi, an increase of around $3 million).These allocation increases were taken from the unallocated portion of the loan.

30. In December 2002, another reallocation of loan funds was undertaken without a change in the value of the loan. The increases in allocation included: (i) civil works of Part A (increase of around $1 million); (ii) civil works of Part B (increase of about $31 million); and (iii) consulting services of Part B (increase of about $7 million). The unallocated portion of the loan was used cover the increases.

31. In July 2004, another partial cancellation and reallocation of loan funds took place. The cancelled portion was $17.718 million, reducing the loan total to $184.172 million. These savings were attributed primarily to savings in the following budget components: (i) civil works for Part A (a reduction of around $20 million); (ii) savings in equipment for Parts A, B, C, E and G (around $4 million). Budget increases were approved for (i) Part F (turbine equipment for Musi, an increase of around $4 million), an increase of the unallocated portion (an increase of around $3 million).

32. In December 2004, a powerful earthquake occurred and resultant tsunami affected much of Indonesia, where over 110,000 people were killed, 132,000 missing and close to 500,000 homeless. In response, the Government requested and ADB agreed to reallocate the remaining unallocated portion of the loan ($6.477 million) to a new category under the loan, Earthquake and Tsunami Emergency Rehabilitation. This reallocation was approved in April 2005.

33. On loan closing in December 2006, the final cancellation of loan proceeds took place with $8,929,521.15 of the loan amount cancelled, bringing the final loan amount to $175,242,478.85. The savings associated with this cancellation came from final minor adjustments in allocations to most portions of the loan. Of particular note were: (i) civil works for the Musi Project (a reduction of around $0.3 million), (ii) savings in equipment for the Musi Project due to bids being lower than expected (a reduction of about $3 million), (iii) consulting services for the Musi Project (a reduction of about $4 million), (iv) the Earthquake and Tsunami Emergency Rehabilitation (a reduction of about $1 million).

34. Overall, the project cost was $420.4 million equivalent, consisting of $252.9 million in foreign exchange costs (60.2% of the total project cost) and $167.5 million equivalent in local currency costs (39.8% of the total project cost). Refer to Appendix 2 for detailed costs. ADB financed 41.7% of the total project cost. The project financing plan is provided in Appendix 3.

D. Disbursements

35. Total loan disbursements were $175.242 million, compared with the originally approved amount of $275 million. Appendix 4 shows the annual disbursements under the loan.

E. Project Schedule

36. According to the original implementation schedule, Part B of the Project was to be completed by the Q2 2000. The actual implementation schedule (Appendix 5) shows a delay of around 6 years, with completion of Musi.

37. All contracts were awarded on a turnkey basis following international competitive bidding (ICB), with the exception of the following: (i) consulting services for Part A by extension of services, as these consultants were already involved in Tanggari I Project's detailed design; (ii) consulting services for Part B by direct recruitment; and (iii) the Earthquake and Tsunami Emergency Rehabilitation by local competitive bidding (LCB). The Project had a significant number of unforeseen changes in scope due to the rapidly changing economic and financial conditions in Indonesia that resulted from the Asian financial crisis. The approved changes resulted in greater overall delays than would be expected under normal circumstances.

38. For Part A, the implementation plan at appraisal called for local contractors bidding for the site development in Q3 1993, and for the overall project to be completed in early 1998. The

end date was revised slightly (to August 1998) prior to project commencement. The project was completed in October 1998, about 2 months behind schedule. Initial delays in Part A were due to difficulties with the civil works. Some delay in procurement occurred in the course of the project due to new Indonesian customs regulations. There were also delays in the completion of the work associated with the turbine and generator. These delays were largely overcome during implementation, however.

39. For Part B, the implementation plan at appraisal called for local contractors bidding for the site development bidding in Q3 1993, and for the overall project to be completed in mid-2000. The project was completed in May 2006, about 6 years behind schedule. Early delays to Part B were attributed to several complex issues related to technical (geological) issues and poor contractor performance. Bad weather delayed the river diversion channel, while an inexperienced contractor delayed tunnel excavation. Slow procurement of materials further contributed to some of the early delays.

40. The impact of the financial crisis on Indonesia further delayed overall project implementation significantly. The Government placed the Musi hydropower project on a list of projects that were to be reviewed for possible deferment or cancellation, although project implementation had commenced, with site preparation and civil works well underway. Additionally, the Government cut PLN's budget for FY 1998–FY 1999. Consequently, PLN was unable to obtain the Government's approval for the planned Austrian co-financing of the turbine and generators. PLN was not able to raise local funds due to (i) the budget cut, (ii) significant devaluation of the Indonesian rupiah, (iii) a reduction in electricity sales (paid in local currency), and an increase in operating expenses (paid in foreign currency), following onset of the financial crisis The Musi project was then placed on hold, but the Government continued to pay the annual commitment fees. In May 2000, the Government allowed PLN to continue with implementation of the Musi HPS. In June 2000, the Government requested ADB to finance procurement of the turbines and generators for the project. The bidding process for the turbines and generators was planned to start in late 1995, but the final bid openings took place in January 2002, more than 6 years behind schedule. The Musi hydropower project was completed in mid 2006, 6 years behind schedule.

41. Route surveys and land acquisition for Part C commenced in early 1993, with completion of Part C originally scheduled for late 1996. Early delays to Part C were attributed to a lack of local counterpart funds for reasons stated in para. 43 above, which led to delays in the awarding of some early contracts. Subsequent problems were experienced with transmission line materials, right-of-way and land acquisition, and the need to reroute parts of the transmission line near Palembang airport. The project was completed in December 1998, 2 years behind schedule.

42. The selection of consultants for Part D was undertaken in mid-1993, with completion of Part D scheduled for Q1 1997. However, the consultant's agreement was not signed until April 1995. The schedule at project appraisal called for the selection process for consultants for Part E to be completed by early 1994, with completion of Part E by Q1 1997. However, the consultant agreement was not signed until March 1995, while some components of Part E were canceled. The design, procurement and installation of the utility communication system (UCS) were completed as originally envisaged but with significant delay. However, design and implementation of the DSM pilot projects were canceled following the July 1998 portfolio review by ADB and the Government.

43. The consultant selection process for Part F was undertaken in mid-1993, with completion of the engineering design scheduled for Q1 1997. However, the consultant's contract was not signed until December 1995. The project was completed in Q1 1998, 1 year behind schedule. The significant delay to Part B eventually led to two extensions to the loan closing date, from 31 December 2000 to 31 December 2004, and then finally 30 September 2006. The loan was closed on 18 December 2006. With the exception of Part B of the Project, all other components were completed by December 2000, the original loan closing date.

F. Implementation Arrangements

44. PLN was the Executing Agency for the Project and its head office was responsible for the overall execution, supervision and coordination of the project. Day-to-day coordination and supervision of construction of the respective parts of the Project was undertaken by different PLN offices. For Part A, the principal project generation and transmission office in Sulawesi; for Parts B and C, the principal project generation and transmission office in southern Sumatra; and for parts D and E, the System Planning Division in the Directorate of Planning of PLN's head office. In 2003, PLN's project organization underwent significant changes, with the Construction Management Directorate eliminated. These changes had significant implications for the recovery of records kept for this Project. The disbanding of the Construction Management Directorate within PLN resulted in the resources and expertise that were essential to the operation of this directorate to be disbursed throughout the various operating and planning departments and regions. This change was implemented due to corporatization of the utility and the consequent planned use of outside parties (independent power producers) to undertake most future major project construction.

G. Conditions and Covenants

45. PLN generally complied with the Project's covenants. Appendix 6 shows the status of compliance with loan conditions and covenants. The covenants were realistic and those initially laid down in the Loan Agreement have not been modified, suspended, or waived. With regard to covenant B.4 of Schedule 6 to the Loan Agreement, this was partly complied with. PLN was to have arranged cofinancing for the turbines and electromechanical equipment from Austria. However, during the Asian financial crisis, the Government froze all cofinancing until Indonesia's fiscal situation improved. In 2000, the Government requested that ADB finance the equipment, as the co-financier's terms and conditions were not acceptable to the Government.

H. Related Technical Assistance

46. No technical assistance grants were provided under this loan.

I. Consultant Recruitment and Procurement

47. Consulting services were required under all six parts of the Project. In parts A and B, the consultants assisted PLN in the construction supervision of the two hydropower projects. For part C, the consultants assisted in construction supervision of the implementation of the reinforcement of the transmission line component. For part D, the consultants assisted PLN implement the waste heat recovery systems and additional steam turbine generators, to be operated with the waste heat recovered. For part E, the consultants assisted PLN implement and evaluate the DSM pilot programs. For part F, consulting services were acquired to prepare the engineering design of the 340 MW Merangin hydropower scheme located in the Jambi Province in the southern part of Sumatra. ADB reviewed and approved the terms of reference

for these consulting firms. PLN carried out the recruitment for each component in accordance with ADB's *Guidelines on the Use of Consultants.*

48. All ADB-financed supplies and services were procured using international competitive bidding (ICB) in accordance with ADB's *Guidelines for Procurement*, with the exception of the following: (i) Part A's engineering services was procured through extension of services; (ii) Part B's consulting services was procured through direct recruitment, and (iii) the Earthquake and Tsunami Rehabilitation was procured through LCB. ADB financed no contracts involving LCB, with the exception of item (iii) above. For the two hydroelectric power schemes, ADB financed the civil works, the procurement and installation of the metal works, and the procurement and installation of the equipment. The site development work was financed by PLN. The procurement and installation of the turbines and generators for the Musi HPS were to be cofinanced by Austria, but these two packages were instead financed by ADB. For the transmission component, ADB financed the procurement of equipment and material for the transmission lines and substations. The Government in turn financed the erection and construction of the transmission lines and associated substations, with ADB procuring the equipment and materials. LCB bidding procedures were used in these cases, which ADB reviewed and found acceptable. Appendix 7 summarizes all contracts financed by ADB. In total, ADB financed two civil works contracts, 15 separate equipment and/or material supply contracts, and 7 engineering services contracts. Thirteen LCB contracts were used to procure material for the Earthquake and Tsunami Rehabilitation.

J. Performance of Consultants, Contractors, and Suppliers

49. The performance of the consultants was satisfactory, with the exception of the consultants for the Musi HPS, whose performance was partly satisfactory. The civil works contractor submitted numerous claims and the consultants did not address these claims critically to determine if they were valid, or take the interest of the employer (PLN) into account, but instead endorsed most of them for payment. The consultants also recommended that PLN enter into mandatory arbitration rather than negotiate with the contractor. This proved to be a long drawn-out affair with little benefit to PLN.

K. Performance of the Borrower and the Executing Agency

50. The Government and PLN were responsible for providing all funds not supplied by ADB. They did so in a timely manner until the onset of the Asian financial crisis, which caused a shortage of local counterpart funds that had a major impact on the Project's scope and implementation schedule. The assessment of PLN's capabilities at appraisal was reasonably accurate, although the internal reorganization of PLN's Project Management Directorate in 2003 was not foreseen. However, the delegation of authority from the head office to the regional units was implemented progressively during the course of the Project. PLN's head office no longer performs operational activities, and it is now only responsible for policy and strategic matters. PLN is continuing to develop its organization by delegating authority from its head office to its regional units. Given the difficult economic circumstances encountered during Project implementation, the performance of the borrower and PLN is rated satisfactory.

L. Performance of the Asian Development Bank

51. ADB responded in a timely and adequate manner to the Project's requirements, which were very challenging at times. The reviews of tender documents and subsequent bid evaluation reports were processed in a timely manner. Over the 12-year project implementation

period, progress was reviewed 21 times, and withdrawal applications were processed promptly. ADB also helped PLN manage the loan through the comprehensive review of all ongoing projects after the 1997 financial crisis. ADB showed flexibility in its dealings with PLN and the Borrower during and after the crisis, which was appreciated by the Government. ADB's performance is rated satisfactory.

III. EVALUATION OF PERFORMANCE

A. Relevance

52. The design of the Project was satisfactory and met the main project rationale of supporting the Government's policy objectives. Changes made to the Project following the Asian economic crisis were adequate to improve the Project's design relevance in line with economic developments in the region and to achieve the Project's goals more effectively. The Project is considered "relevant".

B. Effectiveness in Achieving Outcome

53. Despite cancellations of substantial portions of the Project that were designed to contribute significantly to implementation of Indonesia's energy policy, those portions that did proceed to completion contributed as envisaged, while some parts that were not fully implemented also had an impact. The country's power generation capacity was expanded and diversified through the addition of 229 MW of hydropower capacity. In 1992, thermal power represented 42.9% of the installed capacity on PLN`s countrywide network, but this had decreased to 31% by 2005, in part because of the contribution made by the Musi and Tanggari II HPSs.

54. 1,232 gigawatt hours (GWh) per annum of hydropower energy was to be added to the country's annual energy balance sheet (92 GWh from Tanggari II HPS and 1140 GWh from Musi HPS).However, based on actual operating data, this has not happened, thereby jeopardizing the efficiency of these portions of the Project. The Tanggari II HPS has on average produced 86 GWh annually over the last 8 years. It was plagued with serious electrical faults in Unit 1 for most of the period 2001–2003. The Musi HPS has on average produced 484 GWh annually (42.4% of the appraised value) over the first 11 months of its operation, due to a lack of understanding by the operators of how to effectively operate the plant on a daily and seasonal basis.

55. A total 19 MW of power from waste heat recovery at selected diesel generating stations was to be added to the country's generation capacity, helping reduce its dependence on oil, but none of these projects was implemented. The component was canceled during the financial crisis. The 150 kV transmission networks in the southern part of Sumatra were reinforced. For the region of southern Sumatra, the system average interruption duration index improved from 16.70 hours per customer in 1998 to 12.01 in 2005.[11]

56. Plans to improve the country's supply efficiency and intensify energy conservation efforts throughout the country were not achieved, as portions of Parts D & E were canceled before they could be fully implemented. In spite of the reduction in scope, the UCS installed as part of Part E of the Project is presently used by PLN`s distribution department for automatic meter reading. The utility is in the process of expanding automatic meter reading to another 20,000 customers

[11] PLN. 1998. *PLN Statistics 1998*. Jakarta; PLN. 2005. *PLN Statistics 2005*. Jakarta..

within Java using GSM (mobile phone) technology. A load management tariff has been included in the utility's tariff regime to encourage off-peak power usage.

57. As of 2002, PLN has funded the replacement of incandescent lighting fixtures with compact fluorescent fixtures at a cost of some $20 million. This program was expanded to $60 million in 2006. The economic analysis indicated that the viability of the replacement program had increased; PLN was able to update the consultant's study and to justify proceeding with the CFL replacement program.

58. The Project also contributed to a reduction in transmission losses in the southern Sumatra electrical networks. System losses in southern Sumatra decreased from 14.06% in 1998 to 11.62% in 2005[8] (not including the use by stations themselves), and remained below the covenant value of 15%. The decrease in system losses indicated an improvement in the transmission network. Overall, the Project was effective in achieving its purpose (as formally modified during implementation), and has had a positive impact.

C. Efficiency in Achieving Outcome and Outputs

59. The Project's efficiency was affected by implementation delays. Only three of the original six components of the Project were fully implemented. Because it was not feasible to isolate and quantify the benefits of the transmission reinforcement portion of the Project (Part C) from those attributable to the entire power network, no economic analysis was carried out at project appraisal. This portion of the Project is considered part of the least-cost development plan for power system transmission, and it is considered to be economically justified.

60. The FIRRs for the two hydropower projects were reexamined and compared with these undertaken at appraisal (see Appendix 8). The recalculated FIRR for the Tanggari II HPS is 8.35%, compared with the appraisal value of 10.6% (base case using historical data for future energy production, with a weighted average cost of capital of 10% for PLN in 2006). The deviation from the appraisal results is mainly due to poor plant load factor on one of the two units, a higher-than-expected increase in the cost of electricity supply because of the depreciation of the rupiah and the high share of foreign exchange costs, as well as the inability of PLN to increase tariffs in line with the increase in costs due to the Asian economic crisis. Given the implementation delays and the low financial return, this part of the Project is rated "less efficient". An improvement in the plant load factor for Tanggari II HPS is expected in the future, along with an improvement in the economic efficiency of the Project.

61. The recalculated FIRR for the Musi HPS is 5.64%, compared with the appraisal analysis of 16.8% (base case using historical data for future energy production, with a weighted average cost of capital of 10% for PLN in 2006). The deviation from the appraisal results is mainly due to a (i) longer–than-expected implementation period; (ii) lower-than-expected electricity output; (c) higher-than-expected increase in the cost of electricity supply because of the depreciation of the Rupiah; and (d) high share of foreign exchange costs, as well as the inability of PLN to increase tariffs in line with the increase in costs because of the economic crisis. Given the implementation delays and the low financial return, this portion of the Project is rated "less efficient". PLN's district personnel are initiating an optimization study of the Musi HPS operations; it is hoped that the study outcomes will improve the Project's economic efficiency. Given the implementation delays and the low financial return from the two hydroelectric power portions of the Project, the overall Project is rated "less efficient".

D. Preliminary Assessment of Sustainability

62. Electricity tariffs charged to consumers in the late 1990s were too low to ensure the sector's economic sustainability, and tariffs had to be increased to a level adequate to ensure not only financial survival but also the capacity to repay loans needed to fund new capital investment. PLN has made some progress in increasing tariffs since 1999. Average revenues from electricity sales increased from Rp211 ($0.024) per kWh in 1999 to Rp591 ($.064) per kWh in 2005 (footnote 11). Consumers have accepted the tariff increases, but tariffs are still slightly below the economic cost of power generation and supply, which is currently more than $0.07/kWh. The cost of fuel oil and diesel-based generation varies between $0.19/kWh to $0.25/kWh. Tariffs have not increased since 2004, but there are expectations that electricity tariffs will be revised after 1 June 2008.

63. In March 2005, the Government increased petroleum prices by 49% and again by 105% in October 2005 to reflect the increase in international oil prices. The Government again increased domestic petroleum prices by 30% in May 2008. However, the electricity tariff was not increased. The Government provided a subsidy of over $3.3 billion to PLN in 2007, which is approved by the Parliament, and which allows PLN to meet its financial obligations and to continue its operations. In 2008, the Government subsidy to PLN is expected to total to about $4.5 billion due to increases in international oil prices. As an alternative, the Government is implementing measures to reduce energy generation costs through increased use of non-oil fuels such as gas, coal and renewable energy. In this context, the Government has begun implementing the fast-track coal-based generation (10,000 MW) program to move away from fuel oil and diesel-based generation. PLN was directed to improve its system efficiency in order to reduce power supply costs. PLN's financial strategy is based on (i) strict budget control over strategic business units and operational units, (ii) maintaining stringent cash flow norms, (iii) lowering energy losses, and (iv) promoting efficient energy billing and bill collection.

64. The blueprint for developing the nation's electricity industry recognizes the need for making high quality and reliable electricity services available and for developing transmission and distribution facilities to meet regional electricity demand. The Government has programs for increasing supply capacity by addressing transmission bottlenecks and improving the capacity of the transmission network. Furthermore, the distribution systems needed to be strengthened to be compatible with an improved transmission network. The initiatives taken by the Government and PLN ensure that, overall, the Project is "most likely" to be sustainable.

E. Impact

65. At appraisal, the initial environmental examination of the Project showed that Parts A and C would not cause significant adverse impacts but would require selected mitigation measures for potential minor adverse impacts, while Part B would require a comprehensive environmental impact assessment and associated mitigating measures. However, during implementation Part C was found to have adverse impacts that required mitigation. The major impacts anticipated during project preparation were resettlement, land clearing and disposal of rocks, soil and waste materials, forest protection and reduction in river flow. A summary environmental impact assessment for Part A of the Project was prepared and circulated to the ADB's Board in July 1993, while the environmental impact assessment was submitted to the ADB's Board in August 1993.[i]

66. For Part B, permanent acquisition of about 272 hectares (ha) of land, including one house and 29 huts, along with temporary acquisition of 68 ha of land was undertaken. It was

anticipated that during operation the Musi river flow would be reduced, though not significantly, while the flow in the Simpang Aur River would increase significantly. The environmental impact assessment anticipated the increased flow (of 15.5 m^3 per sec) would raise water levels along the river by 30–50 centimeters (cm). This increase will not affect structures and bridges downstream (see para. 70).

67. There were considerable delays in implementing Part C as negotiations for the right-of-way for the transmission lines were extremely slow. This resulted from several factors: (i) landowners asked for exaggerated amounts compared to what was previously agreed during detailed measurement surveys; (ii) district heads were replaced by the provincial government, which compounded the problem, as PLN had to obtain clearance from them; (iii) differing valuation of land and crops by landowners and PLN. PLN used the opportunity cost of land to determine compensation, but landowners wanted a higher price for the land and crops; and (iv) the depreciation of the Indonesian rupiah during the financial crisis further exacerbated the delays, as more rupiah were required, and PLN lacked the counterpart funds to make the payments.

68. An Environmental Mitigation Case Study Mission was fielded by ADB in May 1999 to review and report on the mitigation measures implemented for the three main parts of the project. At that time, only the Musi hydropower component was under construction (Tanggari HPS was already commissioned) and the mission's findings indicated that PLN had generally complied with the required mitigation measures during implementation, but had not complied with the loan covenant calling for submission of regular environmental monitoring reports to ADB. This improved for the Musi component following the mission's visit.

69. The Mission made the following recommendations: (i) all loan review missions should include a section on the environmental aspects of a project; (ii) environmental aspects of all Category A projects should be reviewed at least once a year; (iii) an environmental specialist should participate in such review missions to the extent possible.

70. The problem with operating the Musi hydropower scheme efficiently was the reluctance of PLN to operate the plant at full output. As originally envisaged by the designers, operation of this trans-basin scheme at full output involved diverting as much as 62 m^3/sec from the Musi River to the Simpanguar River, raising the flow of the latter from an annual mean rate of 2.2 m^3/sec to a peak of 62 m^3/sec at the outfall. At present, plant operators are not permitted to allow the flow from plant outfall to exceed 15 m^3/sec, limiting the plant to about 50 MW on a continuous basis, and 210 MW for 4 hour periods by using a re-regulating basin. Due to the long delay in implementing the Project, many people had encroached on the shores of the upper Simpanguar River, along with their domestic animals. Full operation and improved economic efficiency of this project component requires that larger outflows be allowed, as originally envisaged, but this will have an impact the people living downstream of the Project.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

71. The Project is considered "partly successful" based on review of its relevance, effectiveness, efficiency, and sustainability. The Project was not fully implemented as conceived at appraisal, because adjustments were required due to changes in the economic situation in the country because of the Asian financial crisis. The Project partly achieved its main objectives by meeting increasing demand for power from an energy source other than oil, and

implementing an expansion in the installed MW capacity, although less oil-generated energy was displaced than intended. The Project did meet its objective of enhancing power transmission system efficiency and reliability through reinforcement of the 150 kV networks in southern Sumatra. The Project however did not achieve the objective of promoting energy conservation and improving supply efficiency through the development of DSM pilot programs and through waste heat recovery at some diesel generating stations.

B. Lessons

72. Part B took long to resolve and PLN stated that third party mediation, mandatory arbitration or court settlement of contractor claims should be pursued as a last resort. When a project schedule is extended well beyond the planned date, ADB should ensure that the data needed for the PCR and the final project evaluation are preserved. If parts of a project end significantly earlier than the overall project, measures should be put in place to gather the data needed for the PCR. PCRs from all project teams (consultants and the EA project team) should be gathered soon after completion of the various project components. The ADB should encourage project staff to prepare file notes on project-related matters and record these interviews, as they would be valuable during later PCR preparation.

C. Recommendations

73. The following paragraphs describe Project-related and general recommendations that may benefit new projects or be generally applicable to ADB practices in the future.

1. Project Related

74. **Further Action.** The Musi HPS portion of the Project is underperforming financially. The Operations Department of the southern Sumatra district of PLN's network in Palembang is presently undertaking an optimization study of the Musi hydropower scheme. It is therefore, recommended that ADB assist PLN by participating in this study to improve the plant's operation as well its financial performance.

2. General

75. **PLN Capacity Rebuilding.** PLN was restructured in 2003, significantly reducing their ability to manage large construction projects. The restructuring was motivated by a plan to have independent power producers carry out construction of most large energy projects, and has led to dissolution of PLN's construction directorate and reassignment and dispersal of personnel knowledgeable in project management throughout the utility's operations. It will be difficult for PLN to organize in-house project management teams with the experience necessary to lead large projects and to build project management capacity from within their own ranks. It is recommended that ADB address this situation with the Borrower and the EA well before considering upcoming loan opportunities with these parties. It is felt that placing generally worded covenants related to this matter in loan agreements will not suffice.

76. **Environmental Review.** The Environmental Mitigation Case Study Mission made a series of recommendations that can be summarized as follows: (i) all loan review missions should include a section on the environmental aspects of a project, (ii) environmental aspects of all Category A projects should be reviewed at least once a year, (iii) an environmental specialist should participate in loan review missions to the extent possible.

PROJECT OUTPUTS AT APPRAISAL AND ACTUAL

Appraisal	Actual
Part A: Tanggari II hydropower project	
• Site development	• As planned (May 1995–Nov 1995)
• Civil works	• As planned (May 1995–Jul 1998)
• Metal works	• As planned (Jun 1995–Oct 1998)
• Turbines	• As planned (Oct 1995–Oct 1998)
• Generators	• As planned (Oct 1995–Oct 1998)
• Substations and transmission lines	• As planned (Nov 1995–Oct 1998)
• Consulting services and administration	• As planned (Dec 1993–Oct 1998)
• Land compensation	• As planned
Part B: Musi hydropower project	
• Site development	• As planned (Dec 1994–Apr 1996)
• Civil works	• As planned (Jul 1996–Mar 2003)
• Metal works	• As planned (Mar 1999–Nov 2002)
• Turbines	• As planned (Sep 2003–May 2006)
• Generators	• As planned (Sep 2003–May 2006)
• Transformers	• As planned (Sep 2003–May 2006)
• Transmission lines	• As planned (Feb 2004–Sep 2005)
• Telemetering system	• As planned (Nov 2004–Jul 2006)
• Consulting services	• As planned (Jul 1994–Aug 2006)
• Administration	• As planned
• Land compensation	• As planned
Part C: southern Sumatra transmission lines	
• Reinforcement of South Sumatra and Lampung Systems: – Keramasan to T. Kelapa – 17.8 km 150 kV double – T. Kelapa to Borang – 12.8 km 150 kV double – Keramasan to S. Kedukan – 12.5 km 150 kV double – S. Kedukan to Mariana – 12.8 km 150 kV double – Tengineneng to T. Padang – 38.4 km 150 kV double – Sutami S/S Branch – 16.1 150 kV double – Others – stringing the Palembang ring – Keramasan S/S – T. Kelapa S/S – Borang S/S – Sutami S/S – T. Padang (Pagelaran) S/S – Tegineneng S/S – Lahat S/S	• As planned
• Consulting Services	• As planned
Part D: waste heat recovery in diesel power stations outside Java	
• Equipment – Cot Trueng (3.8 MW additional) – Pakanbaru (3.8 MW additional)	• Cancelled

– Sei Raya (4.2 MW additional) – Batakan (3.1 MW additional) – Batakan (1.4 MW additional) – Tanjung Karang (3.1 MW additional) • Consulting Services	• Partial. The six candidate sites were evaluated technically and economically, with only one site, Tanjung Karang, passing the evaluation. Procurement of the WHR equipment for this station was canceled while in progress, and the remaining consulting services were also canceled.
Part E: demand side management pilot programs • Equipment – Residential lighting DSM pilot program – Commercial lighting DSM pilot program – Industrial DSM pilot program – Utility communication system • Consulting services	• Partial – Canceled – Canceled – Canceled – As planned • Partial. The consulting services provided the design of the various DSM pilot programs and the engineering of the UCS. The services were reduced when DSM pilot program implementation was cancelled.
Part F: engineering and design of the Merangin hydropower project • Consulting Services	• As planned

DSM = demand side management, km = kilometers, kV = kilovolts, MW = megawatts, PLN = Perusahaan Listrik Negara (National Power Company), S/S = substation, UCS = utility communication system, WHR = waste heat recovery.

Source: ADB. 1993. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Republic of Indonesia for Power XXIII Project*. Manila; Project files, and PLN.

APPRAISED AND ACTUAL PROJECT COSTS

Table A2.1: Cost Estimates
($ million)

	Appraisal			Actual		
Component	**Foreign Exchange**	**Local Currency**	**Total**	**Foreign Exchange**	**Local Currency**	**Total**
Part A: Tanggari II HPS	31.6	13.5	45.1	24.2	5.9	30.1
Part B: Musi HPS	162.4	100.0	262.4	118.9	104.7	223.6
Part C: Southern Sumatra Transmission system reinforcement	35.9	5.3	41.2	21.1	4.2	25.3
Part D: Waste heat recovery in diesel stations outside Java	23.1	3.2	26.3	0.4	0.1	0.5
Part E: Demand side management pilot programs	6.1	1.5	7.6	2.1	0.4	2.5
Part F: Design and engineering of Merangin HPS	4.7	1.4	6.1	3.5	0.7	4.2
Base Cost	**263.8**	**124.9**	**388.7**	**170.2**	**116.0**	**286.2**
Earthquake and Tsunami Emergency Rehabilitation	0.0	0.0	0.0	5.1	0.8	5.8
Physical contingencies	22.6	13.9	36.5	—	—	—
Price contingencies	37.6	16.5	54.1	—	—	—
Total Contingencies	**60.2**	**30.4**	**90.6**	—	—	—
IDC on : ADB Loan	67.0	48.3	115.3	77.6	50.7	128.3
JBIC Loan	7.00	0.00	7.00	—	—	—
Grand Total	**398.0**	**203.6**	**601.6**	**252.9**	**167.5**	**420.4**
Percentage	**66**	**34**	**100**	**60**	**40**	**100**

IDC=interest during construction, HPS = hydropower scheme, JBIC=Japan Bank for International Cooperation.
Source: Asian Development Bank.

Table A2.2: Detailed Cost Estimates

($ million)

No	Project Scope	Unit	Cost Estimate FX	LC	Total	No.	Project Scope	Unit	Actual FX	LC	Total
A.	**Tanggari II HPS**					**A.**	**Tanggari II HPS**				
1.	Site Development		—	0.5	0.5	1.	Site Development		—	0.5	0.5
2.	Civil Works		12.1	8.6	20.7	2.	Civil Works		9.9	2.0	11.9
3.	Metal Works		3.5	0.2	3.7	3.	Metal Works		1.6	0.3	1.9
4.	Turbines		3.0	0.1	3.1	4.	Turbines		5.3	1.1	6.4
5.	Generators		4.7	0.2	4.9	5.	Generators				
6.	Substation and Transmission Lines		3.1	0.3	3.4	6.	Substation and Transmission Lines		1.4	0.3	1.7
7.	Consulting Services		5.2	3.1	8.3	7.	Consulting Services		6.0	1.2	7.2
8.	Land Compensation		—	0.6	0.6	8.	Land Compensation		—	0.6	0.6
	Subtotal (A)		**31.6**	**13.5**	**45.1**				**24.2**	**5.9**	**30.1**
B.	**Musi HPS**					**B.**	**Musi HPS**				
1.	Site Development		—	23.2	23.2	1.	Site Development		—	23.2	23.2
2.	Civil Works		73.2	41.4	114.6	2.	Civil Works		52.7	34.7	87.4
3.	Metal Works		16.7	3.1	19.8	3.	Metal Works		6.9	3.3	10.2
4.	Turbines		12.1	2.7	14.8	4.	Turbines		15.2	3.8	19.0
5.	Generators		27.6	6.9	34.5	5.	Generators		14.6	0.4	15.1
6.	Transformers		10.5	3.0	13.5	6.	Transformers		4.0	0.5	4.5
7.	Transmission Lines		1.0	1.1	2.1	7.	Transmission Lines		—	1.3	1.3
8.	Telemetering System		1.4	0.2	1.6	8.	Telemetering System		0.8	0.3	1.1
						9.	Distribution Line		—	0.3	0.3
						10.	Other Local Contracts		—	1.3	1.3
9.	Consulting Services		20.0	7.8	27.8	11.	Consulting Services		24.7	4.4	29.1
10.	Administration		—	10.2	10.2	12.	Administration		—	11.6	11.6
11.	Land Compensation		—	0.5	0.5	13.	Land Compensation		—	2.7	2.7
	Subtotal (B)		**162.4**	**100.0**	**262.4**				**118.9**	**104.7**	**223.6**
C.	**Southern Sumatra Transmission Lines**					**C.**	**Southern Sumatra Transmission Lines**				
1.	Reinforcement of South Sumatra & Lampung Systems		33.0	4.4	37.4	1.	Reinforcement of South Sumatra & Lampung Systems		18.9	3.8	22.7
2.	Consulting Services		2.9	0.9	3.8	2.	Consulting Services		2.2	0.4	2.6
	Subtotal (C)		**35.9**	**5.3**	**41.2**				**21.1**	**4.2**	**25.3**
D.	**Diesel Waste Heat Recovery**					**D.**	**Diesel Waste Heat Recovery**				
1.	Equipment		22.3	2.8	25.1	1.	Equipment		—	—	—
2.	Consulting Services		0.8	0.4	1.2	2.	Consulting Services		0.4	0.1	0,5
	Subtotal (D)		**23.1**	**3.2**	**26.3**				**0.4**	**0.1**	**0.5**
E.	**DSM Pilot Program**					**E.**	**DSM Pilot Program**				
1.	Equipment		4.7	—	4.7	1.	Equipment		1.7	0.3	2.0
2.	Consulting Services		1.4	1.5	2.9	2.	Consulting Services		0.4	0.1	0.5
	Subtotal (E)		**6.1**	**1.5**	**7.6**				**2.1**	**0.4**	**2.5**

No	Project Scope	Unit	Cost Estimate FX	LC	Total	No.	Project Scope	Unit	Actual FX	LC	Total
	Engineering Design of						**Engineering Design of Merangin**				
F.	**Merangin HPS**					**F.**	**HPS**				
1.	Consulting Services		4.7	1.4	6.1	1.	Consulting Services		3.5	0.7	4.2
	Subtotal (F)		**4.7**	**1.4**	**6.1**				**3.5**	**0.7**	**4.2**
G.	**Consulting Services**					**G.**	**Consulting Services**				
1.	Consulting Services					1.	Consulting Services				
	Subtotal (G)										
	Earthquake and Tsunami						**Earthquake and Tsunami**				
H.	**Emergency Rehabilitation**					**H.**	**Emergency Rehabilitation**				
1.	Miscellaneous		0.0	0.0	0.0	1.	Miscellaneous		5.1	0.8	5.8
	Subtotal (H)		**0.0**	**0.0**	**0.0**				**5.1**	**0.8**	**5.8**
	Total Base Cost		**263.8**	**124.9**	**388.7**				**175.2**	**116.8**	**292.1**
I.	**Contingencies**					**I.**	**Contingencies**				
1.	Physical		22.6	13.9	36.5	1.	Physical				
2.	Price		37.6	16.5	54.1	2.	Price				
	Subtotal (I)		**60.2**	**30.4**	**90.6**		**Subtotal (I)**				
J.	**IDC**					**J.**	**IDC**				
	ADB Loan		67.0	48.3	115.3		ADB Loan		77.6	50.7	128.3
	Other Loan		7.0	0.0	7.0		Other Loan				
	Subtotal (J)		**74.0**	**48.3**	**122.3**		**Subtotal (J)**		**77.6**	**50.7**	**128.3**
Grand Total			**398.0**	**203.6**	**601.6**		**Grand Total**		**252.9**	**167.5**	**420.4**

ADB = Asian Development Bank, DSM = demand side management, FX = foreign cost, HPS = hydropower scheme, IDC = interest during construction. Base costs are in 1993 prices.

[a] Numbers shown here match those tabulated in RRP.

[b] Source of Local Cost financing: Parts A,C,D,E,F and IDC – PLN, Part B – Consultant's PCR

FINANCING PLAN ($ MILLION)

	Per Appraisal						Actual					
	FC			Sub-	LC		FC			Sub-	LC	
	ADB	Cofinancing	GOI/PLN	Total	GOI/PLN	Total	ADB	Cofinancing	GOI/PLN	Total	GOI/PLN	Total
Part A:												
Tanggari II HPS	37.0			37.0	15.9	52.9	24.2			24.2	5.9	30.1
Part B:												
Musi HPS												
Engineering	24.7			24.7	9.8	34.5	24.7			24.7	4.4	29.1
Civil works	95.6			95.6	54.2	149.8	52.7			52.7	34.7	87.4
Equipment	37.7	49.0		86.7	20.0	106.7	41.5			41.5	11.2	52.7
Others[a]					42.2	42.2	—			—	54.4	54.4
Subtotal	**158.0**	**49.0**		**207.0**	**126.2**	**333.2**	**118.9**	—		**118.9**	**104.7**	**223.6**
Part C:												
South Sumatra T/L	40.5			40.5	6.1	46.6	21.1			21.1	4.2	25.3
Part D:												
Diesel Waste Heat Recovery	27.5			27.5	3.8	31.3	0.4			0.4	0.1	0.5
Part E:												
DSM Pilot Programs	7.0			7.0	1.9	8.9	2.1			2.1	0.4	2.5
Part F:												
E/S for Merangin HPS	5.0			5.0	1.4	6.4	3.5			3.5	0.7	4.2
Subtotal	**275.0**	**49.0**		**324.0**	**155.3**	**479.3**	**170.2**	—		**170.2**	**116.0**	**286.2**
IDC			74.0	74.0	48.3	122.3			77.6	77.6	50.7	128.3
Earthquake and Tsunami Emergency Rehabilitation							5.1			5.1	0.8	5.9
Grand Total	**275.0**	**49.0**	**74.0**	**398.0**	**203.6**	**601.6**	**175.2**	—	**77.6**	**252.9**	**167.5**	**420.4**
Percentage of ADB Financing	45.7%			66.2 %	33.8%	100.0%	41.7%			60.2%	39.8 %	100.0 %

ADB = Asian Development Bank, FX= foreign cost, GOI = Government of Indonesia, HPS = hydropower scheme, L/C = local cost, PLN = Perusahan Listrik Negara (National Power Company), T/L = transmission line.

[a] Includes administration, land compensation, and taxes.

Source: Asian Development Bank and Perusahan Listrik Negara (National Power Company).

ACTUAL DISBURSEMENTS, 1994–2006

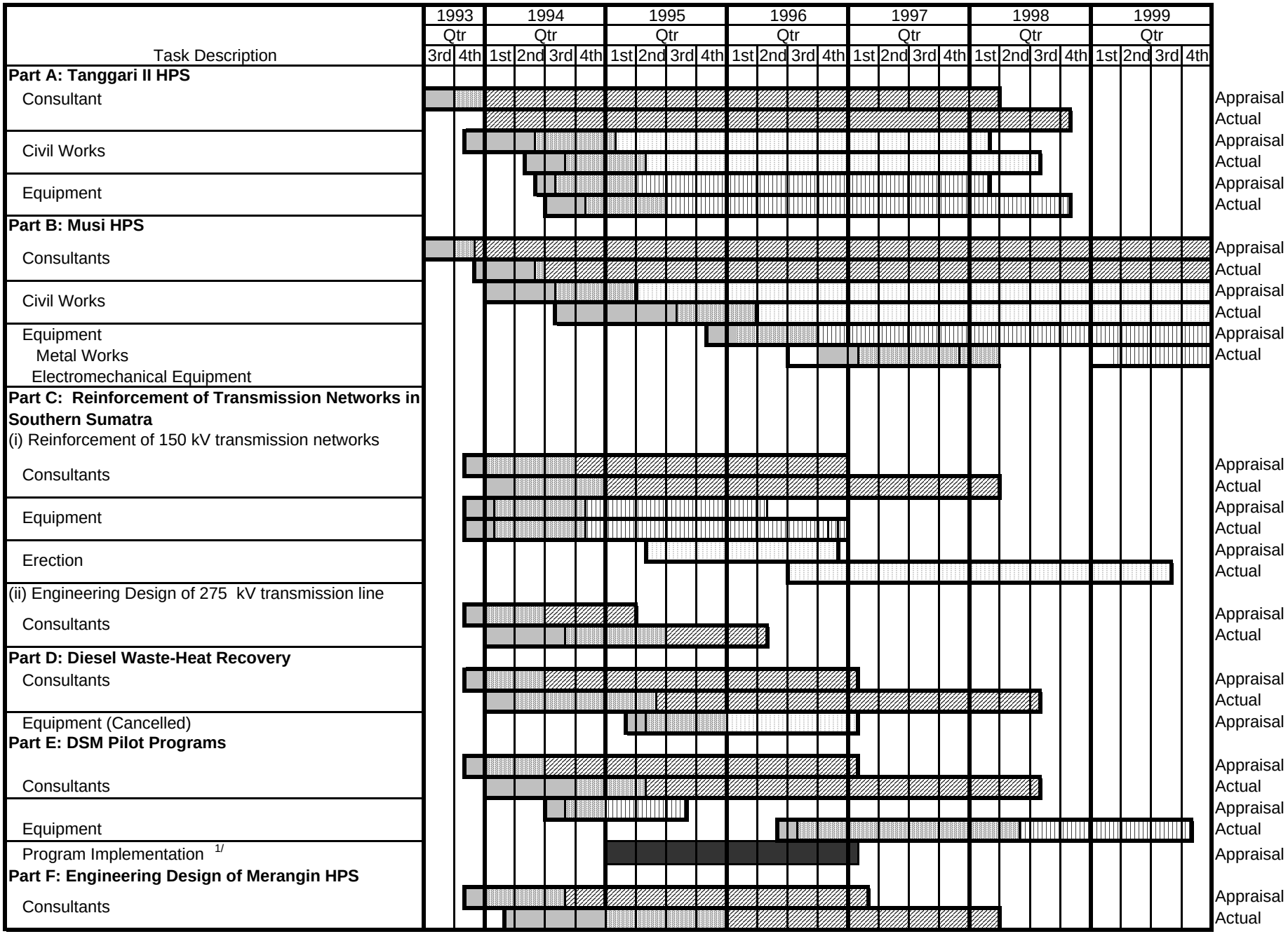
($)

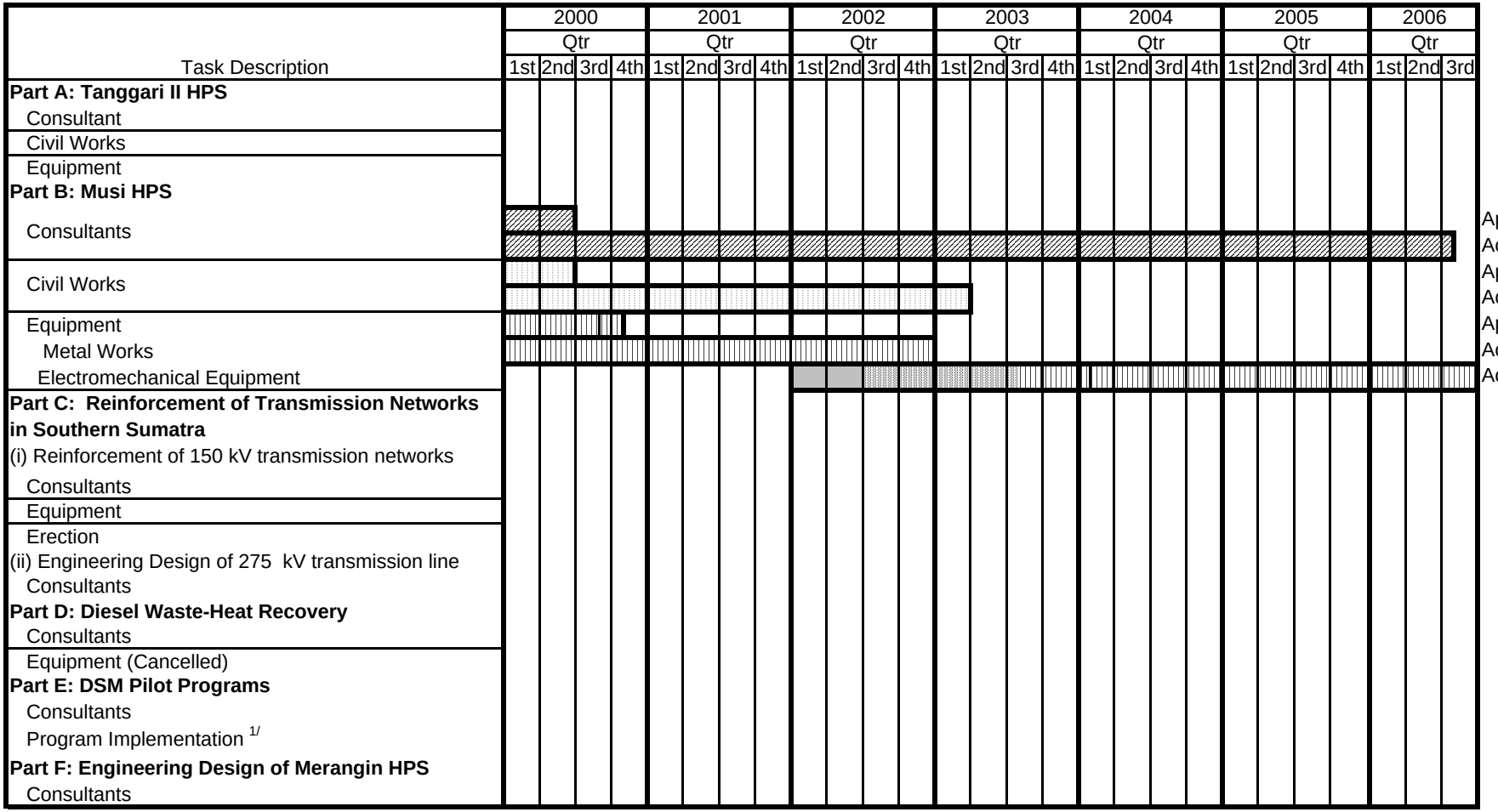
Year	Quarter	Amount Disbursed	Annual Total	Cumulative Total
1994	IV	4.370	4.370	4.370
1995	I			4.370
	II	2.827		7.197
	III	1.547		8.744
	IV	4.706	9.080	13.450
1996	I	5.285		18.735
	II	4.877		23.612
	III	9.532		33.144
	IV	5.082	24.776	38.226
1997	I	3.570		41.796
	II	5.688		47.484
	III	5.764		53.248
	IV	2.735	17.757	55.983
1998	I	3.495		59.478
	II	3.877		63.355
	III	2.096		65.451
	IV	4.674	14.142	70.125
1999	I	2.212		72.337
	II	3.023		75.360
	III	2.138		77.498
	IV	2.985	10.358	80.483
2000	I	2.222		82.705
	II	4.058		86.763
	III	1.225		87.988
	IV	1.069	8.574	89.057
2001	I	2.024		91.081
	II	0.775		91.856
	III	1.294		93.150
	IV	3.145	7.238	96.295
2002	I	0.325		96.620
	II	0.410		97.030
	III	2.611		99.641
	IV	2.011	5.357	101.652

Year	Quarter	Amount Disbursed	Annual Total	Cumulative Total
2003	I	2.396		104.048
	II	24.190		128.238
	III	0.623		128.861
	IV	2.655	29.864	131.516
2004	I	2.478		133.994
	II	0.490		134.484
	III	2.648		137.132
	IV	0.755	6.371	137.887
		0.854		138.741
2005	I	5.381		144.122
	II	5.964		150.086
	III	8.749	20.948	158.835
	IV			
		0.225		159.060
2006	I	3.955		163.015
	II	4.274		167.289
	III	7.953	16.407	175.242

I = first quarter, II = second quarter, III = third quarter, IV = fourth quarter.
Source: Asian Development Bank

IMPLEMENTATION SCHEDULE





Bidding (including prequalification/Invitation of Proposals Evaluation, Contract Negotiation and LC

Manufacture, Delivery and Installation

DSM Program Implementation

Consulting Services

Construction/Erection

Note: Order To Proceed for MetalWorks (Lot II) issued on1 April 1998 was recalled on 18 April 1998 and work was suspended for 11 months. Order to Proceed was reissued in March 1999.

1/ Design and implementation of the DSM pilot projects were cancelledin July 1998 following a comprehensive portfolio review

COMPLIANCE WITH COVENANTS

Covenant		Reference in Loan Documents	Compliance
A.	**General Implementation Arrangements**		
1.	As the Project Executing Agency, National Power Company (Perusahaan Listrik Negara, PLN) shall be responsible for the overall execution, supervision, and coordination of the Project.	LA Schedule 6, Para. 1	Complied with.
2.	The overall responsibility for the implementation of the Project shall rest with PLN's head office, while the day-to-day coordination and supervision of construction for the respective parts of the Project shall be undertaken by the following: (a) for Part A, the Principal Project Generation and Transmission Office in Sulawesi (b) for Parts B and C, the Principal Project Generation and Transmission Office in southern Sumatra; and (c) for Parts D and E, the System Planning Division in the Directorate of Planning of PLN's Head Office.	LA Schedule 6, Para. 2	 Complied with. Complied with Complied with
3.	(a) The Borrower shall ensure that PLN appoints, by the commencement of the site development work, a Site Project Manager, with experience and qualifications satisfactory to the ADB, in the Principal Project Generation and Transmission Office in Sulawesi for Part A of the Project, and in the Principal Project Generation and Transmission Office in southern Sumatra for each of Parts B and C. (b) The Borrower shall ensure that, for each of Parts D and E of the Project, PLN has Project Coordinators, with experience and qualification satisfactory to ADB, in the System Planning Division in the Directorate of Planning of PLN's Head Office. (c) Such Site Project Managers and Project Coordinators shall be supported by adequate staff with suitable experience and qualifications.	LA Schedule 6, Para. 3	Complied with. Complied with. Complied with.
B.	**Specific Implementation Aspects** **Selection of PLN's diesel power stations under Part D of the Project**		
1.	Appraisal of PLN's diesel power stations proposed for installation of waste heat recovery equipment under Part D of the Project shall be conducted by PLN with the assistance of the consultants referred to in Schedule 5 to this Loan Agreement. Detailed design and preparation of bid documents for a proposed diesel power station shall commence only after ADB has approved the appraisal report for such diesel power station.	LA Schedule 6, Para. 4	Partly complied with as this portion of the Project was eventually canceled.

Covenant		Reference in Loan Documents	Compliance
	Land Acquisition		
2.	The Borrower and PLN shall acquire or cause to be acquired all land, rights of way and other property rights as may be required for the timely completion of the Project.	LA Schedule 6, Para. 5	Complied with.
	Social Measures		
3.	The Borrower and PLN shall ensure that compensation satisfactory to ADB be provided to people affected by the construction of the Project facilities under Parts A, B and C of the Project. The compensation shall be determined through consultation and consensus by representatives of the landowners and a committee for land acquisition including village authorities. The Borrower shall ensure that the resettlement program will be monitored by local government authorities and reported to ADB by PLN.	LA Schedule 6, Para. 6	Complied with.
	Co-financing		
4.	The Borrower shall ensure that co-financing, or, if that is not feasible, alternative financing from domestic sources, in amounts and on the terms and conditions satisfactory to ADB be obtained by 30 September 1994.	LA Schedule 6, Para. 7	Partly complied with.
	Environmental Measures		
5.	The Borrower shall ensure that the mitigation and monitoring measures proposed in environmental management plans and environmental monitoring plans satisfactory to the ADB in form and substance will be properly implemented.	LA Schedule 6, Para. 8	Complied with.
	Transmission Line		
6.	The Borrower and PLN shall use their best efforts to complete the construction of the transmission line from Curup to Lubuk Linggau to Bukit Asam prior to the completion of the Musi hydropower scheme.	LA Schedule 6, Para. 9	Complied with.
C.	**Financial, Accounting, and Related Matters**		
1.	**Cost Recovery for Efficient Lighting Equipment** The Borrower and PLN shall ensure that, by 31 March 1994, PLN approves the mechanism of collecting, through the consumer billing system, the consumers' share of the cost of efficient lighting equipment to be used under Part E of the Project.	LA Schedule 6, Para. 10	Not applicable.
2.	**Energy Losses** The Borrower shall ensure that PLN maintains its energy losses, excluding such losses for station use, at no more than fifteen percent (15%) of total electricity generated.	LA Schedule 6, Para. 11	Complied with.

Covenant		Reference in Loan Documents	Compliance
	Rural Electrification Accounts		
3.	The Borrower shall ensure that PLN furnishes to the ADB annual segregated information on its rural electrification operations, in such manner and in such details as may be required by ADB.	LA Schedule 6, Para. 12	Rural electrification now under DGEU since 2000.
	Accounts Receivable		
4.	The Borrower shall ensure that PLN's account receivable, both overall and those related to the public sector, are maintained at a level not higher than the equivalent of three months' sales of electricity.	LA Schedule 6, Para. 13	Complied with.
	Tariff Reviews		
5.	The Borrower shall ensure that PLN annually conducts an overall review of its tariff levels (taking into account long-run marginal costs [LRMC] and average cost of supply of electricity at various voltage levels and for different categories of consumers) and furnishes a report thereon to the ADB for ADB's comments by 31 December of each year. The report shall also contain PLN's proposals for taking any corrective measure as may be found to be required for ensuring compliance with the financial covenants set out in Sections 2.17 and 2.18 of the Project Agreement.	LA Schedule 6, Para. 14	Complied with.
D.	**Particular Covenants**		
1.	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 public utility practices.	LA Article IV Sec. 4.01	Complied with.
2.	The Borrower shall make available to PLN, promptly as needed and on terms and conditions acceptable to ADB, the funds, facilities, services, land and other resources, which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.	LA Article IV Sec. 4.02	Complied with.
3.	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.	LA Article IV Sec. 4.03	Complied with.
4.	The Borrower shall furnish, or cause to be furnished, to the ADB all such reports and information as the ADB shall reasonably request concerning: (i) the Loan, and the expenditure of the proceeds and maintenance of the service thereof; (ii) the goods and services and other items of expenditure financed out of the proceeds of the Loan; (iii) the Project;	LA Article IV Sec. 4.04	Complied with.

Covenant		Reference in Loan Documents	Compliance
	(iv) the administration, operations and financial condition of PLN; (v) financial and economic conditions in the territory of the Borrower and the international balance-of-payments position of the Borrower; and (vi) any other matters relating to the purposes of the Loan.		
5.	The Borrower shall enable the ADB's representatives to inspect the Project, the goods financed out of the proceeds of the Loan, and any relevant records and documents.	LA Article IV Sec. 4.05	Complied with.
6.	The Borrower shall take all action which shall be necessary on its part to enable PLN to perform its obligations under the Project Agreement, including the financial obligations stipulated in Sections 2.16, 2.17, and 2.18 thereof, and shall not take or permit any action which would interfere with the performance of such obligations.	LA Article IV Sec. 4.06	Partly complied with.
7.	(a) 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. (b) No rights or obligations under the Subsidiary Loan Agreement shall be assigned, amended, abrogated or waived without the prior concurrence of ADB.	LA Article IV Sec. 4.07	Complied with.
8.	(a) It is the mutual intention of the Borrower and ADB that no other external debt owed a creditor other than ADB shall have any priority over the Loan by way of a lien on the assets of the Borrower. To that end, the Borrower undertakes (i) that, except as ADB may otherwise agree, if any lien shall be created on any assets of the Borrower as security for any external debt, such lien will ipso facto equally and ratably secure the payment of the principal of, and interest and other charges on, the Loan; and (ii) that the Borrower, in creating or permitting the creation of any such lien, will make express provision to that effect. (b) The provisions of paragraph (a) of this Section shall not apply to (i) any lien created on property, at the time of purchase thereof, solely as security for payment of the purchase price of such property; or (ii) any lien arising in the ordinary course of banking transactions and securing a debt maturing not more than one year after its date. (c) The term "assets of the Borrower" as used in paragraph (a) of this Section includes assets of any administrative subdivision or any agency of the Borrower and assets of any agency of any such administrative subdivision, including Bank Indonesia and any other institution performing the functions of a central bank for the Borrower.	LA Article IV Section 4.08	Complied with.
E.	**The Executing Agency**		
1.	PLN shall carry out the Project with due diligence and efficiency, and in conformity with sound administrative, financial, engineering, environmental and public utility practices.	PA Article II, Sec. 2.01	Complied with.

Covenant		Reference in Loan Documents	Compliance
2.	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 and the operation and maintenance of the Project facilities.	PA Article II Sec. 2.02	Complied with.
3.	(a) 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. (b) Except as ADB may otherwise agree, all goods and services to be financed out of the proceeds of the Loan shall be procured in accordance with the provisions of Schedule 4 of the LA. The ADB shall not finance a contract where goods or services have not been procured under procedures substantially in accordance with those agreed between the Borrower and the ADB or where the terms and conditions of the contract are not satisfactory to the ADB.	PA Article II Sec. 2.03	Complied with.
4.	PLN shall carry out the Project in accordance with plans, design standards, specifications, work schedules and construction methods acceptable to ADB. PLN shall furnish, or cause to be furnished, to ADB, promptly after their preparation, such plans, design standards, specifications and work schedules, and any material modifications subsequently made therein, in such detail, as ADB shall reasonably request.	PA Article II Sec. 2.04	Complied with.
5.	(a) PLN shall take out and maintain with responsible insurers, or make other arrangements satisfactory to ADB for insurance of the project facilities to such extent and against such risks and in such amounts as shall be consistent with sound practice. (b) Without limiting the generality of the foregoing, PLN undertakes to insure, or cause to be insured, the goods to be imported for the Project and to be financed out of the proceeds of the Loan against hazards incident to the acquisition, transportation and delivery thereof to the place of use or installation, and for such insurance any indemnity shall be payable in a currency freely usable to replace or repair such goods.	PA Article II Sec. 2.05	Complied with.
6.	PLN shall maintain, or cause to be maintained, records and accounts adequate to identify the goods and services and other items of expenditure financed out of the proceeds of the Loan, to disclose the use thereof in the Project, to record the progress of the Project (including the cost thereof) and to reflect, in accordance with consistently maintained sound accounting principles, its operations and financial condition.	PA Article II Sec. 2.06	Complied with.
7.	(a) ADB and PLN shall cooperate fully to ensure that the purposes of the Loan will be accomplished. (b) PLN shall promptly inform ADB of any condition which interferes with, or threatens to interfere with, the progress of the Project, the performance of its obligations under this Project Agreement or the Subsidiary Loan Agreement, or the accomplishment of the purposes of the Loan.	PA Article II Sec. 2.07	Complied with.

Covenant		Reference in Loan Documents	Compliance
	(c) 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.		
8.	(a) 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 and services and other items of expenditure 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. (b) 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. (c) Promptly after physical completion of the Project but in any event not later than three 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.	PA Article II Sec. 2.08	Complied with.
10.	(a) PLN shall (i) maintain separate accounts for the Project and for its overall operations; (ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards by auditors 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, all in the English language. PLN shall furnish to ADB such further information concerning such accounts, financial statements, and the audit thereof as ADB shall from time to time reasonably request. (b) In addition to annual audited financial statements referred to in paragraph a) of the Section, PLN shall furnish to ADB, within four (4) months after the end of each fiscal year, unaudited annual financial statements on its operations for such fiscal year, separately showing relevant financial data in respect of its operations in Java and outside Java.	PA Article II Sec. 2.09	Partly complied with delay in submission of audited statements, for Parts A (Tanggari II) and B (Musi) of the Project only.

Covenant		Reference in Loan Documents	Compliance
11.	PLN shall enable the Bank's representatives to inspect the Project, the goods financed out of the proceeds of the Loan, all other plants, sites, works, properties and equipment of PLN, and any relevant records and documents	PA Article II Sec. 2.10	Complied with.
12.	PLN shall (a) 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; (b) at all times conduct its business in accordance with sound administrative, financial, environmental and public utility practices, and under the supervision of competent and experienced management and personnel; (c) at all times operate and maintain its plants, equipment and other property, and from time to time, thereof, all in accordance with sound administrative, financial, engineering, environmental, public utility, and maintenance and operational practices.	PA Article II Sec. 2.11	Complied with.
13.	Except as the Bank 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	PA Article Sec. 2.12	
14.	Except as the Bank 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 and services financed out of such proceeds are used exclusively in the carrying out of the Project.	PA Article Sec. 2.13	
15.	Except as the Bank 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	PA Article Sec. 2.14	
16.	PLN shall promptly notify the Bank of any proposal to amend, suspend or repeal any provision of the Governing Laws and shall afford the Bank an adequate opportunity to comment on such proposal prior to taking any action thereon.	PA Article Sec. 2.15	
17.	PLN shall inform the Bank about any proposed change in its tariff rates sufficiently in advance to allow the Bank an adequate opportunity to comment thereon.	PA Article II Sec. 2.16	
18.	Except as the Bank may otherwise agree, PLN shall not incur any debt, other than for money borrowed for financing the Project, unless as reasonable forecast of the revenues and expenditures of PLN shows that the projected net revenue of PLN for each fiscal year during the term of the debt to be incurred shall be at least 1.5 times the projected debt-service requirement in such year on all of PLN's debt, including the debt to be incurred. For the purposes of this Section:	PA Article Sec. 2.17	

Covenant		Reference in Loan Documents	Compliance
	(i) the term" debt" shall mean any debt maturing by its terms more than one year after the date on which it was originally incurred; (ii) debt shall be deemed to be incurred on the date of execution and delivery of a contract or loan agreement or guarantee agreement providing for such debt; (iii) the term "net revenue" shall mean gross operating revenue from all sources—adjusted to take account of the PLN's tariffs in effect at the time of the incurrence of debt even though they were not in effect during the twelve—month period to which such revenues relate – less all expenses of operation including maintenance and administration (excluding depreciation and other non—cash operating charges), including all tax payments or payments in lieu of taxes but before interest and other charges on debt; (iv) the term "debt-service requirements" shall mean the aggregate amount of amortization (including sinking fund payments, if any), interest and other charges on debt; and (v) the term "reasonable forecast" means a forecast prepared by PLN in the fiscal year in which the debt in question is to be incurred, which both the Bank and PLN accept as reasonable and as to which the Bank has notified PLN of its acceptability, provided that no event has occurred since such notification which has, or may reasonably be expected in the future to have a material adverse effect on the financial condition or future operating results of PLN.		
19.	(a) Except as the Bank may otherwise agree, PLN shall ensure that all necessary measures are taken or caused to be taken, including increases in revenues, as shall be required to generate sufficient revenue as follows: (i) for the island of Java, to maintain an annual rate of return on its net fixed revalued assets in operation of at least 8%; (ii) for the rest of the country, to achieve an annual rate of return on its net fixed revalued assets in operation of not less than 0% starting not later than FY1994/95 and in each fiscal year (b) For the purposes of this Section: (i) the annual rate of return shall be calculated by relating PLN's net operating income for the fiscal year in question to the average of PLN's net fixed revalued assets in operation at the beginning and end of that fiscal year; (ii) the term "net fixed revalued assets in operation" means that gross value of fixed assets in operation" less the amount of accumulated depreciation and consumers' contributions, all as valued from time to time in accordance with a sound and consistently maintained method of valuation satisfactory to the Bank; and (iii) the term "net operating income" means gross revenues from all sources directly related to PLN's operations less all expenses of operation including maintenance and administration, provision for depreciation on the useful life of PLN's fixed assets in operation, any tax payments or payments in lieu of taxes but before interest and other charges on debt. (c) Section 2.18 (a) (ii) of the Project Agreements between PLN and the Bank dated 26 October 1990 (Loan No. 1032-INO, Power XX Project), 2 August 1991 (Loan No. 1092-INO, Power XXI Project), and 10 September 1992 (Loan No. 1172-INO, Power XXII Project) is	PA Article II Sec. 2.18	

Covenant		Reference in Loan Documents	Compliance
	hereby amended to read as provided in paragraph 2.18 (a) (ii) above.		
20.	PLN shall (a) submit to the Bank its annual budgets and any subsequent material amendments thereto immediately after their approval by the Borrower. (b) prepare, in consultation with the Bank during the third quarter of each fiscal year, financial projections for a reasonable period of time.	PA Article II Sec. 2.19	

ADB = Asian Development Bank. EA = executing agency, LA = loan agreement, PA = project agreement, PLN = Perusahaan Listrik Negara (National Power Company)

Sources: ADB Project Completion Report Mission, *PLN Statistics*, 1998–2005.

SUMMARY OF CONTRACTS FINANCED BY THE ASIAN DEVELOPMENT BANK

Contract No. / Category	PCSS No.	Contract Details Description	$ million Equivalent	Mode of Procurement
01A	0007	Part A - Lot 1: Civil Works for Tanggari II HPS	**9.935**	ICB
01B	0017	Part B - Lot I: Civil Works for Musi HPS	**52.692**	ICB
02A		Part A - Equipment	**8.283**	
	0013	Lots II & III: Gate Trashracks; Steel Penstocks	1.551	ICB
	0015	Lots IV & V: Turbine and Generators	5.344	
	0018	Lot VI: Substation Equipment & 70 kV TL	1.388	ICB
02B		Part B - Equipment	**11.756**	
	0020	Lot II: Metal Works	6.864	ICB
	0023	Lot IIIC: Generating Equipment (Transformers and Switchgear)	4.043	ICB
	0027	Lot V: Rainfall and Water Level Telemetering	0.849	ICB
02C		Part C - Equipment	**18.879**	
	0002	Lot 3: 20 kV Switchgear for 150 kV T/L & Substation in South Sumatra * Kampung	1.771	ICB
	0003	Lot 3: Insulator & Hardware Fitting	1.238	ICB
	0004	Lot 2: Conductor & Groundwire for 150 kV T/L	1.895	ICB
	0005	Lot 1: Power Transformers for 150 kV Substation	3.139	ICB
	0008	Lot 1: Steel Towers	2.473	ICB
	0009	Lot 2: 150 kV Switchgear	8.363	ICB
02D		Part D - Equipment	Cancelled	
02E	0019	Part E - Equipment - Utility Communication System	**1.698**	ICB
		Part D - Equipment	**29.791**	
02F	0021	Lot IIIA: Generating Equipment (Turbines and Auxiliary Equipment	15.171	ICB
02G	0022	Lot IIIB: Generating Equipment	14.620	ICB
03A	0006	Part A - Engineering Services for Tanggari II HPS	**5.985**	Consultancy and Extension of Services
03B	0001	Part B - Consulting Services for Musi HPS	**24.676**	DP
03C	0011	Part C - Engineering Services for South Sumatra 150 kV T/L & Substation (150 Dist. Lines)	**1.027**	ICB
03D	0014	Part C - Engineering Services for 275 kV	**1.154**	ICB

Contract No. / Category	PCSS No.	Contract Details Description	$ million Equivalent	Mode of Procurement
		Lubuk - Linggau-Bukit T/L		
03E	0012	Part D - Engineering Services for Diesel Waste Heat Recovery	**0.416**	Consultancy/ ICB
03F	0010	Part E - Engineering Services for Implementation of DSM	**0.413**	Consultancy/ ICB
03G	0016	Part F - Engineering Services for Merangin - 2 HPS	**3.462**	Consultancy/ICB
05		Tsunami Emergency Fund	**5.079**	LCB
	0028		1.036	
	0029		0.205	
	0030		1.436	
	0031		0.565	
	0032		0.050	
	0033		0.123	
	0034		0.398	
	0035		0.029	
	0036		0.000	
	0037		0.042	
	0038		0.086	
	0039		0.528	
	0040		0.581	

DP = direct payment, HPS = hydropower scheme, ICB = international competitive bidding, k/V = kilovolt, LCB = local competitive bidding, PCSS = procurement contract summary sheet, T/L = transmission line.
Note: PCSS Nos. 24 to 26 were cancelled due to wrong inputting.
Source: Asian Development Bank

FINANCIAL ANALYSIS

1. At appraisal, the financial internal rate of return (FIRR) was estimated from the perspective of Perusahaan Listrik Negara (PLN) for each component (except the transmission components of the southern Sumatra system, due to the difficulty of benefit quantification, and the Merangin hydropower component because only the design work was to be financed under the Loan).The analysis was redone here for those components of the Project that were completed, using actual data where available, and based on the following assumptions where such data couldn't be found:

2. The FIRR for the Tanggari II hydropower scheme (HPS) and Musi HPS were studied.

3. 2006 was considered the base year in both cases. The analysis covered the years of implementation plus 20 years of full operation.

4. The actual foreign capital cost components for the FIRR for the HPSs were based on actual payments made by ADB on behalf of PLN. The local cost data for Tanggari II came from PLN. The local cost data for Musi came from data provided in the consultant's project completion report. Tanggari's costs starting in 1995 were brought to the base year of 2006 by inflating the foreign costs by 2% per annum, representing the average international inflation rate over that period, and by inflating the local costs by an average of 10% per annum (an average of inflation rates in Indonesia from 1995 to 2005).

5. On the last year of the project, an additional capital expenditure was added to the last capital cost component, equal to $346 per kilowatt[1] (kW) times the kW net output rating of each plant; this represents the capital cost related to distribution expansion of the PLN system, as a consequence of adding the plant.

6. On the last year of the analysis, a benefit was added in the cost column representing the remaining value of the depreciated facility. A straight-line depreciated value was calculated, assuming a 50-year facility life.

7. In the analysis of the benefits, the actual kWh output component of each plant (where known) was valued at the actual average selling price of electricity as determined from PLN's statistical yearbooks[2] for the particular year of production for each HPS. For years beyond 2006, the running average kWh output of the plant, as determined for the period of actual operation, was used to represent the future benefit of production. These tariffs were deflated by 12% to represent transmission and distribution losses (i.e. no displacement of existing generation was assumed).

8. In the case of Musi HPS, the running average kWh output was based on 11 months of actual operation in the mode of operation in place at the time of the ADB project completion review mission. Refer to paras. 82 and 94 above. In the case of Tanggari II, the running average kWh output was based on 8.25 years of actual operation.

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[1] This figure came from the Report and Recommendation of the President.

[2] PLN. 1998. *PLN Statistics 1998*, Jakarta; PLN. 1999. *PLN Statistics 1999*, Jakarta; PLN. 2000. *PLN Statistics 2000*, Jakarta; PLN. 2001. *PLN Statistics 2001*, Jakarta; PLN. 2002. *PLN Statistics 2002*, Jakarta; PLN. 2003. *PLN Statistics 2003*, Jakarta; PLN. 2004. *PLN Statistics 2004*, Jakarta; PLN. 2005. *PLN Statistics 2005*, Jakarta.

9. An operational and maintenance rate of 1% per annum of final total inflated capital cost was included in the annual costs.

10. Table A9.1 provides details of the FIRR calculations for the Musi HPS investment. The recalculated FIRR is 5.64%. This is considerably lower than the base case FIRR of 16.8% in the appraisal analysis. This significant deviation from the appraisal results is due, in addition to the reasons stated for Tanggari II HPS (see para. 11, below), mainly to the present mode of operation as witnessed by the ADB Project Completion Review Mission (refer to paras. 80, 82 and 94).

11. Table A9.2 provides details of the FIRR calculations for the Tanggari II HPS investment. The recalculated FIRR is 8.35%. This is somewhat lower than the base case FIRR of 10.6% in the appraisal analysis. This deviation from the appraisal results is mainly due to (i) a slightly longer-than-expected implementation phase; (ii) a lower-than-expected production output; and (iii) a higher-than-expected increase in electricity supply costs because of the depreciation of the rupiah and the high share of foreign exchange costs, as well as the inability of PLN to increase tariffs in line with cost increases because of the Asian economic crisis (refer to paras. 80, 84 and 85).

12. The 1997 Asian economic crisis dramatically changed the financial environment in which PLN was operating, and also impacted the Project's financial efficiency. The crisis had the following implications for PLN:

(i) The radical economic changes in Indonesia caused electricity demand to grow at a much lower rate than expected. Devaluation of the rupiah resulted in energy tariffs remaining far below appraisal estimates, despite regular tariff adjustments.
(ii) PLN could not raise tariffs in line with increases input prices.
(iii) In the case of Musi, the crisis caused the project to be placed in a review mode by the Government, which led to a 6-year delay in completion.

11. As a result of these factors, the costs were increased while the benefits were delayed and reduced, which had a negative effect on the FIRRs of these project components.

Table A8.1: Calculation of FIRR on Musi HPS, 1994–2026

Year	Benefits		Costs ($ millions)		Net ($ millions)
	GWh Annual	Sales ($ millions)	Capital	O&M	
1994			5.655		-5.655
1995			21.787		-21.787
1996			14.855		-14.855
1997			10.477		-10.477
1998			8.965		-8.965
1999			11.241		-11.241
2000			9.044		-9.044
2001			15.863		-15.863
2002			16.603		-16.603
2003			49.202		-49.202
2004			10.533		-10.533
2005			28.672		-28.672
2006	307.083	17.611	93.395	2.236	-78.021
2007	483.900	27.751		2.236	25.515
2008	483.900	27.751		2.236	25.515
2009	483.900	27.751		2.236	25.515
2010	483.900	27.751		2.236	25.515
2011	483.900	27.751		2.236	25.515
2012	483.900	27.751		2.236	25.515
2013	483.900	27.751		2.236	25.515
2014	483.900	27.751		2.236	25.515
2015	483.900	27.751		2.236	25.515
2016	483.900	27.751		2.236	25.515
2017	483.900	27.751		2.236	25.515
2018	483.900	27.751		2.236	25.515
2019	483.900	27.751		2.236	25.515
2020	483.900	27.751		2.236	25.515
2021	483.900	27.751		2.236	25.515
2022	483.900	27.751		2.236	25.515
2023	483.900	27.751		2.236	25.515
2024	483.900	27.751		2.236	25.515
2025	483.900	27.751		2.236	25.515
2026	483.900	27.751	(164.520)	2.236	190.035
				FIRR=	5.64%
		O&M (1% of Capital Cost)	2.236	$ millions	

FIRR = financial internal rate of return, GWH = gigawatt hour, HPS = hydropower scheme, O&M = operation and maintenance.

Table A8.2: Calculation of FIRR on Tanggari II HPS, 1995–2019

Year	Benefits		Costs ($ millions)		Net
	GWh Annual	Sales ($ millions)	Capital	O&M	($ millions)
1995			11.223		-11.223
1996			12.873		-12.873
1997			14.375		-14.375
1998	25.956	1.489	1.968		-0.479
1999	91.907	5.271	8.462	0.423	-3.615
2000	115.329	6.614		0.423	6.191
2001	95.168	5.458		0.423	5.035
2002	58.056	3.329		0.423	2.906
2003	61.355	3.519		0.423	3.095
2004	92.416	5.300		0.423	4.877
2005	87.426	5.014		0.423	4.591
2006	82.447	4.728		0.423	4.305
2007	86.068	4.936		0.423	4.513
2008	86.068	4.936		0.423	4.513
2009	86.068	4.936		0.423	4.513
2010	86.068	4.936		0.423	4.513
2011	86.068	4.936		0.423	4.513
2012	86.068	4.936		0.423	4.513
2013	86.068	4.936		0.423	4.513
2014	86.068	4.936		0.423	4.513
2015	86.068	4.936		0.423	4.513
2016	86.068	4.936		0.423	4.513
2017	86.068	4.936		0.423	4.513
2018	86.068	4.936		0.423	4.513
2019	86.068	4.936	-48.754	0.423	53.267
					FIRR = 8.35%
	O&M	(1% of Capital Cost)	0.423	$ millions	

FIRR = financial internal rate of return, GWH = gigawatt hour.