



Technical Assistance Report

Project Number: 41504
August 2008

Papua New Guinea: Preparing the Power Sector Development Project (Financed by the Japan Special Fund)

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 15 July 2008)

Currency Unit	–	kina (K)
K1.00	=	\$0.384
\$1.00	=	K2.600

ABBREVIATIONS

ADB	–	Asian Development Bank
EA	–	executing agency
ED-DPE	–	Energy Division of the Department of Petroleum and Energy
EIA	–	environmental impact assessment
LARP	–	land acquisition and resettlement plan
LNG	–	liquefied natural gas
NGO	–	nongovernment organization
PNG	–	Papua New Guinea
PPL	–	PNG Power Limited
PPTA	–	project preparatory technical assistance
SEL	–	PNG Sustainable Energy Limited
TA	–	technical assistance

WEIGHTS AND MEASURES

GWh	–	gigawatt-hour (1,000,000 kilowatt-hours)
m ³	–	cubic meter
MW	–	megawatt (1,000 kilowatts)

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Energy
Subsector	–	Conventional energy generation (other than hydropower)
Theme	–	Sustainable economic growth
Subtheme	–	Fostering physical infrastructure development

NOTE

In this report, "\$" refers to US dollars.

Vice President	C. Lawrence Greenwood, Jr., Operations 2
Director General	P. Erquiaga, Pacific Department (PARD)
Director	I. Bhushan, Pacific Operations Division (Area B), PARD
Team leader	L. Bodda, Senior Energy Specialist, PARD
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I. INTRODUCTION

1. In Papua New Guinea (PNG), more than 90% of the population (mostly rural dwellers) has no electricity. In urban centers, the power supply is often unreliable. The country's medium term development strategy 2005–2010¹ recognizes energy and power as critical ingredients for development and poverty reduction. The strategy aims to assist the disadvantaged to “lift themselves out of poverty by improving basic services such as water and electricity.” The Government has asked the Asian Development Bank (ADB) to provide project preparatory technical assistance (PPTA) to prepare the Power Sector Development Project.

2. Lending assistance to the country's power sector was included in ADB's country strategy and program 2006–2010 for PNG² and confirmed during the 2007 and 2008 country programming missions. ADB approved the PPTA concept paper in February 2008.³ The ADB Fact-Finding Mission visited PNG in April 2008. An understanding was reached with the Government on the PPTA's purpose, key activities, consultants' terms of reference, cost estimates and financing, and implementation arrangements. The design and monitoring framework is in Appendix 1.

II. ISSUES

A. The Power Sector

3. PNG has significant natural resources, including energy, but the country's formidable geography and the high cost of developing infrastructure have constrained their exploitation. The outcome is a dual economy and society, marked by a few enclaves of industrialization surrounded by widely diffused poverty. The high population growth rate (2.3% per annum) and increasing urbanization have increased difficulties for the country. The challenge is for PNG to use its energy resources to move the country toward more sustainable social and economic development.

4. PNG has substantial deposits of hydrocarbons, mainly natural gas. The recoverable proved and probable natural gas resources are estimated at 428 billion cubic meters (m³), equivalent to about 3 billion barrels of oil.⁴ Planning and design work are proceeding for the production of liquefied natural gas (LNG) for export. The pipeline carrying gas from onshore gas fields to the planned LNG plant may enable the supply of natural gas to domestic users, particularly power generators. The country is rich in renewable energy resources suitable for power production, particularly hydropower. PNG has more than 15,000 megawatts (MW) hydropower potential. Coconut plantations are widely spread throughout PNG and may be a potential source of power as coconut-based bio-diesel becomes a viable option. Other potential energy sources are geothermal, wind, solar and marine. There is no single solution. The geography of PNG calls for articulated power sector optimization based on small, disaggregated markets.

5. Currently, there is no national power grid. The electricity network is located around more populated areas and industrial sites. PNG Power Limited (PPL), the national state-owned power utility, has installed generation capacity of 300 MW (80 MW in Port Moresby). At least another

¹ PNG. 2004. *Medium Term Development Strategy 2005–2010: Our Plan for Economic and Social Advancement*. Port Moresby.

² ADB. 2006. *Country Strategy and Program (2006–2010): Papua New Guinea*. Manila.

³ The TA first appeared in the business opportunities section of ADB's website on 18 April 2008.

⁴ The remaining proved recoverable oil reserves are estimated at 80 million barrels.

280 MW belongs to other entities, most of which is used for self-consumption. Of the country's total 580 MW generating capacity, hydropower comprises 220 MW. A combination of light and heavy oil-fired diesel units comprises 60 MW to supply Port Moresby. A 62 MW gas plant and 54 MW geothermal plant each supply isolated mines. The remaining 184 MW generating capacity uses light diesel fuel, mainly in isolated centers scattered through the country.

6. PPL supplies power to Port Moresby and 26 other urban centers through 19 independent power systems. In 2005, it supplied 629 gigawatt-hours (GWh)—316 GWh in Port Moresby—to 73,500 customers. However, many generating stations require overhaul and maintenance. Of the 300 MW installed capacity, about 250 MW are capable of producing power. Energy system losses equal about 20% of energy input to the system. They continue to rise over time from about 13% in the late 1990s because of outdated transmission and distribution lines, and inadequate substation plants.

7. PPL used to be the sole generator, transmitter, and distributor of electricity in the country. In 1999, an independent power producer, Hanjung Power Ltd., negotiated an agreement with PPL for the production and sale of power to the grid within a 15-year build-operate-transfer arrangement. The Energy Division of the Department of Petroleum and Energy (ED-DPE) is responsible for the rural electrification program. The provincial governments have responsibility for maintaining the Government's stand-alone rural generation facilities (C-Centers), although most of these centers have fallen into poor condition and disuse since their inception. There are several other power suppliers. Churches and missions provide electricity to nearby areas while some mine, industrial, and agricultural enclaves supply free electricity to nearby villages. PPL has an ongoing program of extending the urban grids to sell electricity to rural communities close to urban centers. A new private commercial operator, PNG Sustainable Energy Limited (SEL)⁵ is also actively entering the sector. The World Bank is assisting SEL with a solar lantern project for teachers, and it is discussing possible assistance to finance mini-hydropower schemes in rural areas.

B. The Power Sector Development Plan

8. In 2007, ADB approved the Power Sector Development Plan advisory technical assistance (TA).⁶ The scope of this assistance includes (i) review of the draft sector policy framework; and (ii) based on this framework, prepare the power demand forecast and least-cost supply development plan, and an action-oriented and monitorable power sector operational program. The main findings of this TA are expected in December 2008 (draft final report) and the final report by March 2009.

9. Three policy drafts have been circulated and widely discussed within the Government and concerned stakeholders: the draft Energy Policy, the draft Electricity Industry Policy and the draft Rural Electrification Policy. The draft Electricity Industry Policy is the most advanced and closest to being adopted. It provides exclusive service areas for PPL, though it allows for third party producers in the form of feed-in and for use of facilities. It allows for free entry of private sector producers to serve large customers with loads of 10 MW or more and also third party investment in generation, retailing and network activities in areas outside current PPL exclusive areas, which include rural areas. The framework uses a standard pricing in the shape of

⁵ SEL is a joint venture (50–50) between PNG Sustainable Development Program Limited (PNGSDP) and Snowy Mountain Engineering Company (SMEC), Australia.

⁶ ADB. 2007. *Technical Assistance to Papua New Guinea for the Power Sector Development Plan*. Manila (TA 4932, approved on 25 May, for \$630,000).

national single tariff and envisages an Electricity Trust Fund to finance subsidies for rural areas.

10. Three main issues are still debated among stakeholders: subsidies and the country-wide uniform tariff; the PPL exclusivity provision; and third party access. In particular, the price cap (average cost) uniform tariff allows PPL cross-subsidies from urban to rural and from large commercial/industrial to residential customers. The cross subsidies and the proposed Electricity Trust Fund for more remote areas are seen as necessary to maintain the affordability of electricity access in high cost areas. However, subsidies represent a financial burden and, in some instances, might not be necessary. SEL is running commercially sustainable mini-grids in the Western Province charging a tariff that is twice that of PPL.

11. The demand for electricity has been estimated for all districts in PNG and for the three grids: Port Moresby, Ramu and Gazelle. Demand is forecasted to grow in the next 20 years from 616.4 GWh to 4,916.8 GWh. The forecast assumes the supply⁷ of the presently unmet demand and that, at the end of the 20-year period, about 25% of the population in PNG will have access to electricity.⁸

12. With current peak demands of 80 MW and 60 MW respectively, the Port Moresby and Ramu systems will require the most capital investment. The sector development strategy for Port Moresby includes (i) the replacement of the old diesel generation units with new plants capable of burning heavy fuel oil and convertible to gas; as well as (ii) in the event of the LNG project materializing, negotiations of terms for the off-take of gas from the gas pipeline to Port Moresby; and (iii) as an alternative to LNG, the development of hydropower potential in the Angabanga, Vanapa and Brown River Basins.⁹

13. It is worth noting that the LNG development requires large amount of power, mainly for chilling purposes. This requirement could be in the hundreds of MW and would be powered by pipeline gas. One avenue to explore with gas-fired generation is the possibility of the LNG producer acting as an independent power producer, where it would supply the Port Moresby grid, at limited incremental cost above its own requirements.

14. For the Ramu system, further development will likely be driven by new industrial mega-projects, such as Wafi and Yandera.¹⁰ Supply will be enhanced with the development of the Ramu 2 hydropower plant (120 MW), with most of this output (around 90 MW) destined for the Ramu Nickel mine. Possible interconnection between the Port Moresby and the Ramu systems will be explored in the event of sufficient surplus hydropower on the Ramu system.

15. The power sector development plan will create the foundation of a power sector development project to increase the availability of reliable and sustainable power supply at reasonable cost. The investment(s) to be financed under the power sector development project may include LNG-based and/or priority hydropower facilities, the relative transmission line to the town grid, and power distribution enhancement and rehabilitation.

⁷ For example, the peak load of the Port Moresby system is close to 80 MW, although it is estimated that there is another 10 MW or so "suppressed demand".

⁸ For the residential consumers, the demand has been estimated by adopting an *end-use* approach based on prototypes of urban and rural households along six steps of the energy ladder. From step 1, where the household uses primitive energy sources such as wood for lighting and cooking to step 6, where it uses modern clean energy such as electricity and gas.

⁹ Hydropower and gas-based power production have comparable costs. However, hydropower has higher cost uncertainties and longer lead-time requirements.

¹⁰ The Wafi and Yandera mines combined demand is expected to be in the 300 MW range.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

16. The PPTA impact will be increased availability of reliable and sustainable power supply at reasonable cost. The PPTA outcome will be a power sector development project design agreed between the Government of PNG and ADB. The PPTA outputs will include the (i) updated least-cost power sector development plan, (ii) preliminary design and costing of prioritized core subprojects, (iii) financial and economic analysis of the power sector development plan and its core subprojects, (iv) environmental and social safeguards due diligence of the core subprojects,¹¹ (v) climate-proofing analysis, (vi) recommendations for power sector governance framework, and (vii) public consultations and an awareness campaign.

B. Methodology and Key Activities

17. Building on the findings and recommendations of the advisory TA on a Power Sector Development Plan, a detailed study of the power sector structure, financial restructuring, poverty reduction, private sector participation, and investment planning will be undertaken. Advice on policy matters and stakeholder participation will be provided throughout PPTA implementation. The PPTA activities will include (i) assisting the Government to finalize the power demand development plan, including load forecast and least-cost supply solution; (ii) explore ways to expand private sector participation in the power sector; (iii) prepare the feasibility studies of prioritized core subprojects, including procurement packages and bid documents; (iv) secure safeguards' capacity development and assist preparation of the social and environmental safeguards; (v) undertake stakeholders consultation and capacity development; and (vi) conduct awareness campaign and dissemination of results.

18. To ensure compliance with ADB's safeguard policies on the environment, involuntary resettlement, and indigenous people, the PPTA will review the existing work and the Government's procedures and, if required, conduct supplementary detailed field surveys for core subprojects, including access roads. To analyze the way in which the envisaged project is linked to poverty reduction, a poverty analysis will be undertaken using data collected from field consultations. Particular attention will be paid to the affordability of up-front connection charges and monthly bills. Indicators for benefits monitoring will also be prepared. Appendix 2 provides the summary initial poverty and social analysis.

19. Since individual subprojects—which could not yield benefits if considered singly—are part of the power sector expansion program, a time-slice approach will be used in the economic and financial analysis of the project. A distribution analysis will be conducted to assess the distribution and net benefits and cross-subsidies among key stakeholders. Risks and the effects of various delays in commissioning of generation plants on financial and economic results will be analyzed.

C. Cost and Financing

20. The total cost of the PPTA is \$1,500,000 equivalent. The Government has asked ADB to finance \$1,200,000. The PPTA will be financed on a grant basis by the Japan Special Fund, funded by the Government of Japan. The Government of PNG will contribute

¹¹ If the due diligence indicates that involuntary resettlement may be involved, the PPTA may need to prepare a short resettlement plan for the core subprojects and a resettlement framework for the project.

\$300,000 equivalent to finance counterpart staff, office accommodation, communication, local transport, and consultations and awareness facilitation. The detailed cost estimates and financing plan are in Appendix 3. The Government has been informed that approval of the PPTA does not commit ADB to finance any ensuing project.

D. Implementation Arrangements

21. ED-DPE will be the Executing Agency (EA) of the PPTA. The EA will facilitate the collection of all available relevant information. It will provide office space and counterpart staff, including a project manager with qualifications acceptable to ADB on terms of reference prepared by the EA and reviewed by ADB. The director of ED-DPE will provide overall guidance to the project. It is proposed that a steering committee be chaired by the Department of National Planning and Monitoring and could include representatives of ED-DPE; Department of Treasury, of Works Environment and Conservation, and of Provincial and Local Government Affairs; PPL; SEL; private sector representatives; nongovernment organizations; and users. The committee will provide overall supervision and help to ensure adequate cooperation from local government bodies, governments, and nongovernment organizations active in the power sector, as well as users and beneficiaries. The Consultative Implementation and Monitoring Council might be considered for the role of secretariat to the steering committee.

22. ADB will engage about 26 person-months of international and 26 person-months of national consulting services. A consulting firm will be recruited through the quality- and cost-based selection method based on the submission of full technical proposals and in accordance with ADB's *Guidelines on the Use of Consultants* (2007, as amended from time to time).¹² The quality-cost weighting ratio will be 80:20. Procurement of equipment and software will be carried out in accordance with ADB's *Procurement Guidelines* (2007, as amended from time to time) and will be handed over to the EA upon completion of the PPTA. The detailed terms of reference for the consultants are in Appendix 4.

23. The PPTA will be implemented over 20 months, with services to be rendered on an intermittent basis. It is expected to begin in October 2008 and be completed by June 2010. Within 6 weeks after commencement of the PPTA, the consultants will submit a brief inception report summarizing their findings, identifying specific issues, and suggesting changes to the methodology and program, if any. Within 10 months after commencement of the PPTA, the consultants will submit the midterm report. A draft final report will be submitted within 18 months after PPTA commencement. A tripartite meeting among the EA, ADB, and consultants will be conducted to discuss the draft final report and any changes to be made. The consultant will submit three copies, in electronic and hard copies, of all reports to ADB, the Government, and the EA.

IV. THE PRESIDENT'S DECISION

24. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of \$1,200,000 on a grant basis to the Government of Papua New Guinea for preparing the Power Sector Development Project, and hereby reports this action to the Board.

¹² The international consulting firm will administer the training, seminars and conferences, maps and surveys, and miscellaneous and administration and support costs.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and/or Indicators	Data Sources and/or Reporting Mechanisms	Assumptions and Risks
<p>Impact Increased availability of reliable and sustainable power supply at reasonable cost</p>	<p>Share of households with power supply increases from 7% to 12% within 8 years</p> <p>Share of electricity produced by oil products decreases from 45% to 35% within 6 years</p> <p>Power demand supplied with least-cost solutions</p>	<p>PNG country economic and power sector statistics</p> <p>PNG national budget</p> <p>ADB country consultations</p>	<p>Assumption</p> <ul style="list-style-type: none"> • Donors' financial assistance and the Government's commitment to the power sector is maintained <p>Risk</p> <ul style="list-style-type: none"> • Poor understanding of the power sector development plan and flawed policy adoption
<p>Outcome A power sector development project design agreed between the Government and ADB</p>	<p>Draft final report submitted to the Government and ADB and other agencies by January 2010</p> <p>Memorandum of understanding agreed by ADB and the Government for further processing of the loan and associated TA by March 2010</p>	<p>PPTA draft final report</p> <p>Government and steering committee assessment</p> <p>ADB final review mission</p> <p>Feedback from stakeholders, including donors</p>	<p>Assumption</p> <ul style="list-style-type: none"> • Recommended actions accepted and endorsed by the Government and other stakeholders <p>Risk</p> <ul style="list-style-type: none"> • Insufficient public debate and/or support for the PPTA recommendations
<p>Outputs</p> <ol style="list-style-type: none"> 1. Updated least-cost power sector development plan 2. Preliminary design and costing of prioritized core subprojects 3. Financial and economic analysis of the power sector development plan and its core subprojects 4. Environmental and social (indigenous people and involuntary resettlement) safeguards due diligence of the core subprojects 	<p>Consultant reports acceptable to the Government and ADB:</p> <ul style="list-style-type: none"> • Inception report with (i) first findings, (ii) detailed work program, and (iii) short-term consulting services required by month 1.5 • Midterm report including review/assessment of (i) power sector expansion plan; (ii) legislation, regulation, and procedure framework; and (iii) stakeholders' diagnosis and binding constraints analysis by month 6 	<p>Consultant reports</p> <p>TA progress reports</p> <p>Tripartite meeting</p> <p>Power sector development plan</p> <p>Pre-feasibility studies of prioritized projects</p> <p>Stakeholders' workshop</p>	<p>Assumptions</p> <ul style="list-style-type: none"> • Stakeholders' interest and engagement is sustained • Power sector development plan is discussed widely • Appropriate counterpart staff and resources are assigned <p>Risks</p> <ul style="list-style-type: none"> • Private sector and civil society not engaged in PPTA implementation • Limited availability of adequate human and financial resources • Poor understanding of sector development concepts

Design Summary	Performance Targets and/or Indicators	Data Sources and/or Reporting Mechanisms	Assumptions and Risks
<p>5. Climate-proofing analysis</p> <p>6. Preparation of bid documents for core subprojects</p> <p>7. Recommendations for power sector governance framework</p> <p>8. Public consultations and awareness campaign</p>	<ul style="list-style-type: none"> • Draft final report including three to five core subprojects— (i) prefeasibility studies, (ii) economic and financial analysis, and (iii) environmental and social safeguard due diligence by month 12 • Final report including (i) findings and recommendations, (ii) dissemination tools, and (iii) draft feasibility study for development bank financing by month 15 		
<p>Activities with Milestones</p> <ol style="list-style-type: none"> 1. Power sector development plan update/refinement (by month 3) <ol style="list-style-type: none"> 1.1 Review of the development plan and other existing studies 1.2 An 8–10 year load forecast and investment plan 1.3 Institutional arrangements 2. Feasibility study preparation (by month 9) <ol style="list-style-type: none"> 2.1 Technical design of prioritized core subprojects 2.2 Economic analysis and financial due diligence 2.3 Procurement packaging and preparation of bidding documents 3. Social Safeguards (by month 12) <ol style="list-style-type: none"> 3.1 Social and gender analysis 3.2 Resettlement framework 3.3 Compliance with social safeguards 4. Environmental Analysis (by month 12) <ol style="list-style-type: none"> 4.1 Compliance with environmental safeguards 4.2 Climate-proofing analysis 4.3 Clean energy financing facilities/mechanisms eligibility screening 5. Capacity Building (continuous) <ol style="list-style-type: none"> 5.1 Capacity development and on-the-job training 5.2 Assessment of the outcome 6. Results Dissemination (by month 15) <ol style="list-style-type: none"> 6.1 Stakeholders' awareness and buy-in 6.2 Results dissemination 		<p>Inputs</p> <ul style="list-style-type: none"> • About 26 person-months of international and 26 person-months of national consulting services • ADB (Japan Special Fund) financing of \$1,200,000 • Government contribution of \$300,000 equivalent • Counterpart facilities 	

ADB = Asian Development Bank, PNG = Papua New Guinea, PPTA = project preparatory technical assistance, TA = technical assistance.

INITIAL POVERTY AND SOCIAL ANALYSIS

Country/Project Title:	Papua New Guinea/Power Sector Development Project		
Lending/Financing Modality:	Sector/Multitranche Financing Facility	Department/Division:	Pacific Department/ Pacific Operations Division (Area B)

I. POVERTY ISSUES

A. Linkages to the National Poverty Reduction Strategy and Country Partnership Strategy

In Papua New Guinea (PNG), more than 90% of the population (mostly rural dwellers) has no electricity. In urban centers, the power supply is often unreliable. The country's medium term development strategy 2005–2010 recognizes energy and power as critical ingredients for development and poverty reduction. It aims to assist the disadvantaged to "lift themselves out of poverty by improving basic services such as water and electricity."

PNG has significant natural resources, including energy reserves, but the country's formidable geography and the high cost of developing infrastructure have constrained their exploitation. The challenge is for PNG to use its energy resources to help reverse a negative spiral and to move the country toward more sustainable social and economic development. This vision is articulated in the national energy policy, which aims "to diligently promote and facilitate the development of the energy sector in order to ensure the availability, reliability, affordability and efficient use of energy. Therefore, social development occurs by utilizing energy for economic activity, through an environment sound manner."^a

B. Targeting Classification

1. Select the targeting classification of the project:

General Intervention Individual or Household (TI-H); Geographic (TI-G); Non-Income MDGs (TI-M1, M2, etc.)

2. Explain the basis for the targeting classification:

Limited power supply affordability, availability, and reliability are a strain for the economy as well as the quality of life of the people. The project aims to address these limitations by providing more reliable power supply in the country, and it will contribute to PNG's general economic growth—essential to support poverty reduction in the country. Improving the delivery of clean water and electricity was identified as a major priority of the poor.

C. Poverty Analysis

1. If the project is classified as TI-H, or if it is policy-based, what type of poverty impact analysis is needed?

2. What resources are allocated in the project preparatory technical assistance (PPTA)/due diligence?

No PPTA resources are specifically allocated to poverty analysis. However, the terms of reference require such analysis by the team leader to help guide the design of subprojects.

3. If GI, is there any opportunity for pro-poor design (e.g., social inclusion subcomponents, cross subsidy, pro-poor governance, and pro-poor growth)?

The ultimate impact of the project—to increase the affordability, availability, and reliability of power—is pro-poor. Key components of the project are the discussion/identification of the willingness/ability of the poor to pay for power, eventual cross-subsidies, and access to power supply services.

II. SOCIAL DEVELOPMENT ISSUES

A. Initial Social Analysis

Based on existing information:

1. Who are the potential primary beneficiaries of the project? How do the poor and the socially excluded benefit from the project?

Energy consumers in the commercial, industrial and domestic (including poor households) sectors are the primary direct beneficiaries of the project. The poor will also benefit indirectly from the countries' improved trade balance and fiscal position, which result from improved power supply efficiency because more foreign exchange and public resources will become available and could be spent on social services.

2. What are the potential needs of beneficiaries in relation to the proposed project?

To be identified.

What are the potential constraints in accessing the proposed benefits and services, and how will the project address them? To be identified.

B. Consultation and Participation

1. Indicate the potential initial stakeholders.
 Commercial, industrial, government, and domestic power consumers, in both urban and rural areas; government planning departments and other government stakeholder ministries; power producers; the private sector; and nongovernment organizations (NGOs).

2. What type of consultation and participation (C&P) is required during the PPTA or project processing (e.g., workshops, community mobilization, involvement of NGOs and community-based organizations, etc.)?
 The PPTA will include capacity development and stakeholders' public consultations and workshops, ensuring full participation of women and vulnerable groups at all stages of the PPTA.

At the country level, the project will be implemented through a project steering committee that will represent all key stakeholder groups. Workshops and meetings will be held under the auspices of the steering committee to ensure that awareness and project information (and opportunity for feedback) is widely disseminated.

3. What level of participation is envisaged for project design?
 Information sharing Consultation Collaborative decision making Empowerment

4. Will a C&P plan be prepared? Yes No Please explain.
 The PPTA includes a strategy for improvement of public awareness and education. The C&P will be considered in the subsequent Asian Development Bank (ADB)/Global Environment Facility (GEF) project.

C. Gender and Development

1. What are the key gender issues in the sector/subsector that are likely to be relevant to this project/program?
 Gender issues are not prominent in this project, except among domestic energy consumers of which the majority (in terms of energy consumed) are women. More available and reliable power can benefit women, as they will free up household budgets for increased expenditure on non-energy household services.

2. Does the proposed project/program have the potential to promote gender equality and/or women's empowerment by improving women's access to and use of opportunities, services, resources, assets, and participation in decision making? Yes No Please explain.
 At the residential level, women (who are chiefly responsible for energy consumption in households) will have a leading role. To the extent that the residential sector will be provided with more reliable power, women will be empowered by having a better service and quality of life.

3. Could the proposed project have an adverse impact on women and/or girls or to widen gender inequality?
 Yes No Please explain
 Improved power supply will have no impact or a slightly positive impact on women and girls, and will have no effect on gender inequality.

III. SOCIAL SAFEGUARD ISSUES AND OTHER SOCIAL RISKS

Issue	Nature of Social Issue	Significant/Limited/ No Impact/Not Known	Plan or Other Action Required
Involuntary Resettlement		The project is not expected to have a significant involuntary resettlement impact. However, it could have some impact, contingent to the subprojects selected.	<input type="checkbox"/> Full Plan <input checked="" type="checkbox"/> Short Plan <input checked="" type="checkbox"/> Resettlement Framework <input type="checkbox"/> No Action <input type="checkbox"/> Uncertain
Indigenous Peoples		The project is not expected to have a significant impact on indigenous people. However, it could have some impact, contingent to the subprojects selected. If required, specific actions favorable to IP will be included in the resettlement framework.	<input type="checkbox"/> Plan <input checked="" type="checkbox"/> Other Action <input type="checkbox"/> Indigenous Peoples Framework <input type="checkbox"/> No Action <input type="checkbox"/> Uncertain

Issue	Nature of Social Issue	Significant/Limited/ No Impact/Not Known	Plan or Other Action Required
Labor <input checked="" type="checkbox"/> Employment Opportunities <input type="checkbox"/> Labor Retrenchment <input type="checkbox"/> Core Labor Standards		Positive Impact	<input type="checkbox"/> Plan <input type="checkbox"/> Other Action <input type="checkbox"/> No Action <input type="checkbox"/> Uncertain
Affordability		Positive Impact The impact will be assessed as part of the social and poverty assessment.	<input type="checkbox"/> Action <input type="checkbox"/> No Action <input type="checkbox"/> Uncertain
Other Risks and/or Vulnerabilities <input checked="" type="checkbox"/> HIV/AIDS <input checked="" type="checkbox"/> Human Trafficking <input type="checkbox"/> Others (conflict, political instability, etc.), please specify		The project is not expected to have a HIV/AIDS or human trafficking risk and/or vulnerability. However, it could have some risk, contingent to the location and subprojects selected.	<input type="checkbox"/> Plan <input type="checkbox"/> Other Action <input type="checkbox"/> No Action <input checked="" type="checkbox"/> Uncertain
IV. PPTA/DUE DILIGENCE RESOURCE REQUIREMENT			
<p>1. Do the TOR for the PPTA (or other due diligence) include poverty, social and gender analysis and the relevant specialist/s? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If no, please explain why.</p> <p>None are needed as the project has an inherent pro-poor impact and there are no significant gender issues.</p> <p>2. Are resources (consultants, survey budget, and workshop) allocated for conducting poverty, social and/or gender analysis, and C&P during the PPTA/due diligence? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If no, please explain why.</p> <p>None are needed (see above). Financial resources for the C&P will be eventually made available during project implementation in consideration of the subprojects to be developed.</p>			

^a National Energy Policy and Rural Electrification Policy Workshop. Papua New Guinea, 21–26 August 2005.

COST ESTIMATES AND FINANCING PLAN
(\$'000)

Item	Total Cost
A. Asian Development Bank Financing^a	
1. Consultants	
a. Remuneration and Per Diem	
i. International Consultants	600.0
ii. National Consultants	130.0
b. International and Local Travel	90.0
c. Reports and Communications	20.0
2. Equipment ^b	10.0
3. Training, Seminars, and Conferences	
a. Facilitators	30.0
b. Training Program	30.0
4. Maps and Surveys	70.0
5. Miscellaneous Administration and Support Costs	30.0
6. Representative for Contract Negotiations	10.0
7. Contingencies	180.0
Subtotal (A)	1,200.0
B. Government Financing	
1. Office Accommodation and Transport	100.0
2. Remuneration and Per Diem of Counterpart Staff	150.0
3. Contingencies	50.0
Subtotal (B)	300.0
Total	1,500.0

^a Financed by the Japan Special Fund, funded by the Government of Japan.

^b One personal computer, one printer/copier/fax/scanner, software, and supplies.

Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

A. Terms of Reference for the Consultants

1. The consultants shall ensure that all works and outputs under the project preparatory technical assistance (PPTA) are fully compliant with all relevant Asian Development Bank (ADB) policies and guidelines. The consultants' work should include, but not be limited to, the following:

1. **Power Sector Specialist/Team Leader** (international, 9 person-months)
 - (i) Prepare the detailed work program and implementation schedule for the PPTA, and coordinate the work of the consultants on the team.
 - (ii) Review available studies relating to the power sector in Papua New Guinea (PNG). Undertake the optimization of hydropower resources. Prepare a summary of the current status of resources and the energy sector requirements.
 - (iii) Assess the current efficiency and availability of existing power plants and suggest ways to improve them.
 - (iv) In coordination with the technical assistance (TA) for Policies for Private Sector Development,¹ explore the possibility of private sector participation in the power sector.
 - (v) Carry out least-cost generation expansion planning of the power system up to 2020; discuss the assumptions, methodology, and completeness of data used; and present an analysis of the results. Verify and confirm the least-cost plan with full assessment of all alternatives, and provide full economic and technical justification for the projects in the plan in relation to other alternatives.
 - (vi) Prepare the project design. Recommend pro-poor components of the power sector expansion.
 - (vii) Assess the project cost estimates, including unit costs and estimates of quantities for project components, identification of local and foreign cost components, and physical and price contingencies. Determine the financing requirements of the plan, identify options for cofinancing, and evaluate the possibility of private sector participation.
 - (viii) Identify cofinancing opportunities on renewable energy and energy efficiency components by the Global Environment Facility, clean development mechanism, and other funding sources.
 - (ix) Identify the goods to be procured and civil works to be undertaken, and prepare indicative procurement packages for the ensuing projects in the plan.
 - (x) Draft bid documents for the procurement of the core subprojects and associated components. Prepare a preliminary procurement plan in accordance with ADB *Procurement Guidelines* (2007, as amended from time to time).
 - (xi) Evaluate the adequacy of the government policy and regulatory framework, and identify measures ADB could take to facilitate participation.
 - (xii) Prepare the project implementation schedule, a Gantt chart showing the schedule, and a procurement schedule. Assess the plan's technical risks and carry out sensitivity analysis to check project viability under these risks. Prepare terms of reference, expertise requirements, and person-month and cost estimates for implementation consulting services.

¹ ADB. 2007. *Technical Assistance to Papua New Guinea for the Power Sector Development Plan*. Manila (TA 4932, approved on 25 May, for \$630,000).

- (xiii) Prepare terms of reference and outline a feasible implementation schedule for consultant inputs required to implement the core subprojects and the power sector expansion plan.
- (xiv) Prepare the project design and monitoring framework and undertake any reasonable requests made by ADB in association with the PPTA.

2. Economic and Financial Analyst (international, 3 person-months)

- (i) Provide macro and sector information, including energy production and consumption by sectors, energy efficiency, and electricity production and consumption by sectors (current and historical).
- (ii) Assess the short-term (3 years) and long-term (system planning period) demand forecasts for different consumer categories. Provide detailed discussion on the assumptions and methodology used in the demand forecast. Analyze system hourly load curves, and monthly peak load and demand curves; and present the existing power supply/shortage situation in the country. List all operational thermal and other types of power plants, indicating age, unit size, installed capacity, and energy generation; and indicate the location of these power plants on a map.
- (iii) Analyze economic parameters and present the model for least-cost generation expansion. Provide quantitative and qualitative project benefits. Carry out economic analysis including: (a) power demand, (b) least-cost and equalizing discount rate, (c) economic viability, and (d) risk analysis. Discuss alternative methodologies for carrying out the economic analysis and justify the method(s) chosen.
- (iv) Provide a table detailing the conversion of economic cost from financial cost of the project and the specific conversion factors used. Incorporate an economic quantification of environmental impact caused by the project.
- (v) Prepare a financing plan for the investment subprojects, including proposed ADB lending, any prospective cofinancing, and counterpart funds for local currency expenditures.
- (vi) Discuss the assumptions and parameters used in the economic analysis, including consumers' willingness to pay and resource cost savings in relation to alternative options; compare the shadow prices with those in similar projects and discuss justification for shadow prices. Identify and analyze economic uncertainties and carry out a risk analysis.
- (vii) Identify risks and undertake risk and sensitivity analysis with respect to the economic internal rate of return in accordance with ADB's *Handbook for Integrating Risk Analysis in the Economic Analysis of Projects*.²
- (viii) Review the accounting and financial records of PNG Power Limited (PPL). Present PPL's capacity addition and investment program for the next 10 years; present the financing plan for this proposed investment program; examine the financial feasibility of this plan. Determine the financial viability of the project and each of its components.
- (ix) Assess the methodology for determining the tariff for power supply of the project, and review the adequacy of this tariff compared with the economic costs and financial targets. Assess the impact of the existing tariff structure/levels on energy conservation, efficient use of power system facilities, and private sector

² ADB. 2002. *Handbook for Integrating Risk Analysis in the Economic Analysis of Projects*. Manila.

participation. Evaluate the economic impact of the tariff increase required for cost recovery and the affordability of different users.

- (x) Conduct financial management assessment and prepare a governance risk assessment and a risk assessment plan in accordance with ADB's second Governance and Anticorruption Action Plan (GACAP II) implementation guidelines³ covering the requirements to design fund flow mechanism and identify ADB disbursement procedure, based on the project needs and executing agency (EA) capacity to manage funds and disbursement.

3. Social Impact Expert (international, 4 person-months)

- (i) Organize surveys in the project area, and consult with relevant officials from the Government and other organizations to supplement available secondary data. During phase 1, prepare an initial poverty and social analysis in accordance with ADB's *Handbook on Social Analysis and Poverty Handbook*.⁴ In phase 2, prepare a poverty profile of the project area and project impact area. Clearly define the poverty line and the poverty incidence. Assess the capacity to pay of the poor and the pro-poor impact of the project in line with ADB's poverty reduction strategy, taking into account rural electrification and other linkage effects. Provide a detailed discussion of the potential impacts on the economy in the project area, particularly on the poor. Identify ways to make the project pro-poor.
- (ii) In coordination with the economist, estimate power price elasticity for inputs and outputs, and for consumers. Based on the project economic analysis, estimate the expected distribution of project net benefits among electricity consumers, power utilities, labor, the Government, the economy in general, and where appropriate, lenders. Estimate the number of poor people who will benefit from the project. Estimate the willingness/ability to pay of the consumer, and proportion of net benefits going to the poor, and calculate the poverty impact ratio in accordance with ADB guidelines. Conduct risk analysis for key variables used in calculating the ratio, and explain the implications. Summarize the poverty reduction effects of the project. Identify any complementary activities that would enhance the poverty reduction effects of the project, including (a) poverty-related measures considered at project design and implementation stage, and (b) strategy used to enhance participation of the poor in project design and implementation.
- (iii) In consultation with local nongovernment organizations, identify the different project stakeholders; examine their existing rights and possible risks. Help the Government build public acceptance of the project. Conduct a capacity assessment, either through strengths/weaknesses opportunities/threats (SWOT) analysis or other means. Assist an informed, participatory assessment of the nature and extent of the ownership and demand of the proposed project.
- (iv) Assist capacity development on social (indigenous people and involuntary resettlement) safeguards. Prepare an initial social assessment, including land acquisition effects and any potential adverse effects. Prepare a social analysis in accordance with ADB guidelines; and an analysis of indigenous peoples impacts (including preparation of an indigenous peoples development plan, if required)

³ ADB. 2008. *Guidelines for Implementing Asian Development Bank's Second Governance and Anticorruption Action Plan*. Manila.

⁴ ADB. 2007. *Handbook on Social Analysis, A Working Document*. Manila; and ADB. 2006. *Poverty Handbook: Analysis and Processes to Support ADB Operations, A Working Document*. Manila.

and socioeconomic monitoring and management plans to be implemented. The social analysis, recommendations on changes in design to incorporate social dimensions, analysis of minority nationality impacts, and socioeconomic monitoring plans should be specified as separate outputs.

- (v) Review the adequacy of PNG's land acquisition and resettlement plan (LARP), if any, in accordance with ADB's *Involuntary Resettlement Policy* (1995) and guided by ADB's *Handbook on Resettlement*.⁵ If needed, prepare a LARP including a baseline for monitoring and evaluating incomes and living standards, and for developing rehabilitation strategies. The LARP will include eligibility criteria, compensation rates for assets lost, specific measures for the poor and vulnerable, time frame showing how those affected will be compensated, and a monitoring and evaluation plan.

4. Environmental Impact Expert (international, 3 person-months)

- (i) Identify key environmental issues and assist the EA to prepare the initial environmental examination, or an environmental impact assessment (EIA), if warranted, of the prioritized core subprojects following ADB's format prescribed in the environmental assessment requirements and environmental review procedures under the *Environmental Assessment Guidelines* (2003)⁶ and other relevant ADB guidelines. The EIA should include a study of the conditions, trends, and protection of the watershed. Submit the draft summary for review and incorporate any subsequent comments in completing the summary.
- (ii) Based on the review, provide the EA with specific and detailed recommendations for revisions and/or additional studies, if needed, to make the EIA conform to ADB requirements. Assess the impact of soil erosion and sediment on the proposed hydropower plants.
- (iii) Prepare a summary EIA. Assess other options for power generation and meeting the energy demand; compare their environmental and social sustainability. Review the environmental management capability of the Government and recommend institutional strengthening measures.
- (iv) Assess climate-related risks under the project, and identify a range of adaptation options that may be considered. In coordination with the Government and the EA and in consultation with the main stakeholders, incorporate adaptation to climate change into the project design, including costing of the adaptation measures, in line with the recommendations of ADB's *Climate Proofing: A Risk-based Approach to Adaptation*.⁷

5. Short-Term Consultants (international, 7 person-months)

2. Short-term international consultants, identified during PPTA implementation, will be engaged to assist the team leader and ADB staff. The specific skill requirements will be identified during PPTA implementation (possibly in the inception phase). The consultants will mainly act as technical support for the team leader in implementing the PPTA. The development plan involves an extremely broad area of expertise. The additional expertise required can cover social (indigenous people and involuntary resettlement) safeguard and environmental analysis,

⁵ ADB. 1998. *Handbook on Resettlement: A Guide to Good Practice*. Manila.

⁶ ADB. 2003. *Environmental Assessment Guidelines*. Manila.

⁷ ADB. 2005. *Climate Proofing: A Risk-based Approach to Adaptation*. Manila.

hydropower capacity and transmission and distribution optimization, bid document preparation, and private sector participation in power generation.

- 6. Social Analysis/Community Development Expert(s)** (national, 26 person-months)
- (i) Assist the organization of gender-disaggregated surveys in the project area or project impact areas, and consult with relevant officials from the Government and other organizations to supplement available secondary data. Assist the preparation of a poverty profile of the project area and project impact area. Assess the capacity to pay of the poor and the pro-poor impact of the project in line with ADB's poverty reduction strategy, taking into account rural electrification and other linkage effects. Provide a detailed discussion of the potential impacts on the economy in the project area, particularly on the poor. Identify ways to make the project pro-poor.
 - (ii) Ensure gender-sensitive public consultations and awareness campaign to secure that gender and other social concerns are addressed and that women will also benefit from the project in accordance with ADB's *Handbook on Social Analysis and Poverty Handbook* (footnote 4).
 - (iii) Facilitate the public acceptance of the project. Assist the preparation of an initial social assessment, including land acquisition effects and any potential adverse effects. Prepare a social analysis in accordance with ADB guidelines and an analysis of indigenous people's impacts and socioeconomic monitoring and management plans to be implemented by the Government.
 - (iv) If the investment projects are likely to involve significant resettlement, prepare a resettlement plan with full participation of stakeholders. Prepare a short resettlement plan if the resettlement aspects of the investment subprojects are classified nonsignificant, a summary resettlement plan, and an indigenous people development plan, if required.
 - (v) Facilitate an awareness campaign and capacity development, and conduct stakeholder workshops, ensuring full participation of women and vulnerable groups at all stages of the PPTA.

B. Reporting Requirements

3. The following reports will be prepared by the consultants and submitted simultaneously to the Government and ADB:

- (i) An inception report 4 weeks from the commencement of services, detailing initial findings and recommendations for the future direction of the PPTA.
- (ii) Brief monthly reports summarizing the progress of work, major findings, and notation of problem areas such as lack of data and other impediments that could hamper the PPTA.
- (iii) A midterm report including the power sector investment program and detailed analysis for the components proposed for ADB financing, and similar reports for projects to be financed by other development partners. The analysis will include the following: (a) road map and investment program, (b) design and monitoring framework, (c) implementation framework, and (d) subproject selection criteria if the multitranche financing facility or sector project modalities are proposed.
- (iv) A draft final report, incorporating the findings of the PPTA and containing a comprehensive proposal and institutional formation plan based on the

recommendations of the consultants consistent with the ADB country strategy and program for PNG⁸ following the format of a report and recommendation of the President with appendixes.

- (v) A final report, based on the draft final report, incorporating the comments and views received on the draft.

⁸ ADB. 2006. *Country Strategy and Program (2006–2010): Papua New Guinea*. Manila.