



# Report and Recommendation of the President to the Board of Directors

---

Project Number: 40553  
September 2009

## Proposed Loan and Administration of Grants Nepal: Energy Access and Efficiency Improvement Project

## CURRENCY EQUIVALENTS

(as of 1 August 2009)

Currency Unit – Nepalese rupee/s (NRe/NRs)

NRe1.00 = \$0.0125

\$1.00 = NRs80.0

## ABBREVIATIONS

ADB	–	Asian Development Bank
ADF	–	Asian Development Fund
CFL	–	compact fluorescent lamp
CIDA	–	Canadian International Development Agency
CO <sub>2</sub>	–	carbon dioxide
Danida	–	Danish International Development Agency
DFID	–	Department for International Development of the United Kingdom
DOED	–	Department of Electricity Development
DSM	–	demand-side management
EIRR	–	economic internal rate of return
ETFC	–	Electricity Tariff Fixation Commission
EU	–	European Union
FIRR	–	financial internal rate of return
GTZ	–	Deutsche Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
IEE	–	initial environmental examination
IPP	–	independent power producer
JBIC	–	Japan Bank for International Cooperation
JICA	–	Japan International Cooperation Agency
KfW	–	Kreditanstalt für Wiederaufbau (Credit Institute for Reconstruction)
LED	–	light emitting diode
NEA	–	Nepal Electricity Authority
NORAD	–	Norwegian Agency for Development Cooperation
PPP	–	public–private partnership
TA	–	technical assistance
UNDP	–	United Nations Development Programme
USAID	–	United States Agency for International Development
WACC	–	weighted average cost of capital

## WEIGHTS AND MEASURES

GWh	–	gigawatt-hour (1,000 megawatt-hours)
kV	–	kilovolt (1,000 volts)
kW	–	kilowatt (1,000 watts)
kWh	–	kilowatt-hour
MVA	–	megavolt-ampere (1,000,000 volt-amperes)
MVA <sub>r</sub>	–	megavolt-ampere reactive
MW	–	megawatt (1,000 kilowatts)
MWh	–	megawatt-hour
VA	–	volt-ampere
W	–	watt

## NOTES

- (i) The fiscal year (FY) of the Government and its agencies ends on 15 July. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2009 ends on 15 July 2009.
- (ii) In this report, "\$" refers to US dollars.

<b>Vice-President</b>	X. Zhao, Operations 1
<b>Director General</b>	K. Senga, South Asia Department (SARD)
<b>Director</b>	T. Kandiah, Energy Division, SARD
<b>Team leader</b>	P. Wijayatunga, Energy Specialist, SARD
<b>Team members</b>	J. Acharya, Climate Change Specialist, Regional and Sustainable Development Department
	I. Caetani, Social Development Specialist, SARD
	K. Mulqueeny, Senior Counsel, Office of the General Counsel
	M.S. Parwez, Program/Project Implementation Officer, SARD
	J. Peththawadu, Project Implementation Officer, SARD
	S. Sasaki, Environment Specialist, SARD
	K. Takebayashi, Energy Specialist, SARD

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.



## CONTENTS

	<b>Page</b>
LOAN AND PROJECT SUMMARY	i
I. THE PROPOSAL	1
II. RATIONALE: SECTOR PERFORMANCE, PROBLEMS, AND OPPORTUNITIES	1
A. Background, Performance Indicators, and Analysis	1
B. Analysis of Key Problems and Opportunities	1
III. THE PROPOSED PROJECT	5
A. Impact and Outcome	5
B. Outputs	5
C. Special Features	7
D. Project Investment Plan	7
E. Financing Plan	8
F. Implementation Arrangements	9
IV. CAPACITY DEVELOPMENT	12
V. PROJECT BENEFITS, IMPACTS, ASSUMPTIONS, AND RISKS	13
A. Project Financial and Economic Justification	13
B. Social and Poverty Analysis	14
C. Environmental Aspects	15
D. Benefits and Beneficiaries	16
E. Assumptions and Risks	16
VI. ASSURANCES AND CONDITIONS	17
A. Specific Assurances	17
B. Conditions for Loan Effectiveness	20
C. Condition for Loan Withdrawal	20
VII. RECOMMENDATION	20
APPENDIXES	
1. Design and Monitoring Framework	21
2. Power Sector Assessment	24
3. External Assistance to the Power Sector	28
4. Detailed Cost Estimates	30
5. Project Implementation Schedule	33
6. Procurement Plan	35
7. Nepal Electricity Authority Financial Performance	40
8. Financial Analysis	43
9. Economic Analysis	46
10. Description of Energy Efficiency in Lighting Component	51
11. Description of Renewable Energy for Street Lighting Component	54
12. Summary Poverty Reduction and Social Strategy	57

SUPPLEMENTARY APPENDIXES (available on request)

- A. Nepal Electricity Authority Past Financial Performance
- B. Nepal Electricity Authority Financial Projections
- C. Nepal Electricity Authority Financial Management Assessment
- D. Detailed Economic Analysis
- E. Procurement Capacity Assessment
- F. Social Safeguard Documents:
  - (i) Full Resettlement Plan
  - (ii) Detailed Socioeconomic Analysis
- G. Environmental Safeguard Documents
- H. Outline Terms of Reference for Consultants
- I. Summary Resettlement Plan
- J. Implementation Chart
- K. Project Readiness Schedule

## LOAN AND PROJECT SUMMARY

<b>Borrower</b>	Nepal
<b>Classification</b>	<p>Targeting classification: General intervention</p> <p>Sector (subsectors): Energy (electricity transmission and distribution, energy efficiency and conservation, renewable energy)</p> <p>Theme (subtheme): <b>Economic growth</b> (promoting economic efficiency and enabling business environment), environmental sustainability (natural resources conservation), regional cooperation (crossborder infrastructure), capacity development (institutional development)</p> <p>Location impact: National (high), regional (medium)</p> <p>Partnerships: Climate Change Fund, Clean Energy Fund under the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility</p>
<b>Environment Assessment</b>	<p>Category B. The Government of Nepal has undertaken initial environmental examinations and developed an environmental management plan. The summary initial environmental examination is in Supplementary Appendix G.</p>
<b>Project Description</b>	<p>The Project consists of seven components under three main categories: (i) energy access, (ii) clean energy, and (iii) capacity building.</p> <p><b>Energy Access</b></p> <p>Component 1: Facilitating Access to Clean Energy. Component 1 consists of (i) constructing the Middle Marsyangdi–Damauli–Marsyangdi transmission line and associated facilities to strengthen the evacuation of power from the 70 megawatt (MW) Marsyangdi hydropower station, (ii) constructing the second circuit of the Butwal–Kohalpur transmission line to improve cross-border power import capacity, and (iii) constructing and expanding the Chapali and Matatirtha grid substations and installation of capacitor banks to strengthen the capability of the transmission network to transfer power.</p> <p>Component 2: Energy Access Quality Enhancement. Component 2 consists of constructing eight primary distribution substations and three switching stations to strengthen the electricity system’s ability to connect new consumers and to improve the quality of electricity supply to existing consumers.</p> <p><b>Clean Energy</b></p> <p>Component 3: Clean Energy Plant Improvement. Component 3 involves rehabilitating two small-scale run-of-river hydropower plants at Marsyangdi (69 MW) and Gandak (15 MW) to increase the efficiency.</p>

Component 4: Supply-Side Energy Efficiency Improvement. Component 4 will develop a pilot project to rebuild selected distribution feeders and low-voltage networks which have unacceptably high losses, using international best practice to reduce both technical and commercial losses.

Component 5: Energy Efficiency in Lighting. Component 5 involves distributing approximately 1 million compact fluorescent lamps to households and implementation support to improve energy efficiency in lighting.

Component 6. Renewable Energy for Street Lighting. Component 6 consists of the installation of 1,000 solar and solar-wind streetlights in Bhaktapur, Kathmandu, and Lalitpur municipal areas to reduce the burden on the main electricity grid.

### **Capacity Building**

Component 7: Component 7 involves assisting the Nepal Electricity Authority (NEA) by providing expert services to formulate, design, and implement public–private partnerships (PPPs) in three identified distribution areas, and capacity building and implementation support to the NEA for component 4.

## **Rationale**

Years of underinvestment in Nepal's electricity generation, transmission, and distribution facilities have led to chronic supply shortages and network bottlenecks. As a consequence, the quality and reliability of supply provided to end consumers is one of the poorest in South Asia. Electricity supply is characterized by frequent unscheduled interruptions and long periods of scheduled supply outages. The power sector in Nepal presents a severe infrastructure constraint on economic growth.

The Government's policies and actions on power sector development are set out in policy documents such as the Hydropower Development Policy 2001, the National Water Resources Strategy 2002, and the 10th Five-Year Plan (2002–2007). The latest policy document is the Interim Plan of 2008–2010. The main strategies contained in the Interim Plan include, among other things, (i) promoting good governance and effective service delivery, and (ii) increasing investment in physical infrastructure including electricity. The targets set for the sector in the long-term (up to 2027) are (i) generation of 4,000 MW of power to meet domestic demand; (ii) expansion of electricity services to ensure coverage of 75% of the population through the national grid, 20% through isolated small and micro-hydropower systems, and 5% through other alternative energy sources; and (iii) increasing per capita annual electricity consumption to 400 kilowatt-hours (kWh). Further, existing legislative provisions and laws are to be modified to support establishing the Nepal Electricity Regulation Commission and restructuring the NEA to create an environment more conducive to sector development.



The Government has progressed on the Interim Plan to improve sector governance. First, as an interim measure, the Electricity Tariff Fixation Commission, which was established in 1994 and has recently been inactive, has been reactivated as the economic regulator. The legislation to establish an independent regulator and restructuring of the NEA is at an advanced stage. Second, the NEA already has an internal structure separating generation, transmission, distribution, electrification, and other functional units which facilitates efficient management and effective regulation of the NEA by the economic regulator. Making these divisions into independent business units with their own balance sheets will be important for effective regulation. Third, in 2009, the Cabinet appointed a high-level task force to provide recommendations on the financial restructuring of the NEA. Finalizing and implementing the financial restructuring plan will be an important factor in ensuring NEA financial sustainability.

The proposed loan and grants will directly address the urgent needs attributed to the electricity supply crisis in Nepal, through rehabilitation of two hydropower plants, supply-side energy efficiency, and demand-side management. The transmission network strengthening will also add supply capacity by increasing evacuation of power from hydropower stations in the western region and allow increased energy imports across the western border in the short term.

In the medium term, the transmission network strengthening will allow cross-border energy exports, while distribution strengthening will facilitate additional consumer connections and increased energy efficiency. PPPs in distribution will help the NEA to pilot private sector involvement in improving distribution efficiency.

These project interventions will also lead to improved financial performance of the NEA and sustainability of the sector through increased revenues, reduced losses, and improved efficiency.

### **Impact and Outcome**

The impact of the Project will be increased access to electricity across Nepal.

The outcome will be a reliable and energy efficient power supply with increased access and operational efficiency in the project areas.

### **Project Investment Plan**

The investment cost of the Project is estimated at \$93.7 million, including taxes and duties of \$2.0 million.

**Financing Plan****Project Financing Plan**

(\$ million)

<b>Source</b>	<b>Amount</b>	<b>%</b>
ADB (ADF Loan) <sup>a</sup>	65.0	69.0
CCF <sup>b</sup>	0.3	0.3
CEF <sup>c</sup>	4.2	4.7
<b>Subtotal</b>	<b>69.5</b>	<b>74.0</b>
Government /NEA	24.2	26.0
<b>Total Cost</b>	<b>93.7</b>	<b>100.0</b>

ADB = Asian Development Bank, ADF = Asian Development Fund, CCF = Climate Change Fund, CEF = Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility, NEA = Nepal Electricity Authority.

<sup>a</sup> For components 1–4 and 7.

<sup>b</sup> For component 5.

<sup>c</sup> For component 6.

Sources: Nepal Electricity Authority and ADB estimates.

A loan in various currencies equivalent to Special Drawing Rights 41,127,000 (\$65 million equivalent) from ADB's Special Funds resources will be provided to finance components 1, 2, 3, 4, and 7 with an interest charge at the rate of 1.0% per annum during the grace period and 1.5% per annum thereafter; a term of 32 years, including a grace period of 8 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements.

Grants of \$4,500,000 will be provided, comprising \$300,000 from the Climate Change Fund to finance component 5 and \$4,200,000 from the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility to finance component 6, both to be administered by ADB.

**Allocation and Relending Terms**

The Government will make the loan and grant proceeds available to the NEA and will cause the proceeds to be applied to the financing of subproject expenditures through separate, subsidiary loan and grant agreements, the terms of which will be acceptable to ADB.

**Period of Utilization**

The Asian Development Fund loan will be utilized up to 31 March 2015. The grants from the Climate Change Fund and the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility will be utilized up to 31 March 2013.

**Estimated Project Completion Date**

Asian Development Fund loan components: 30 Sept 2014  
Grant components: 30 Sept 2012

**Executing Agency**

Nepal Electricity Authority

**Implementation Arrangements**

The NEA will be responsible for implementation of all project components. A project management unit will be set up with responsibility for day-to-day coordination, monitoring, and reporting on project implementation.

**Procurement**

All procurement to be financed under the ADB grant will be carried out in accordance with ADB's *Procurement Guidelines* (2007, as amended from time to time).

International competitive bidding procedures will be used for all the components, except one contract package under component 3 (clean energy plant improvement) and the single package under component 5 (energy efficiency in lighting).

Under component 3, direct contracting will be adopted for procurement of a generator excitation system which will be procured from the original supplier on a turnkey basis. The generator excitation system has a powerful impact on generator dynamic performance and availability, and accordingly ensures quality of generator voltage and reactive power. Only the equipment manufactured by the original supplier and/or manufacturer will be compatible with and maintain the functional guarantees of the original plant. National competitive bidding will be used for selection of the compact fluorescent lamp supplier under component 5. Shopping procedures will be used for the procurement of standard specification goods in component 5 with estimated costs of less than \$50,000.

Advance contracting for procurement of equipment and civil works and recruitment of consultants has been approved for all components of the project, subject to these being in accordance with ADB's *Procurement Guidelines* and *Guidelines on the Use of Consultants* (2007, as amended from time to time) and safeguard policies. The NEA has been informed that approval of advance contracting does not commit ADB to finance the project.

**Consulting Services**

Capacity building consulting services in component 7 will be required to provide the NEA with support for project implementation works, including design, supervision of construction, and management for component 4, and design and implementation of PPPs in distribution.

The Climate Change Fund will finance national and international consultancy services for implementation support under component 5. Under component 6, the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility will finance national consultancy services for implementation support, supervision, monitoring, and capacity building.

The NEA will select and engage consultants in accordance with ADB's *Guidelines on the Use of Consultants*. For component 4, individual experts will be recruited based on biodata submitted in specific terms of reference for assignments.

**Project Benefits and Beneficiaries**

Benefits will flow from the incremental electricity consumption, increased reliability of electricity supply, and resource cost savings. These benefits will be made possible by (i) increased capacity to efficiently and reliably evacuate power from transmission (132 kilovolt [kV]) and distribution (33 kV) substations to serve existing and forecast demand, (ii) reduced technical and non technical losses at transmission and distribution levels, (iii) increased capacity for cross-border power trade, (iv) efficient management, and (v) increased efficiency of electricity end use.

The Project will improve access to an estimated 20,000 additional households by strengthening the distribution network. It will improve the supply reliability to about 1.5 million of all existing consumers with increased power import capacity, additional generation capability, efficient management, energy efficiency, and demand management.

The demand-side management components of the project will result in the reduction of an estimated 15,000–20,000 tons (t) of carbon dioxide (CO<sub>2</sub>) emissions annually. Human safety—particularly of women and children using the main streets in Bhaktapur, Kathmandu, and Lalitpur will also improve due to better street lighting.

**Risks and Assumptions**

There is an overall risk to the Project from a potential deterioration of the political situation with possible changes in government and prolonged and disruptive political transition. This could impede project implementation and the pace of the proposed institutional and policy reforms in the sector. However, given the critical importance of improving power supply and the efficiency of the power sector in the face of the acute power shortages the country has been facing, the proposed project activities and reform actions should be high on any incoming government's agenda. Also, given the nature of the proposed reforms (financial restructuring of the NEA, strengthening the regulatory authority, and internally separating the NEA's operations) and project activities (expanding transmission and distribution lines, improving energy efficiency, and developing renewable energy), political disturbances such as those being experienced currently are unlikely to have any major adverse implications for effective and timely implementation. However, the fragile political situation and weak governance situation does pose a risk to procurement activities under the Project. Special efforts to closely monitor the project and procurement activities along with regular and intensive policy dialogue on the proposed reform actions will help to mitigate these potential risks.

The other risks specific to the Project are (i) delayed project implementation, (ii) inadequate capacity to implement the Project, (iii) failure to resolve safeguard issues in a timely manner, and (iv)

the impact of external macroeconomic and financial cost factors and revenue projections on the viability of the Project.

Adequate measures have been taken to ensure a high level of project readiness through training of executing agency staff and the approval of advance contracting. Potential safeguard issues have been mitigated through preparation and early implementation of environmental management plans and resettlement plans. The sensitivity analyses carried out in relation to the economic and financial analysis indicate that the rates of return are robust.

ADB is preparing a capacity development technical assistance project for the Government and the NEA to strengthen their capacity in power system planning, regulation, best practices in rural electrification, and materials management. ADB support will also be provided for the Government to finalize the NEA financial restructuring plan in the form of consultancy services to the Cabinet-appointed committee through the ongoing small-scale project preparatory technical assistance.



## I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on (i) a proposed loan, and (ii) proposed administration of grants to be provided by the Climate Change Fund<sup>1</sup> and the Multi-Donor Clean Energy Fund<sup>2</sup> under the Clean Energy Financing Partnership Facility to Nepal for the Energy Access and Efficiency Improvement Project. The design and monitoring framework is in Appendix 1.

## II. RATIONALE: SECTOR PERFORMANCE, PROBLEMS, AND OPPORTUNITIES

### A. Background, Performance Indicators, and Analysis

2. The power sector in Nepal, with its vast hydropower potential, could be expected to contribute to the country's economic development in a significant way. Instead, the years of underinvestment in electricity generation, transmission, and distribution facilities have led to chronic supply shortages and network bottlenecks. The quality and reliability of supply provided to end-consumers are among the poorest in South Asia. An analysis of these issues is provided in Appendix 2.

3. The total installed generation capacity of Nepal was 615 megawatts (MW) at the end of 2008 and the Nepal Electricity Authority (NEA) owned 75% of it. The transmission network, which is almost totally owned and operated by the NEA, has 1,900 kilometers (km) of 132 kilovolt (kV) and 66 kV lines. The grid electrification rate is 33% of households, and 98% of these 1.5 million electricity consumers are served by the NEA. The private sector is responsible for 25% of installed generation capacity; a private sector distribution company and community organizations serve about 2% of consumers.

### B. Analysis of Key Problems and Opportunities

#### 1. Infrastructure

4. Nepal's electricity generation mix is dominated by run-of-river and daily storage hydropower plants, which represent around 80% of total installed capacity. The dominance of these plants has led to periods of acute capacity and energy shortages during the dry season. In FY2008, an estimated 430 gigawatt-hours (GWh) equivalent of planned power interruptions were carried out. The transmission infrastructure is in moderate condition and related energy losses are estimated at around 6%. While timely commissioning of certain new transmission lines is critical to maintaining system stability, inadequate transmission capacity is hampering further private investment in power generation. Several independent power producers (IPPs) have been unable to undertake new power development initiatives because of the difficulties in power evacuation. The grid electricity coverage in the country is limited to only 33% of households. Technical and commercial losses in the distribution networks have been high for many years due to underinvestment.

#### 2. Financial Sustainability of the Sector

5. In recent years the NEA's financial performance has been poor, due to energy costs and operating expenses increasing faster than revenues. It has only been able to meet cash

---

<sup>1</sup> Administered by the Asian Development Bank (ADB).

<sup>2</sup> Contributors to the fund are the governments of Australia, Norway, Spain, and Sweden; the fund is administered by ADB.

operating expenses and maintain ongoing capital investment by deferring payment of interest during construction, debt service, and royalty payments. Thus, the NEA's finances require substantive restructuring, principally by converting some Government loans to equity, reducing Government lending rates on loans, and utilizing royalties paid to the Government to partly cover the NEA's rural electrification losses. The Government is examining the restructuring options for the NEA, and has given a firm commitment that action will be taken. The World Bank has already provided capacity development technical assistance (TA) to strengthen the financial management system of the NEA with necessary support for hardware, software, and related training.

6. The financial performance of the sector can also be improved by full exploitation of hydropower potential and related investment in transmission and distribution networks which will increase revenue. Creating an effective regulatory environment by developing capacity and operational independence within the Electricity Tariff Fixation Commission (ETFC) and Department of Electricity Development (DOED) will substantially contribute to increased performance in the sector through consumer tariffs which reflect costs. The investments in loss reduction and efficiency improvements through demand- and supply-side management will also enhance sector performance by reducing the cost of supply. The Asian Development Bank (ADB) has been providing assistance to implement these measures through its technical and investment support, including this proposed Project.

### **3. Private Sector Participation**

7. Nepal's first official hydropower policy in 1992, which was followed by the Electricity Act 1992, provided a provisional legal and policy basis for private participation in the power sector. Soon IPPs began setting up and operating small power plants. The build-own-operate-transfer modality laid out in the Hydropower Policy 1992 still provides the framework for public-private partnerships (PPPs) in generation, transmission, and distribution. Of the total installed generation capacity of 617 MW, 17 IPPs contribute 156 MW. The NEA has signed power purchase agreements with 22 additional IPPs totaling 68 MW of capacity, which is under construction. In the transmission subsector, 107 km of transmission lines are privately owned. In addition to one large privately owned electricity distribution company supplying 23,000 consumers, there are many community-managed distribution schemes scattered across the country.

8. To increase private sector participation in generation, ADB initiated the ongoing TA on PPPs in hydropower development.<sup>3</sup> This TA has three main objectives: (i) providing recommendations for an enabling framework for private sector participation, (ii) assisting and advising the bidding process, and (iii) capacity building in the licensing authority—the DOED.

### **4. Government Policies and Sector Road Map**

9. In July 2007 the National Planning Commission released the 3-year interim plan covering 2008–2010, identifying the major development interventions in Nepal. The long-term vision for the power sector is the utilization of water resources to meet domestic power demand and the export of surplus power to increase the country's foreign exchange earnings. The targets set for the sector in the long-term (up to 2027) are (i) generating 4,000 MW of power to meet domestic demand; (ii) expanding electricity services to ensure coverage of 75% of the population through the national grid, 20% through isolated small and micro-hydropower

---

<sup>3</sup> ADB. 2007. *Technical Assistance to Nepal for Promoting Private Sector Participation in the Power Sector*. Manila.



systems, and 5% through other alternative energy sources; and (iii) increasing per capita annual electricity consumption to 400 kWh.

10. Some of the key strategies adopted to achieve these targets are (i) introducing effective regulation of generation, transmission, and distribution of electricity and related businesses; (ii) adopting a one-stop-shop approach to encourage investments in hydropower development to allow investors to obtain all approvals from a single agency; (iii) consistent efforts in the expansion of electricity generation potential; (iv) expanding transmission capacity, targeting both local consumption and export potential; and (v) strengthening and expanding the electricity distribution system.

11. Existing legislation is being modified to support establishing the Nepal Electricity Regulation Commission and restructuring the NEA and other sector participants for efficient sector operation. Electricity tariffs will be rationalized, taking into account the cost of supply and the need to ensure lifeline tariffs or other measures to protect the poor. The transmission system will be strengthened to ensure effective transmission of new hydropower-derived electricity to demand centers. Electricity losses will be minimized. Consumers' interests will be protected by ensuring that electricity services are of adequate quality and are dependable and easily accessible. Appropriate pricing signals will be sent to consumers to encourage efficient electricity consumption.

## 5. Policy Dialogue

12. **Effective Regulatory Intervention.** The ETFC has not given approval to the NEA to revise consumer electricity tariffs since 2001, and hence tariffs have declined by around 40% in real terms. Presently, the NEA's average cost of supply is greater than the average consumer tariff, which seriously affects its ability to invest in and maintain its assets. This issue, among others, highlights the need for effective regulation in the power sector. ADB has ongoing dialogue with the Government on the new electricity act, which provides for the establishment of an independent electricity regulator, and on the interim arrangement for the ETFC to function as the economic regulator. ADB will provide TA support for capacity building in the ETFC and in the new regulatory agency. The TA will also help the NEA to respond to regulatory requirements.

13. **System Loss Reduction.** Energy losses in the NEA's transmission and distribution networks are significant. Systemwide losses are approximately 25% of generation. Inadequate attention to regular maintenance in low-voltage distribution networks, overextension of medium voltage and low-voltage lines, and pilferage contribute to the high loss levels. ADB's dialogue with the Government on system losses focuses on (i) the need for independent regulation to enforce realistic loss reduction targets for the NEA, and (ii) the need to design and maintain medium voltage and low-voltage networks so that technical and commercial losses are minimized.

14. **Hydropower Development.** Despite the large hydropower potential, Nepal experiences major generation capacity constraints. This potential can be harnessed to at least satisfy the local demand by establishing small and medium-sized plants by removing barriers to their development. ADB has ongoing TA to provide recommendations to overcome these barriers. These include creating an enabling framework for private sector participation and developing related capacity within the licensing authority. ADB will have policy dialogue with the Government to implement those recommendations.

## 6. ADB's Power Sector Strategy for Nepal

15. ADB's power sector strategy in Nepal is aligned with Nepal's Three Year Interim Plan (2008–2010)<sup>4</sup>. Further, it is based on all four pillars of ADB's country partnership strategy for 2010–2014<sup>5</sup>: (i) broad-based and inclusive high economic growth, (ii) inclusive social development, (iii) governance and state strengthening, and (iv) climate change and environment sustainability. ADB's assistance for the power sector in Nepal will have six main priorities: (i) improving access to electricity, (ii) increased energy efficiency, (iii) clean power development, (iv) regional cooperation, (v) strengthening sector governance, and (vi) promoting private sector participation.

## 7. Lessons Learned

16. In the past, the efficiency and sustainability of ADB-funded projects<sup>6</sup> were affected by the political instability leading to lack of policy, institutional reforms, and capacity constraints in the power sector. With the improved political environment, ADB has been assisting to address these issues through its TA. The proposed project and the proposed capacity development TA also provide assistance in this regard. The past ADB-financed power projects suffered implementation delays due to failures in meeting loan effectiveness conditions and slow recruitment of consultants and procurement. Once the contracts were awarded, implementation generally proceeded smoothly, except for one project component that encountered difficulties in acquiring land for a substation and obtains agreement on the compensation for the transmission line right of way. The lessons learned have been considered in the design and preparation of the proposed project to avoid implementation delays. A procurement capacity assessment of the NEA (as the executing agency) was conducted, and on-the-job training provided during due diligence to ensure the early preparation of consultants recruitment documentation and bid documents. The proposed project components are now at a high level of readiness for implementation, and advance contracting has been approved. Environmental management and resettlement plans have been prepared and the sites for project components and routing of transmission lines have been designed to avoid densely populated and ecologically sensitive areas to minimize environmental and involuntary resettlement problems. Impractical and unrealistic loan effectiveness conditions, in terms of actions and time frame, have been avoided.

## 8. External Assistance

17. The power sector in Nepal has received assistance from various international development partners. In addition to ADB being a major development partner in the power sector, the Japan Bank for International Cooperation (JBIC) and the World Bank have been major sources of external funding to the sector, focusing on sector reforms, strengthening of financial management systems, generation, rehabilitation and improvement of generation facilities, and development of renewable energy resources. In addition, bilateral donors including Kreditanstalt für Wiederaufbau (Credit Institute for Reconstruction [KfW]), United States Agency for International Development (USAID), Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Danish International Development Agency, and Norwegian Agency for Development Cooperation have been active in the power sector. Further, the European Union, Kuwait Fund for Arab Economic Development, Saudi Fund for Development, United Nations Development Programme, Canadian International Development Agency, Department for

<sup>4</sup> National Planning Commission, Nepal. 2008. *Three Year Interim Plan*. Kathmandu

<sup>5</sup> ADB. 2009. *Country Partnership Strategy Nepal 2010–2014*. Manila

<sup>6</sup> ADB. 2009. *Evaluation Study: Nepal Delivering Assistance in a Challenging Environment*. Manila

International Development of the United Kingdom, Finnish Department for International Development, Government of France, and Japan International Cooperation Agency have all provided TA to the power sector. A description of external assistance to the Nepal power sector in the past is given in Appendix 3.

## 9. Rationale for the Project

18. The proposed loan will address urgent needs in the Nepal power sector by providing immediate relief to the supply crisis in Nepal directly through rehabilitation of two hydropower plants, supply-side energy efficiency, and demand-side management (DSM). The component on transmission network strengthening will assist increased evacuation of power from hydropower stations in the western region and increased cross-border energy imports in the short term. In the medium term, the transmission network strengthening will allow cross-border energy exports while distribution strengthening will facilitate additional consumer connections and increased energy efficiency. PPPs in distribution will help the NEA to pilot private sector involvement in improving distribution efficiency. These project interventions will lead to improved financial performance of the NEA and sustainability of the sector

## III. THE PROPOSED PROJECT

### A. Impact and Outcome

19. The impact of the Project will be increased access to clean electricity across the country. The Project will address major infrastructure barriers to improved access by investments in the transmission system, generation rehabilitation, distribution system, and efficiency in supply and demand which will increase supply capacity and operational efficiency.

20. The Project's outcome will be reliable and energy efficient power supply with increased access and operational efficiency in the project areas.

### B. Outputs

21. The ADB loan will support investments under seven main components each consisting of one or more subprojects. The proposed new transmission and distribution components form part of the least-cost network expansion plans of the NEA planning process based on the national demand forecast produced by the NEA. The proposed generation rehabilitation component forms part of the optimal generation rehabilitation plans of the NEA. Best practice design standards and construction techniques—including adaptations to counter climate change incidents, e.g., flood and extreme weather—will be applied to all investments.

(i) **Component 1: Facilitation of access to clean energy.** This component will include the following subprojects:

(a) **Middle Marsyangdi–Marsyangdi, Dumre–Damauli 132 kV transmission line and related substation works.** This subproject involves construction of the transmission line and the related substation that will improve the security of power evacuation from the newly constructed 70 MW Middle Marshyangdi hydropower station, and will provide general reinforcement through the Damauli substation.

(b) **Butwal–Kohalpur 132 kV transmission line.** This 200 km line section is part of the 400 km Mahendranagar–Butwal transmission line. This subproject involves stringing a transmission line along the second circuit

of the existing 132 kV line built on double circuit towers. Upgrading of the entire Mahendranagar–Butwal transmission line could increase cross-border trade by up to 100 MW.

- (c) **Construction of Chapali substation.** This subproject involves construction of the Chapali grid substation, extending the Lainchaur substation, and laying an underground cable between Lainchaur and Chabel required to strengthen the transmission capability in the central region.
  - (d) **Expansion of Matatirtha substation.** The western part of the Kathmandu valley is relatively well served with 132 kV transformer capacity. However, the area experiences poor power supply due to the load imposed upon, and the length of, 11kV feeders, resulting in frequent feeder tripping and high losses. This subproject will reduce the average 11 kV feeder length by converting the Matatirtha 132 kV switching station into a full 132 kV substation.
  - (e) **Installation of capacitor banks.** This subproject involves installation of approximately 220 megavolt-ampere reactive (MVAR<sup>7</sup>) capacitor banks for reactive power compensation at eight transmission substations, improving the voltage profile of the transmission network.
- (ii) **Component 2: Energy access quality enhancement.** This component consists of constructing eight new 33/11 kV, 6/8 MVA primary distribution substations and three new 11 kV switching stations to strengthen the electric system's ability to connect new consumers and to enhance the quality of electricity supply to existing consumers. These new substations will reduce the incidence of scheduled and unscheduled power supply interruptions, reduce distribution system losses, and improve power supply quality.
  - (iii) **Component 3: Clean energy plant improvement.** This component involves rehabilitating two run-of-river hydropower plants at Marsyangdi (69 MW) and Gandak (15 MW) to increase the efficiency of their electricity generation and reduce self-consumption of electricity. As a result, an estimated additional 4 gigawatt-hours (GWh) of energy will be supplied each year to the power system.
  - (iv) **Component 4: Supply-side energy efficiency improvement.** This component will develop a pilot project to rebuild selected distribution feeders and low-voltage networks with unacceptably high losses, using international best practice for design, construction, and commercial operation, to reduce both technical and commercial losses in the Kathmandu valley. Sixteen 11 kV feeders and downstream low-voltage networks with unacceptably high losses have been identified by the NEA. This pilot project will become a model network that can be replicated across Nepal.
  - (v) **Component 5: Energy efficiency in lighting.** This component involves the distribution of 1 million compact fluorescent lamps (CFLs) to households and CFL program implementation support to improve energy efficiency in lighting. The project will target domestic consumers in all electrified areas. It is expected that this program will free up a minimum of 10 MW of power plant capacity and potentially reduce 23 GWh of annual consumption. Assistance will also be provided for a public awareness campaign, an implementation consultant (local), and resources to establish a demand-side management (DSM) unit in the NEA. Additional details of this component are provided in Appendix 10.

---

<sup>7</sup> The reactive power capacity of the capacitor banks.

- (vi) **Component 6: Renewable energy for street lighting.** This component consists of installation of 1,000 solar and solar-wind streetlights in Bhaktapur, Lalitpur, and Kathmandu municipal areas to reduce street lighting demand on the main electricity grid. The activities include purchase of solar and solar-wind hybrid street lighting systems, and replacing/installing and setting up a system to ensure proper maintenance through the NEA. It is estimated that this subproject will reduce peak load demand by about 0.2 MW and save about 700 megawatt-hours (MWh) per year. Consulting services will be provided to assist the NEA with program design and implementation. Additional details of this component are in Appendix 11.
- (vii) **Component 7: Capacity building.** This component involves providing the NEA with expert services to formulate, design, and implement pilot PPP projects in three identified distribution areas. This will involve reviewing legislation, identifying appropriate PPP modalities, identifying pilot areas, preparing legal agreements, developing bid documents, making recommendations for implementation, developing an implementation plan, monitoring the bid process, and overseeing final implementation. This component will also assist the NEA in implementation support for component 4.

### C. Special Features

22. **Supply-Side Energy Efficiency.** The high network losses represent a heavy burden in a power system with limited supply. Relieving this burden is the least-cost means of reducing the demand and supply gap. The Project will tackle this problem by addressing inefficiencies on the supply side and introducing long-term, replicable solutions. The “model networks” concept will demonstrate that loss minimization in distribution networks is a function of planning, design, construction, operation, and maintenance. When best practices of these are adhered to, particularly in the often-ignored low-voltage parts of the network, more efficient networks will result. Clean Development Mechanism benefits will also be explored.

23. **Demand-Side Management.** DSM will be adopted to reduce energy consumed for lighting, which represent a significant component of total electricity demand at the peak load times. This involves introducing energy efficient lighting for households and solar or solar-wind based street lighting on a pilot scale. DSM efforts will reduce electricity flowing through upstream networks, which will reduce losses and free up generation output for other productive uses. Implementation and capacity building support will also be provided for this component. Further, Clean Development Mechanism benefits under these subprojects will be explored.

24. **Strategic Public–Private Partnerships Scheme.** Under the Project, strategic franchising partnerships with the private sector will be developed in selected urban areas to reduce distribution losses and improve the quality of service to consumers. If successful, this scheme will be extended into other semi-urban and urban areas across Nepal.

### D. Project Investment Plan

25. The project investment cost is estimated at \$93.7 million, including taxes and duties of \$2.0 million. The total cost includes physical and price contingencies, and interest and other charges during implementation. Detailed cost estimates are provided in Appendix 4.

**Table 1: Project Investment Plan**

(\$ million)

Item	Amount <sup>a</sup>
<b>A. Base Cost<sup>a</sup></b>	
1. Facilitating Access to Clean Energy	46.6
2. Energy Access Quality Enhancement	14.3
3. Clean Energy Plant Improvement	3.4
4. Supply-Side Energy Efficiency Improvement	12.3
5. Energy Efficiency in Lighting	1.9
6. Renewable Energy for Street Lighting	2.3
7. Capacity Building	0.6
<b>Subtotal (A)</b>	<b>81.4</b>
<b>B. Taxes and Duties</b>	<b>2.0</b>
<b>C. Interest During Construction</b>	<b>2.3</b>
<b>C. Contingencies <sup>b</sup></b>	<b>8.0</b>
<b>Total (A+B+C)</b>	<b>93.7</b>

<sup>a</sup> In mid-2009 prices.<sup>b</sup> Physical contingencies and price contingencies.

Sources: Nepal Electricity Authority and Asian Development Bank estimates.

**E. Financing Plan**

26. The Government has requested ADB to provide a loan of \$65 million equivalent from its Special Funds resources (Asian Development Fund [ADF]) to finance components 1, 2, 3, 4, and 7 of the Project. Component 5 of \$2.0 million will be financed by the Climate Change Fund (\$0.3 million) and by the Multi-Donor Clean Energy Fund (\$1.7 million) under the Clean Energy Financing Partnership Facility. Component 6 (\$2.5 million) will be financed by the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility. The Government and the NEA will finance \$24.2 million equivalent. ADB will not finance taxes and duties.

**Table 2: Financing Plan**

Source	Amount (\$ million)	Share of Total (%)
ADB (ADF Loan) <sup>a</sup>	65.0	69.0
CCF <sup>b</sup>	0.3	0.3
CEF <sup>c</sup>	4.2	4.7
Government/NEA	24.2	26.0
<b>Total</b>	<b>93.7</b>	<b>100.0</b>

ADB = Asian Development Bank, ADF = Asian Development Fund, CCF = Climate Change Fund, CEF = Multi-Donor Clean Energy Fund under Clean Energy Financing Partnership Facility, NEA = Nepal Electricity Authority.

<sup>a</sup> For components 1–4 and 7.<sup>b</sup> For part of component 5.<sup>c</sup> For part of component 5 and complete component 6.

Source: Asian Development Bank estimates.

27. The ADF loan will have a term of 32 years, including a grace period of 8 years and an interest charge of 1.0% per annum during the grace period and 1.5% per annum thereafter. The ADF loan and the grants from the Climate Change Fund and the Multi-Donor Clean Energy

Fund under the Clean Energy Financing Partnership Facility will be transferred by the Government to the NEA as a grant. A summary financing plan is provided in Table 2.

## **F. Implementation Arrangements**

### **1. Executing Agencies and Project Management**

28. The NEA will be the executing agency with overall responsibility for the execution of all components of the Project. A project management unit, headed by senior officers, will be set up by October 2009 specifically for the Project for necessary coordination, monitoring, and reporting on the day-to-day project implementation activities with the concerned groups of the NEA. Necessary guidance and training on the latest ADB procurement guidelines and procedures has been provided to the NEA. Based on the assessment of its procurement capacity, the NEA is considered to be fully capable of implementing the Project. The procurement capacity assessment is in Supplementary Appendix E. The implementation structure is in Supplementary Appendix I.

### **2. Implementation Period**

29. The Project will be implemented over 5 years, including procurement and construction activities, from 2010 to 2014. The project implementation schedule is shown in Appendix 5. Components 1, 2, 3, 4, and 7 will be completed by 30 September 2014 and the corresponding funds will be utilized for a period ending on 31 March 2015. Components 5 and 6 will be completed by 30 September 2012 and the corresponding funds will be utilized for a period up to 31 March 2013.

### **3. Procurement**

30. All procurement to be financed under the ADB loan will be carried out in accordance with ADB's *Procurement Guidelines* (2007, as amended from time to time). With the exception of one contract package under component 3 (clean energy plant improvement) and procurement under component 5 (energy efficiency in lighting), international competitive bidding procedures will be used for all contracts (11 turnkey and 8 supply contracts). While eight packages for components 2 and 4 will be based on single-stage:one-envelope bidding procedures, all the other 11 packages will follow single-stage:two-envelope procedures.

31. Under component 3, direct contracting will be adopted for procurement of a generator excitation system, which has a powerful impact on generator dynamic performance and availability, and accordingly ensures quality of generator voltage and reactive power. Only the equipment manufactured by the original supplier/manufacturer will be compatible with and maintain the functional guarantees of the original plant. Therefore, it will be procured from the original supplier on a turnkey basis. National competitive bidding will be used for selection of the CFL supplier under component 5. Shopping procedures will be used for the procurement of standard specification goods in component 5 with estimated costs less than \$50,000. The CFL supplier will be paid by the NEA (who will in turn be reimbursed by ADB) based on the quantity of CFLs distributed to electricity consumers through its distribution network and documentary evidence of such distribution. The procurement plan including an indicative list of contract packages is in Appendix 6.

#### **4. Advance Contracting**

32. In order to expedite implementation, the NEA has requested ADB to approve advance contracting actions for procurement of works, goods, and services subject to them being in accordance with ADB's *Procurement Guidelines* and *Guidelines on the Use of Consultants* (2007, as amended from time to time) and safeguard policies. ADB has already approved advance contracting and has informed the NEA that approval of advance contracting does not in any way commit ADB to finance the Project. The project readiness schedule is in Supplementary Appendix K.

#### **5. Consulting Services**

33. For component 4 (distribution loss reduction), the NEA requested consulting services to assist its implementation of the project. The NEA will select and engage one individual international consultant and one individual national consultant based on biodata submitted in response to terms of reference for the assignment. The process of advance contracting action for recruiting consultants has been initiated by the NEA as normal procedures. These consulting services are part of component 7.

34. Component 7 also includes capacity building and implementation support for the introduction of distribution PPPs. The NEA will select and engage one individual international consultant and one individual national consultant based on biodata submitted in response to terms of reference for the assignment. The NEA will also engage a national legal consultant to assist with a review of legislation and with legal drafting. The NEA has initiated the process of advance contracting action for recruiting consultants as normal procedures.

35. The Climate Change Fund grant will provide finance for one national consultant and one international individual consultant for implementation support under component 5. The Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility grant will provide finance for two individual national consultants for implementation support, supervision, monitoring, and capacity building under component 6. The ADF grant will provide finance for international consulting services for component 7.

36. The NEA will select and engage consultants in accordance with ADB's *Guidelines on the Use of Consultants*. Outline terms of reference for the consulting services are in Supplementary Appendix H.

#### **6. Anticorruption Policy**

37. ADB's *Anticorruption Policy* (1998, as amended from time to time) was explained to and discussed with the Government and the NEA. Consistent with its commitment to good governance, accountability, and transparency, ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the Project. To support these efforts, relevant provisions of ADB's *Anticorruption Policy* are included in the grant regulations and the bidding documents for the Project. In particular, all contracts financed by ADB in connection with the Project shall include provisions specifying the right of ADB to audit and examine the records and accounts of the NEA and all contractors, suppliers, consultants, and other service providers as they relate to the Project. Table 3 summarizes major project-specific governance measures.



**Table 3: Governance Measures**

Area	Measure
Procurement	(i) Use of ADB's <i>Guidelines on the Use of Consultants</i> (2007, as amended from time to time) and <i>Procurement Guidelines</i> (2007, as amended from time to time) (ii) Use of ADB's standard bidding documents and standard request for proposal documents for procurement and recruitment of consultants (iii) Project management unit headed by a senior officer directly reporting to the managing director of the NEA (iv) Bid specifications and packaging to be prepared to ensure maximum competition under international competitive bidding procedures (v) Information on procurement to be disclosed on a project website.
Financial Management and Audit	(i) Measurable financial performance indicators for the NEA (ii) Regular monitoring of expenditures, other financial transactions, and safe custody of project-financed assets by the accounting and control systems of the NEA (iii) Expanded use of advanced financial management systems to ensure efficient and accountable financial management (iv) Ensure scoped internal audit of the NEA including revenue audit and internal audit reports to the audit committee of the NEA board (v) Financial statements to be audited by external auditors acceptable to ADB and regularly published and reported to the shareholders
Institutional /Corporate Governance	(i) The NEA board will delegate operational authority to its business units. (ii) Business units will be operated as independent units with their accounts and assets fully separated facilitating regulation by the ETFC and its successor. (iii) Reconstituted ETFC will entertain tariff filing by the NEA along the lines of its business unit structure.
Anticorruption	(i) ADB to review and examine any alleged corrupt, fraudulent, collusive, or coercive practices relating to the Project (ii) Information on the Project to be made public through publication of leaflets and their availability in the provinces and districts within which the Project operates
Grievance Review	(i) A grievance redress mechanism to be established to address issues relating to project implementation

ADB = Asian Development Bank, ETFC = Electricity Tariff Fixation Commission, NEA = Nepal Electricity Authority.  
Sources: Asian Development Bank and Nepal Electricity Authority

## 7. Disbursement Arrangements

38. Disbursement procedures will be in accordance with ADB's *Loan Disbursement Handbook* (2007, as amended from time to time), and detailed arrangements agreed upon by the Government, the NEA, and ADB. Imprest fund procedures will be used to facilitate disbursement for investment in component 5 funded by the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility. The imprest account will be established and managed by the NEA. The ceiling of the initial advance of the imprest account<sup>8</sup> will not exceed ADB's estimated share of eligible project expenditures to be financed through the imprest account for the next 6 months, or 10% of the grant amount, whichever is lower. statement of expenditure procedures may be used for reimbursement under all the components and liquidating/replenishing advances under component 5. The statement of expenditure ceiling will be \$50,000 for individual payments applicable to reimbursement and imprest fund procedures. Financial management capacity assessment and previous experience shows that the NEA has adequate capacity and controls to implement these procedures.

<sup>8</sup> Bank charges for imprest account operations will be charged to the Asian Clean Energy Fund.

## **8. Accounting, Auditing, and Reporting**

39. The accounting, auditing, and reporting systems and procedures for the Project will be established in accordance with accounting principles and practices satisfactory to ADB. The NEA will maintain separate accounts for the different components. Within 6 months of the close of the financial year, the NEA will submit (i) annual project accounts, with detailed descriptions of the sources of receipts and expenditures; (ii) annual financial statements comprising an income statement, balance sheet, statement of cash flows, and related notes to the financial statements and consolidated for all operations; and (iii) procedures for the imprest accounts and/or statement of expenditures. The auditors will also prepare a memorandum on issues identified during the audit process, to be submitted with the respective reports. The auditors will be required to provide an opinion on the NEA's compliance with ADB's financial covenants. For component 5, the NEA will report to ADB every quarter, without limitation, on the overall portfolio performance. If requested by ADB, the NEA will provide ADB with certification that ADB funds have been used to provide CFLs to households and that those who received funds actually purchased CFLs under this component. The use of imprest accounts and statement of expenditure will also be part of the annual audit, as will a separate opinion on the use of imprest accounts and statement of expenditure.

## **9. Performance Monitoring and Evaluation**

40. The NEA will prepare progress reports for its respective parts and submit these to ADB within 30 days from the end of each quarter. Each report will provide a narrative description of (i) progress made during the period, (ii) changes in the implementation schedule, (iii) problems or difficulties encountered, (iv) the performance of the project implementation consultants, and (v) the work to be carried out in the next period. The report will also include summary financial accounts for each component, consisting of project expenditures for the year to date and total expenditure to date. Performance will be evaluated based on indicators and targets stipulated in the design and monitoring framework.

## **10. Project Review**

41. ADB will field an inception mission within 3 months of loan approval. ADB will review the implementation and operation of the projects based on the quarterly progress reports and meet with the NEA and the Government twice a year to discuss the progress of each part of the Project and any changes to implementation arrangements or remedial measures that need to be taken. A midterm review will be carried out 2 years after loan effectiveness, focusing on the engineering, resettlement, and environmental aspects of the investment program, and reviewing the financial status of the NEA. The NEA will submit a project completion report to ADB within 3 months of physical completion of the projects.

## **IV. CAPACITY DEVELOPMENT**

42. ADB has been providing capacity development support to the Nepal power sector on a continuous basis, addressing its needs from time to time. Table 4 provides a description of the ADB assistance for capacity building, both ongoing and planned, under the proposed loan.

**Table 4: Capacity Development Support**

<b>Item</b>	<b>Area of Support</b>
Public–Private Partnership	(i) Hydropower development: Assist DOED review policies, identify projects, prepare and issue bidding documents, award contracts, and manage contracts (ii) Distribution franchising: Identify franchise areas, develop bid documents, monitor bidding process, develop selection criteria, and award contracts
Power Sector Regulation	(i) Licensing and tariff regulation (ii) Financial management in line with the business unit structure and the emerging regulatory environment
Policy formulation and planning	(i) Assist the Cabinet-appointed committee to finalize the NEA financial restructuring plan (ii) Share experience on best practices of rural electrification in other countries (iii) Transmission, distribution, and operational planning including training and purchase of necessary software
Project Management and/or Implementation	(i) Train NEA personnel on material management (ii) Prepare bid documents, award contracts, and manage contracts for the distribution loss reduction and solar street lighting project components (iii) Establish the DSM unit and implement the CFL program

DOED = Department of Electricity Development, NEA = Nepal Electricity Authority, DSM = demand side management, CFL = compact fluorescent lamp.

Sources: Asian Development Bank and Nepal Electricity Authority.

## **V. PROJECT BENEFITS, IMPACTS, ASSUMPTIONS, AND RISKS**

### **A. Project Financial and Economic Justification**

#### **1. Financial Management**

43. The financial management assessment, conducted in accordance with ADB's *Financial Management and Analysis of Projects*<sup>9</sup> during project preparation is in Supplementary Appendix C. The NEA with the assistance of the World Bank is upgrading and computerizing its system of controls and accounting, including segregation of costs into internal business units, to allow greater transparency for regulatory intervention. The updated financial accounting system will meet the requirements of national and international accounting standards and will include cost and management information systems to support timely business decision making by NEA's managers. Capacity building will include on-the-job training for NEA staff in financial management, internal control, and internal audit. The proposed project financial management arrangements are considered satisfactory.

#### **2. Past Financial Performance and Future Projections**

44. Over the past 10 years, NEA's financial position has continued to deteriorate with no tariff increases since FY2001 and rising costs of energy purchases and operations. The NEA has been implementing the Government's rural electrification policy, which is characterized by high costs and low revenues. The NEA has only been able to meet its cash operating expenses

<sup>9</sup> ADB. 2005. *Financial Management and Analysis of Projects*. Manila.

and maintain ongoing capital investment in recent years by deferring payment of interest during construction, interest, and principal repayments, and by delaying royalty payments.

45. The future financial performance of the NEA was analyzed under various financial restructuring scenarios, including (i) converting some Government loans to equity; (ii) reducing onlending rates on Government loans to the NEA from 8% to 5%; (iii) utilizing a share of royalties currently paid by the NEA to cover the NEA losses on rural electrification; (iv) Government to fund unit cost escalation, on FY2009 prices, for the NEA's electricity purchases from India and IPPs necessary to meet generation shortfalls; and (v) a combination of these scenarios. Details are provided in Appendix 7. The cumulative cash flow benefit to the NEA from the scenarios analyzed is NRs42.6 billion during 2010–2015. Tariff increases are therefore unavoidable; increases in the order of 8% per annum from 2012 through to 2015 would produce a positive cash flow for the NEA by the end of 2015. A high-level task force has been appointed by the Government to provide recommendations on the financial restructuring of the NEA.

### **3. Financial Analysis**

46. Financial analysis was undertaken for the major components (1, 2, and 4) of the Project by comparing project-related incremental revenues at the present average tariff with incremental capital and operating costs. The financial internal rate of return (FIRR) is calculated at 12.2% for component 1, 8.0% for component 2, and 5.9% for component 4. The overall FIRR for the three components is 11.0%. The FIRR compares favorably with the estimated weighted average cost of capital of 1.3%, substantiating the Project's financial viability. The sensitivity analyses demonstrated the results were robust to standard sensitivities. Details of the financial analysis are in Appendix 8.

### **4. Economic Analysis**

47. Economic analysis was undertaken for the major components of the Project. The economic internal rates of return (EIRRs) were calculated by comparing with-project and without-project scenarios. Incremental consumption occurs because of the extended availability of electricity during peak demand periods. Incremental consumption was valued using consumers' willingness to pay. Non-incremental consumption occurs as other forms of energy are displaced by the project outputs (the resource cost saving). This was valued using the marginal cost of generation on the grid against the long term average economic cost of captive generation or kerosene for lighting. Analysis was undertaken on a time-of-year and time-of-day basis. The EIRR for component 1 was 19.3%, for component 2 it was 16.9%, and for component 4 it was 18.7%. The EIRR of the aggregated subprojects is estimated to be 18.0%. The Project also demonstrates robust economic performance under a range of downside sensitivity tests. A summary of the economic analysis is presented in Appendix 9. Detailed analysis is in Supplementary Appendix D.

## **B. Social and Poverty Analysis**

48. A full resettlement plan was prepared in consultation with affected parties, local authorities, and the NEA, in accordance with ADB's *Involuntary Resettlement Policy* (1995), and the relevant sections of the *Operations Manual*. Because no impact is expected on indigenous peoples communities, but only on individual households, no indigenous peoples development plan was prepared. However, in accordance with ADB's *Policy on Indigenous Peoples* (1998), additional compensation will be awarded to vulnerable groups, including indigenous people, as per the provisions in the resettlement plan.

49. The project will entail limited permanent acquisition of agricultural land (4.66 hectares [ha]) and temporary restriction of use for 21.39 ha. To minimize and avoid damage and crop disruption, tower construction and line stringing will be carried out in the off-season whenever possible. A total of 314 households will be affected by the project, of which only 22 will be significantly affected. Of these only two will be affected by the loss of more than 10% of their land; the remaining 20 households will be affected by the loss of structures. The entitlement matrix provides for compensation at full replacement cost. Among these, 14 households fall under ADB's *Policy on Indigenous Peoples*. Special provisions were included in the resettlement plan to address their needs.

50. The resettlement plan was translated into the local language and is being disclosed to all affected people. The summary poverty reduction and social strategy is in Appendix 12. The summary resettlement plan is in Supplementary Appendix I and the full resettlement plan is in Supplementary Appendix F (i). A detailed socioeconomic analysis of the project-affected populations is as in Supplementary Appendix F (ii).

### **C. Environmental Aspects**

51. Environmental assessments have been carried out for all the subprojects in the seven project components, in accordance with ADB's *Environment Policy* (2002) and *Environmental Assessment Guidelines* (2003). The NEA has either completed or is carrying out the environmental assessment process for the subprojects under the Environmental Protection Act (1997) and Environmental Protection Rules (1997 as amended). The Project has been assigned category B under ADB's *Environment Policy*. An initial environmental examination (IEE) and a summary IEE have been prepared covering all the subprojects regardless of the exemption of all except one subproject from IEE/environmental impact assessment requirements under the prevailing environmental laws in Nepal.

52. Environmental impacts of the subprojects on transmission lines and substations are not significant and are mostly confined to the right-of-way of those facilities. There are some negative impacts on natural and socioeconomic resources during the land acquisition for some subprojects and construction activities. The construction of the Dumre–Damauli transmission line involves only small-scale excavation for tower foundations at scattered locations that are refilled with excavated materials. Therefore, uncontrolled silt run-off is not expected. The best engineering practices will be used to prevent soil erosion during erection of transmission towers on slopes and erosion-prone soils. Adequate steps will be taken to resurface the area after construction. On the sites which are likely to be affected by active erosion or landslides, both biological and engineering treatment will be carried out, including provision of retaining walls, sowing soil-binding grasses at the site, and routine bioengineering measures. Construction activities will be discouraged in the rainy season. During operation, the land area under the transmission line can be used for agriculture. The footings of the towers are acquired permanently and compensated for at 100% of the land value. Vegetation will be trimmed for minimum required clearance for the conductors. To minimize the risk of accidents and exposure to electric fields, houses and other structures will not be allowed within the right-of-way.

53. It is concluded that there is no significant environmental or social impact of the project components, in either the short or long term. Some impacts that may arise during the construction stage are temporary and insignificant and can be made to be at the acceptable level with the application of appropriate mitigation measures. There are negligible impacts during the operation stage. The components on generation rehabilitation, distribution loss

reduction, CFLs, and solar street lighting contribute to reduction in emissions and hence have positive environmental impacts. These reductions result from avoidance of petroleum products use in domestic lighting, standby generation, and even coal-based cross-border electricity imports. However, the contractor and the NEA need to incorporate recommended mitigation measures in all stages of the Project. Although the contractors have the primary responsibility for implementation of the mitigation measures during construction, the NEA will be responsible for overall implementation of the environmental management plan.

#### **D. Benefits and Beneficiaries**

54. The Project will improve access for an estimated 20,000 additional households through strengthening the distribution network. It will improve the reliability of supply to about 1.5 million existing consumers with increased power import capacity, additional generation capability, efficient management, energy efficiency, and demand management. The DSM components of the Project will result in the reduction of an estimated 15,000–20,000 t of CO<sub>2</sub> emissions annually. Human safety—particularly of women and children using the main streets in Bhaktapur, Kathmandu, and Lalitpur—will also improve due to better street lighting.

55. The Project is likely to have a positive effect on households below the poverty level in terms of per capita cash income. Semiskilled and unskilled local laborers are likely to have access to employment opportunities during the construction of towers, stringing of new 132 kV transmission lines, substation construction, and even post-construction for repair and maintenance and vegetation clearance along the right of way of the transmission lines.

56. Poverty reduction impacts of the project are expected in a few areas. The rural communities will benefit from the access to cleaner energy improving health and sanitation, education, and access to information. The newly electrified households will have the opportunity to start different income-generating activities. Local income-generation activities will be developed in the project sites. The local economy will improve due to the increased business for restaurants, markets, and retail premises after the mobilization of construction teams. Reliable electricity will create industrial growth and increase production in the existing industries. This will generate employment opportunities. Project areas as well as other adjoining locations will benefit from an increased industry activity.

#### **E. Assumptions and Risks**

57. There is an overall risk to the Project from a potential deterioration of the political situation with changes in government and prolonged political transition. However, given the critical importance of improving power supply and efficiency of the power sector, the proposed project activities and reform actions should be high on any government's agenda. Also, given the nature of the proposed reforms and project activities, political disturbances are unlikely to have major adverse implications for effective and timely implementation, although the fragile political and weak governance situation pose a risk to procurement activities under the Project. Special efforts to closely monitor the project and procurement activities along with regular and intensive policy dialogue on the proposed reform actions will help to mitigate these potential risks.

58. The other risks specific to the Project are (i) delayed project implementation, (ii) inadequate capacity to implement the Project, (iii) failure to resolve safeguard issues in a timely manner, and (iv) the impact of external macroeconomic and financial cost factors and revenue projections on the viability of the Project. Adequate measures have been taken to ensure a high

level of project readiness through training of NEA staff and the approval of advance contracting. Potential safeguard issues have been mitigated through preparation and early implementation of environmental management and resettlement plans. The sensitivity analyses carried out in relation to the economic and financial analysis indicate that the rates of return are robust.

59. In addition, ADB is preparing capacity development TA for the Government and the NEA to strengthen their capacity in power system planning, regulation, best practices in rural electrification, and materials management. ADB support will also be provided for the Government to finalize the NEA financial restructuring plan.

## **VI. ASSURANCES AND CONDITIONS**

### **A. Specific Assurances**

60. In addition to the standard assurances, the Government and the NEA have given the following assurances, which are incorporated in the legal documents:

#### **1. Project Execution and Implementation Arrangements**

61. The Government shall also ensure that (i) the project management unit is managed and operated by a full-time project director reporting to the managing director, acceptable to ADB; and (ii) the project director is supported by competent full-time senior officers of the NEA and other personnel acceptable to ADB.

62. The NEA shall appoint a separate project manager to ensure that all day-to-day operations for each subproject under components 1 and 3, and for components 2 and 4, including procurement and accounting, are conducted by persons within the relevant NEA division. Also NEA shall establish a demand side management unit within NEA

63. Within 3 months of the effective date, the NEA shall have obtained the final government clearance for the environmental impact assessment for the construction of the new 132 kV transmission line from Dumre to Damauli from the Ministry of Environment prior to implementation of its civil works.

#### **2. Sector Reforms**

64. The NEA is an autonomous legal entity, legally distinct from the Government and will remain an autonomous legal entity for the duration of the Project. The Government will not interfere with NEA's management and operations for the duration of the Project.

65. The Government shall ensure that the NEA prepares tariff petitions and submits them for ETFC to consider at least once every year.

66. The Government shall ensure coordination between ETFC and DOED to ensure that the ETFC adequately considers economic and technical regulation in determining tariff petitions. The Government shall ensure that ETFC considers the NEA's (i) debt service, (ii) a rate of return to equity to be agreed upon between the ETFC and the NEA, and (iii) a lifeline tariff to protect poor consumers, in determining tariff petitions.

67. The NEA shall develop a plan, acceptable to ADB, for including PPPs in electricity distribution by 31 December 2010 in at least three geographical areas based upon the recommendations in component 7 of the Project and a process of stakeholder consultation.

### **3. Financial**

68. The Government will approve the NEA's financial restructuring plan by 30 Dec 2010 and start implementing it by 31 July 2011.

69. The NEA shall have a financial accounting system in place by 31 December 2011 that ensures that each of the NEA's separately established business units prepares separate accounts.

70. The Government shall cause the NEA to meet a debt service coverage ratio of 1.2 times debt service, and a rate of return on historic net fixed assets of 6% by 15 July 2013 and the year after.

71. If the Government takes any decision that has a direct and adverse financial impact upon the NEA, the Government shall compensate the NEA by a line item in the budget to offset the entire amount of the negative impact, including any subsidy for a lifeline tariff.

72. The Government shall cause (i) all government institutions to ensure payment of their electricity bills and dues for street lighting to the NEA within 90 days of receiving the bill; and (ii) the Government shall cause the NEA to improve accounts receivable to 3 months by 31 December 2010.

73. The Government shall exempt the NEA from all taxes and duties on project-related procurement, except for 1% customs levy on imported equipment and 13% value added tax on construction.

### **4. Technical and Commercial**

74. The NEA shall take measures to reduce the overall transmission and distribution losses from the present levels of 25.2% to (i) 24.5 % by 15 July 2011, (ii) 23.5% by 15 July 2012, and (iii) 22% by 15 July 2013.

75. The NEA shall present to ADB by 1 December 2010 a plan for reducing technical and nontechnical losses in the geographical areas under the component on supply-side energy efficiency improvement, acceptable to ADB. Such plans should be replicable across all the NEA's distribution networks. The NEA shall start implementing the plan by 30 June 2011.

### **5. Social Safeguards**

76. **Land Availability and Resettlement.** The NEA, subject to compliance with the relevant provision of the resettlement plan and in accordance with all applicable laws, regulations and policies of the Government and ADB, shall acquire or make available the land and rights to land free from any encumbrances, and clear the utilities, trees, and any other obstruction from such land, required for commencement of construction activities in accordance with the schedule agreed under the related civil works contract.



77. The NEA shall ensure timely availability of all land and rights of way required by the subprojects and implementation of the resettlement plan in conformity with all applicable laws, regulations and policies of the Government and ADB. The NEA shall ensure that persons affected are provided with cash compensation at the replacement cost of acquired land and other property in a timely manner in accordance with the resettlement plan. The NEA shall provide adequate budgetary allocation to cover the costs of land acquisition and resettlement. The NEA shall submit progress and completion reports on land acquisition and resettlement under the quarterly progress reports. In addition, the external monitoring report shall be submitted to ADB on a semiannual basis.

78. The NEA shall ensure that, prior to land acquisition and any resettlement under each subproject, the resettlement plan is disclosed to persons affected by the subproject, and is uploaded onto ADB's website. The NEA shall ensure that essential communal property that may be affected under land acquisition and resettlement is replaced as appropriate in an expeditious manner in accordance with the resettlement plan. The Government shall ensure that compensation is awarded in case construction activities temporarily block pathways and deprive some people of their livelihood. The NEA shall ensure that all compensation programs are completed as outlined in the resettlement plan prior to the commencement of civil works.

79. **Labor.** NEA shall ensure that all contracts under the Project follow all applicable labor laws of the government including provisions to the effect that contractors (i) do not use children as labor; (ii) follow legally mandated provisions of labor, health, safety, sanitation, welfare and working conditions; and (iii) take steps to ensure priority employment for households headed by women. The contracts shall also include clauses for termination in case of any breach of these provisions by contractors.

80. **Gender.** The Government shall ensure that the gender development measures provided in the agreed summary poverty reduction and social strategy are undertaken in order to promote the participation of women in project activities.

## **6. Environmental Safeguards**

81. The Government, through the NEA, shall ensure that all environmental laws, regulations and policies of the government and ADB apply to the Project and that contractors' contracts include relevant provisions thereof.

82. The Government, through the NEA, shall ensure (i) compliance with each IEE outcome and mitigation measure identified in each environmental management plan during design, implementation, and operation of the Project; and that (ii) the IEEs shall be updated and submitted to ADB for approval in case of any changes in the project design that would cause significant environmental impacts not included in the scope of any of the current IEEs. The Government shall ensure that the NEA includes the provisions of the environmental management plan in contractors' bidding documents and awarded contracts, and submit to ADB progress reports on the implementation of the environmental management plan twice a year.

83. The Government shall in particular ensure that (i) the components are not located within national parks, wild and planted forests, and wildlife sanctuaries unless prior environmental clearances are obtained from Government agencies and submitted to ADB for review and approval; and (ii) monuments of cultural or historical importance are avoided.

**B. Conditions for Loan and Grant Effectiveness**

84. In addition to the standard conditions for effectiveness, the following conditions shall apply.

85. The Subsidiary Loan Agreement for the loan, in form and substance satisfactory to ADB, shall have been duly executed and delivered on behalf of Nepal and the NEA and shall have become fully effective and binding upon Nepal and the NEA in accordance with its terms.

86. The Subsidiary Grant Agreement for the grants, in form and substance satisfactory to ADB, shall have been duly executed and delivered on behalf of the Government and the NEA and shall have become fully effective and binding upon Nepal and the NEA in accordance with its terms.

**C. Condition for Loan Withdrawal**

87. No withdrawals shall be made from the loan account unless the NEA has developed, finalized, and submitted to the Government the NEA financial restructuring plan linked to the NEA performance improvement targets in a form and manner satisfactory to ADB.

**VII. RECOMMENDATION**

88. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and, acting in the absence of the President, under the provisions of Article 35.1 of the Articles of Agreement of ADB, I recommend that the Board approve:

- (i) the loan in various currencies equivalent to Special Drawing Rights 41,127,000 to Nepal for the Energy Access and Efficiency Improvement Project from ADB's Special Funds resources with an interest charge at the rate of 1.0% per annum during the grace period and 1.5% per annum thereafter; a term of 32 years, including a grace period of 8 years; and other terms and conditions as are substantially in accordance with those set forth in the draft Loan Agreement and the relevant draft Project Agreement presented to the Board;
- (ii) the administration by ADB of a grant not exceeding the equivalent of \$300,000 to Nepal for the Energy Access and Efficiency Improvement Project to be provided by the Climate Change Fund on terms and conditions that are substantially in accordance with those set forth in the relevant draft Grant and Project Agreements presented to the Board; and
- (iii) the administration by ADB of a grant not exceeding the equivalent of \$4,200,000 to Nepal for the Energy Access and Efficiency Improvement Project from the Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility on terms and conditions that are substantially in accordance with those set forth in the relevant draft Grant and Project Agreements presented to the Board.

C. Lawrence Greenwood  
Vice-President

30 September 2009

## DESIGN AND MONITORING FRAMEWORK

<b>Design Summary</b>	<b>Performance Targets/Indicators</b>	<b>Data Sources/ Reporting Mechanisms</b>	<b>Assumptions and Risks</b>
<p><b>Impact</b></p> <p>Increased access to electricity across the country</p>	<p>Grid electrification rate increased from 33% in 2008 to 45% by 2015</p> <p>Installed generation capacity for domestic use annually increased by 50 MW</p>	<p>NEA annual reports</p>	<p><b>Assumptions</b></p> <p>The Government's continuing high priority for power sector development</p> <p>NEA and/or Government strong commitment to timely delivery of infrastructure needs and continuous improvement in management in the power sector including PPPs</p> <p>Regular generation capacity additions to meet the demand</p> <p>d. Increased consumer awareness on energy efficiency in electricity use</p> <p><b>Risk</b></p> <p>Exogenous factors affecting availability of funds for sector development</p>
<p><b>Outcome</b></p> <p>Reliable and energy efficient power supply with increased access and operational efficiency in the project areas</p>	<p>Increased power transfer capability between generation regions and load centers by 75 MW by 2014</p> <p>Additional domestic consumer connections of 20,000 in project areas by 2014</p> <p>4 GWh average increase in annual generation from Marsyangdi and Gandak hydropower plants</p> <p>Reduced system losses in the pilot areas for distribution loss reduction and private sector participation from present 25% to 22% by 2013 with an energy saving of 25 GWh per year</p> <p>Per capita lighting load to reduce by 30% by the end of</p>	<p>NEA annual reports</p> <p>Annual reports of new entities responsible for operation and management of franchised distribution areas</p>	<p><b>Assumptions</b></p> <p>Proper maintenance of all the new facilities constructed including off-grid street lighting systems</p> <p>Cooperation of municipal councils in installing street lighting systems</p> <p>Rapid uptake of CFLs by consumers</p> <p>d. Increase in new generation capacity</p> <p><b>Risks</b></p> <p>Poor quality CFLs entering the market</p> <p>ii. Politicization of compensation issues</p>

<b>Design Summary</b>	<b>Performance Targets/Indicators</b>	<b>Data Sources/ Reporting Mechanisms</b>	<b>Assumptions and Risks</b>
	<p>2011 against without-project scenario, and save approximately 23 GWh of energy per year</p> <p>Eliminate street lighting load in selected urban centers by end of 2011 and save approximately 1 GWh of energy per year</p> <p>Improve revenue collection efficiency and consumer service indicators. Accounts receivables to reduce from 4.3 months to 3.0 months by end of 2010</p> <p>Reduce CO<sub>2</sub> emissions by a minimum of 15,000 tons annually against the business as usual case by 2012</p>		
<p><b>Outputs</b></p> <p><b>1. Component 1</b> Construction of Middle Marshyangdi–Marshyangdi 132 kV line, Butwal–Kohalpur 132 kV line second circuit, and Chapali grid substation; expansion of Matatirtha grid substation; and installation of capacitor banks.</p> <p><b>2. Component 2</b> Construction of eight primary distribution substations and three distribution switching stations</p> <p><b>3. Component 3</b> Rehabilitation of Marshyangdi and Gandak hydropower stations</p> <p><b>4. Component 4</b> Rebuilding of 11 kV feeders, relevant low-voltage networks, and</p>	<p>132 kV transmission line length increased by 400 km and grid substation capacity increased by 80 MVA</p> <p>Distribution substation capacity increased by 48 MVA</p> <p>Excitation system of Marshyangdi plant and weir control system of Gandak plant replaced</p> <p>Sixteen 11 kV feeders and downstream networks in Kathmandu valley and Birgunj</p>	<p>Quarterly progress reports</p> <p>Reports of review missions</p> <p>Project completion report</p>	<p><b>Assumptions</b></p> <p>Timely mobilization of counterpart funds</p> <p>Timely resolution of safeguard issues</p> <p>Dedicated counterpart project teams established in time</p> <p><b>Risks</b></p> <p>Increase in estimated costs</p> <p>Undue political interference in safeguard issues</p>

Design Summary	Performance Targets/Indicators	Data Sources/ Reporting Mechanisms	Assumptions and Risks
<p>associated facilities in pilot areas</p> <p><b>5. Component 5</b> Countrywide expansion of the CFL program</p> <p><b>6. Component 6</b> Establishment of solar/solar-wind street lighting systems</p> <p><b>7. Component 7</b> Introduction of PPP in distribution</p> <p>Implementation support for component 4</p>	<p>replaced</p> <p>1 million CFLs introduced by 2012</p> <p>Construction and commissioning of 1,000 solar and solar-wind street lighting systems in Bhaktapur, , Kathmandu and Lalitpur</p> <p>PPP introduced in three distribution centers by 2014</p>		
<p><b>Activities with Milestones</b></p> <p><b>1. Physical Investments</b></p> <p>1.1 Completion of bidding documents for physical investments by August 2009</p> <p>1.2 Contract award for physical investments of components 1, 2, and 3 by February 2010</p> <p>1.3 Contract award for physical investments of component 6 by May 2010</p> <p>1.4 Contract award for physical investments of component 4 by August 2010</p> <p>1.5 Completion of construction of physical investments of all components by December 2012</p> <p><b>2. Implementation of CFL program</b></p> <p>2.1 Design and establishment of the mechanism for disbursement of CFLs by November 2009</p> <p>2.2 Implementation of the CFL program by December 2010</p> <p><b>3. Consulting Support</b></p> <p>3.1 Engagement of consultants for supply-side energy efficiency improvement by December 2009</p> <p>3.2 Engagement of consultants for distribution PPP by March 2010</p> <p>3.3 Engagement of consultants for components 5 and 6 by December 2009</p> <p>3.4 Completion of consulting services for component 7 by September 2011</p> <p>3.5 Completion of consulting services for component 5 by October 2010</p> <p>3.6 Completion of consulting services for component 6 by September 2011</p>		<p><b>Inputs</b></p> <p><b>Financing (\$ million)</b></p> <p><b>ADB:</b> ADF Loan : \$65.0 CCF Grant: \$0.3 CEF Grant: \$4.2</p> <p><b>Government/NEA: \$24.2</b></p> <p><b>Breakdown of Clean Energy Investment (\$ million)</b></p> <p>Generation: \$3.38 Transmission: \$9.41 Loss reduction: \$9.43 DSM: \$4.5</p> <p><b>Total Clean Energy Investment: \$26.7 million</b></p>	

ADB = Asian Development Bank, ADF = Asian Development Fund, CCF = Climate Change Fund, , CEF = Multi-Donor Clean Energy Fund under Clean Energy Financing Partnership Facility, CFL = compact fluorescent lamps, CO<sub>2</sub> = carbon dioxide, DSM = demand side management, GWh = Gigawatt hour, km = kilometer, kV = kilovolt, MVA = megavolt-ampere, MW = megawatt, NEA = Nepal Electricity Authority, PPP = public-private partnership.

## POWER SECTOR ASSESSMENT

### A. Power Sector Institutional Structure

1. The Ministry of Energy is the line ministry with primary jurisdiction and authority over the energy sector. The Ministry of Energy's Department of Electricity Development is responsible for promoting the development of hydropower resources, preparing standards for transmission and distribution of electricity, and inspection and monitoring. The Electricity Tariff Fixation Committee was established to review and approve tariff filings by the Nepal Electricity Authority (NEA) and other licensed entities under the Electricity Act 1992. The Electricity Tariff Fixation Committee is expected to be replaced by an independent Nepal electricity regulatory commission; the legislation is awaiting Parliamentary approval. The NEA, a wholly government-owned corporation, dominates Nepal's power sector. It is responsible for most of Nepal's electricity generation, dispatch, transmission, distribution, and retailing. It operates hydropower plants with a total installed capacity of 407 megawatt (MW), two diesel plants with total installed capacity of 53 MW, and two small (50 kilowatt [kW]) solar power stations.

2. There has been private sector participation in the Nepal power sector since 1992, with the Hydropower Development Policy 1992<sup>1</sup> and the Electricity Act 1992. Since the legislative changes required to implement certain components of the Hydropower Policy 2001 have not yet been enacted, The Hydropower Policy 1992 still provides the framework for private sector participation. Seventeen independent power producers (IPPs) contribute 156 MW of generation. The NEA has signed power purchase agreements with 22 additional IPPs totaling 68 MW of capacity, and this is under construction. About 107 kilometers (km) of transmission lines are privately owned. One large privately owned distribution company supplies electricity to 23,000 consumers, and there are many community-managed distribution schemes scattered across the country.

### B. Power Sector Policy

3. **Hydropower Development Policy 2001.** This policy sets out a list of specific objectives and rules to govern the hydroelectric sector. It provides for (i) the functions pertaining to the operation of the power centers, operation of electricity transmission and national grid, and electricity distribution owned by the NEA; (ii) the creation of an independent (power) system operator; and (iii) encouragement of local body, community, and private sector participation in the operation of the electricity distribution system.

4. **National Water Resource Strategy 2002.** The key policy directives pertaining to the power sector contained in this document are that (i) the NEA is to become commercially viable through corporatization, improved management, and separation of its rural electrification operations; (ii) the NEA is to be unbundled by separately creating a transmission/load dispatch center; (iii) generation will be the responsibility of a separate corporation; (iv) distribution operations will be sold or contracted out to municipal or private operators; and (v) the NEA will operate as a holding company.

5. **Interim Plan (2008–2010).** The long-term vision for the power sector is the utilization of water resources to meet domestic power demand and the export of surplus power to increase the country's foreign earnings. Some of the key strategies to be adopted are (i) introducing effective regulation of generation, transmission, and distribution of electricity and related

---

<sup>1</sup> Government of Nepal. 1992. *Hydropower Development Policy*. Kathmandu.

businesses; (ii) adopting a one-stop-shop approach to encourage investments in hydropower development to allow investors to obtain all approvals from a single agency; (iii) consistent efforts in the expansion of electricity generation potential; (iv) expanding transmission capacity, targeting both local consumption and export potential; and (v) strengthening and expanding the electricity distribution system.

### C. Sector Issues

6. **Generation.** Of the total hydropower capacity, storage-type hydropower represents only 14%. The dominance of run-off-river and daily storage hydropower plants has led to acute capacity shortage during the dry season when the demand rises sharply. The wet season sees a glut of energy available in the system which has yet to find a market. The Interim Plan (2008–2010) envisaged hydropower projects with a total capacity of 105 MW being commissioned within the plan period to meet domestic electricity demand, with 85 MW of this coming from the public sector and the balance coming from the private sector. This has largely been achieved. Initiation of 2,085 MW of new capacity was also envisaged within the plan period. However, constraints on funding and process inefficiencies mean that this target will not be achieved.

7. **Transmission.** The NEA transmission system consists of 1,563 km of 132 kV power lines, 350 km of 66 kV power lines, and 2,500 km of 33 kV power lines. A 132 kV transmission ring around the Kathmandu valley is being completed by the NEA. The completion of this series of projects, due in 2009, will cater for demand growth in the Kathmandu valley and will reduce losses and improve supply quality and reliability. Timely commissioning of transmission lines is critical for evacuation of much-needed new hydropower generation. Several IPPs are unable to undertake new power development initiatives because of the difficulties in power evacuation. The NEA completed its most recent comprehensive transmission planning study in July 2006. However, the study does not directly address increased transmission connectivity with India, an issue that has far-reaching implications for Nepal's power sector and the development of large-scale export-focused hydropower plants in Nepal. Construction of 175 km of high-voltage transmission line and 377 megavolt-amperes (MVA) of transmission substation capacity was programmed for the Interim Plan period. Construction of the first of three planned 400 kV India–Nepal transmission interconnections is to be completed within the Interim Plan period.

8. **Distribution.** The NEA presently serves 1.5 million customers across all 75 districts of the country. It sold 2,204 gigawatt-hours (GWh) of electricity in FY2007, an increase of 10% over the previous year. Domestic and industrial consumers represent almost 80% of sales. Only 40% of the population has access to electricity services, with 33% having access to the grid and the NEA off-grid facilities, with the remaining 7% served by micro-hydro plants developed by local entrepreneurs and other alternate sources. The Interim Plan expresses the need to connect an additional 450,000 rural households to the national electricity grid and has identified 651 km of 33 kV lines, 3,163 km of 11 kV lines, 5,978 km of low-voltage lines, and 113 MVA of 33/11 kV substation capacity to be added during the plan period.

9. **Barriers to Private Sector Participation.** The Government has already taken some steps to attract private investment in the power sector. With the exception of some run-off-river hydropower plants funded by domestic investors, little investment has taken place. Reasons for the reluctance of the private sector to become involved in the sector include (i) lack of transparency and accountability in the licensing process, (ii) incompatibilities and inconsistencies in legal and regulatory frameworks, (iii) difficulties in raising non-recourse finance, (iv) discriminatory tariff setting for projects greater than 5 MW, (v) inadequate transmission network capacity to evacuate power, and (vi) political risk.

**Table A2.1: ADB Energy Sector Results Framework**

Relevant CPS Outcomes		Sector-Level Outputs		ADB Assistance	Risks
CPS Outcomes Relevant to the Sector	Key Opportunities and Constraints	Subsector Outcome/Key Sector Outputs	Sector Milestone/Tracking Indicators/Interim Indicators		
<p>Increased energy access</p> <p>Rapid hydropower development</p> <p>Increased regional cooperation through cross-border power trade and related investment</p>	Poor access to the national grid in rural areas	<p>Increased investment in transmission and distribution expansion</p> <p>PPP arrangements in rural distribution services</p>	Energy access increased from the present 33% to 45% of households by 2015	<p><b>Ongoing</b> TA on PPP modalities for distribution services in three pilot areas</p> <p><b>Planned</b> Project covering transmission and distribution augmentation</p>	<p>Sociopolitical stability in rural areas</p> <p>Willingness of the private sector in distribution investment</p>
	Slow pace of hydropower development	<p>PPP-based financing for hydropower development facilitated</p> <p>Increased public sector investment in hydropower</p>	Construction of hydropower plants for domestic use with a total capacity of 700 MW started during 2011–2015	<p><b>Ongoing</b> TA on PPP modalities for hydropower development</p> <p><b>Planned</b> West Seti 750 MW hydropower project based on PPP model</p> <p>Public sector funding for a medium-scale hydropower plant</p> <p>Project covering generation rehabilitation</p>	The Government's ability to maintain a consistent policy and action plan on hydropower development
	Inadequate cross-border transmission capacity	<p>New cross-border transmission interconnection</p> <p>Upgraded existing interconnection (absorption) capacity</p>	Cross-border transmission capacity expanded by 200 MW by 2015 (excluding dedicated lines for export-oriented generation projects)	<p><b>Planned</b> Project covering enhanced absorption capacity of imported power via existing transmission links</p>	Political will in expanding cross-border energy trade



CPS Outcomes Relevant to the Sector	Key Opportunities and Constraints	Subsector Outcome/Key Sector Outputs	Sector Milestone/Tracking Indicators/Interim Indicators	ADB Assistance	Risks
Increased energy access  Rapid hydropower development  Increased regional cooperation through cross-border power trade and related investment	High technical and commercial losses and poor energy efficiency at end-use level	Increased support for energy efficiency programs both supply side and demand side  Strengthened antitheft law and enforcement of the same  Replicated pilot loss reduction program on model distribution networks  Expanded off-grid street lighting with the pilot program replicated	Systemwide transmission and distribution losses reduced from the present 25% to 22% by 2015	<b>Planned</b> Project covering distribution loss reduction, energy efficient lighting, and solar street lighting	Long periods of power shortages discouraging energy efficiency at user end  Below-cost electricity and poor tariff structure tariffs maintained for an extended period  NEA's ability to enforce antitheft laws
	Poor financial sustainability of the sector	Restructured debt of NEA	NEA's cumulative cash-flow to become positive by 2015		The Government's will to implement a financial restructuring plan for NEA
	Weak policy and/or legal framework, governance, and institutional arrangements	Enactment of relevant legislation  Establishment of an independent regulator  Effective internal restructuring of the NEA by introducing functional separation with independent cost centers	Independent regulator established by 2012  NEA to fully ring-fence functionally separated cost centers by 2012	<b>Planned</b> CDTA support covering power regulation, financial management, and planning	The Government's will to pass the relevant legislation
	Inadequate human resource capacity	Increased assistance for planning and financial management	Effective planning and financial management activities undertaken by in-house staff by 2012		NEA's ability to retain trained staff

CDTA = capacity development technical assistance, NEA = Nepal Electricity Authority, PPP = Public-Private Partnership, TA = technical assistance.  
Source: Asian Development Bank.

## EXTERNAL ASSISTANCE TO THE POWER SECTOR

1. The power sector in Nepal has received assistance from various international development partners. The Japan Bank for International Cooperation (JBIC) and the World Bank have been the major source of external funding to the sector, focusing on reforms in generation, facility rehabilitation and improvement, and development of renewable energy resources. In addition, bilateral donors including Danish International Development Agency, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), KfW, Norwegian Agency for Development Cooperation and United States Agency for International Development have been active in the power sector. Further, Canadian International Development Agency, Department for International Development of the United Kingdom, Japan International Cooperation Agency, Kuwait Fund for Arab Economic Development, Saudi Fund for Development, the European Union, the Finnish Department for International Development, the Government of France and the United Nations Development Programme have all provided assistance to the power sector.

2. Nepal has received substantial external assistance for the development of its power sector. The Asian Development Bank (ADB) has provided 11 loans totaling \$349.5 million (including \$35.1 million for a private hydropower project) and 19 technical assistance grants totaling \$8.8 million.

**Table A3: ADB's Assistance to the Power Sector in Nepal**

Loan	Project Name	Amount (\$ million)	Year of Approval
<b>A.</b>	<b>Public Sector Loans</b>		
102	Gandak–Hetauda Power	2.7	1972
249	Gandak–Hetauda Power (Supplementary)	2.5	1975
250	Second Power	3.8	1975
447	Third Power	18.6	1979
512	Mini-Hydropower	8.3	1981
533	Fourth Power	19.4	1981
670	Fifth Power	20.0	1983
708	Sixth Power	28.1	1984
1011	Seventh Power	51.0	1990
1452	Kali Gandaki “A” Hydroelectric	160.0	1996
1732	Rural Electrification, Distribution, and Transmission	50.0	1999
	<b>Subtotal (A)</b>	<b>364.4</b>	
<b>B.</b>	<b>Private Sector Loans</b>		
1430/ 1431	Himal Power Limited	35.1	1996
<b>C.</b>	<b>Technical Assistance</b>		
TA 399	Mini Hydropower	820,000	1981
TA 417	Fourth Power	740,000	1981
TA 418	Fourth Power Part B (Rural Electrification Study)	150,000	1981
TA 420	Power Development Study	45,000	1981
TA 478	Formulation of Fifth Power	50,000	1982
TA 837	Formulation of Seventh Power	75,000	1986
TA 1267	Institutional Support for Distribution Planning and Commercial Operations	780,000	1990

<b>Loan</b>	<b>Project Name</b>	<b>Amount (\$ million)</b>	<b>Year of Approval</b>
TA 1394	Equitable and Efficient Energy Pricing Study	600,000	1990
TA 1737	Kali Gandaki "A" Hydroelectric Detailed Design	2,000,000	1992
TA 2342	Institutional Strengthening in Rural Energy Planning and Implementation	400,000	1995
TA 2613	Institutional Strengthening of NEA's Environment Division	534,000	1996
TA 2614	Power System Master Plan	600,000	1996
TA 2911	Rural Electrification and Distribution Improvement	450,000	1997
TA 3193	Transmission Plan for Kathmandu Valley	100,000	1999
TA 4493	Rural Electrification and Renewable Energy	600,000	2004
TA 4985	West Seti Hydroelectric	300,000	2007
TA 4997	Promoting Private Sector Participation in the Power Sector	600,000	2007
TA 7076	Preparing Transmission and Distribution Project	150,000	2008
TA 7176	Preparing Electricity Connectivity and Energy Efficiency Project	150,000	2008
<b>Subtotal (B)</b>		<b>9,144,000</b>	

ADB = Asian Development Bank, TA = technical assistance

Source: Asian Development Bank.

3. The current power crisis that Nepal faces is a result of lack of investment in large, storage-based hydropower plants to provide base-load generation during the dry winter months. Investment has not occurred due to confused and conflicting legislation that has done little to encourage private participation in the sector, lack of domestic financial resources, and inadequate transmission infrastructure to transmit large blocks of power to load centers. Consequently, with a few exceptions, most generation development has been on a small scale in recent years, which has done little to relieve the power crisis. ADB's interventions in Nepal's power sector and those of its development partners have mostly focused on transmission, distribution, and small hydropower. While these interventions have mostly produced useful and measurable results, they have not directly contributed to addressing the power crisis. The proposed Project is also largely transmission and distribution focused, but it directly addresses the power crisis by improving capacity to import power from India, increasing transmission capacity for evacuation of power from planned large storage-based hydropower stations, targeting loss reduction in urban areas, dramatically increasing end-use energy efficiency, and increasing the output of two existing hydropower stations. However, it must be recognized that the Project itself will not solve the power crisis—ongoing and targeted interventions from ADB and its development partners will be essential if the gains made by the Project are to be sustained and built upon.

**DETAILED COST ESTIMATES <sup>a</sup>**  
**Table A4.1: Detailed Cost Estimates by Expenditure Category**

Item	NRs Million			\$ Million			% of Base Cost
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost	
<b>A. Investment Costs <sup>a</sup></b>							
1. Civil works and erection	95.29	836.82	932.11	1.19	10.46	11.65	13
2. Equipment	4,802.51	100.12	4,902.63	60.03	1.25	61.28	70
3. Consultants							
a. Project management, design, and supervision	17.68	33.41	51.09	0.22	0.46	0.68	0
b. Capacity development	23.35	3.28	26.63	0.29	0.00	0.29	0
4. Taxes and duties	0.00	159.78	159.78	0.00	2.00	2.00	2
<b>Subtotal (A)</b>	<b>4,938.83</b>	<b>1,133.41</b>	<b>6,072.24</b>	<b>61.74</b>	<b>14.17</b>	<b>75.90</b>	<b>86</b>
<b>B. Other Investment Costs</b>							
1. Land	0.00	343.75	343.75	0.00	4.30	4.30	8
2. Environmental and social mitigation	0.00	100.17	100.17	0.00	1.25	1.25	2
3. Project management and construction supervision <sup>b</sup>	0.00	159.32	159.32	0.00	1.99	1.99	4
<b>Subtotal (B)</b>	<b>0.00</b>	<b>603.23</b>	<b>603.23</b>	<b>0.00</b>	<b>7.54</b>	<b>7.54</b>	<b>14</b>
<b>Total Base Cost</b>	<b>4,938.83</b>	<b>1,736.64</b>	<b>6,675.47</b>	<b>61.74</b>	<b>21.71</b>	<b>83.44</b>	<b>100</b>
<b>C. Contingencies</b>							
1. Physical <sup>c</sup>	289.89	104.43	394.32	3.62	1.35	5.01	6
2. Price <sup>d</sup>	43.48	198.46	241.94	0.53	2.47	3.00	4
<b>Subtotal (C)</b>	<b>333.37</b>	<b>302.89</b>	<b>636.26</b>	<b>4.15</b>	<b>3.82</b>	<b>8.01</b>	<b>10</b>
<b>D. Financing Charges During Implementation <sup>e</sup></b>							
1. Interest during implementation <sup>f</sup>	177.60	0.00	177.60	2.22	0.00	2.22	3
2. Commitment charges	0.00	0.00	0.00	0.00	0.00	0.00	0
3. Front-end fees	0.00	0.00	0.00	0.00	0.00	0.00	0
<b>Subtotal (D)</b>	<b>177.60</b>	<b>0.00</b>	<b>177.60</b>	<b>2.22</b>	<b>0.00</b>	<b>2.22</b>	<b>3</b>
<b>Total Project Cost (A+B+C+D)</b>	<b>5,449.79</b>	<b>2,039.54</b>	<b>7,489.33</b>	<b>68.11</b>	<b>25.52</b>	<b>93.67</b>	<b>111</b>

<sup>a</sup> In mid 2009 prices.

<sup>b</sup> Internal Nepal Electricity Authority cost allocation capitalized to project account.

<sup>c</sup> Computed at 5% for transmission component and 10% for other components.

<sup>d</sup> Computed using Asian Development Bank's forecasts of international and domestic inflation.

<sup>e</sup> Estimate of costs include financing of bank charges, where applicable.

<sup>f</sup> Interest during implementation has been computed at the Asian Development Fund (ADF) interest rate of 1% for ADF loan components and at zero for grant components.

Sources: Nepal Electricity Authority and Asian Development Bank estimates.

Table A4.2: Detailed Cost Estimates by Financier

Item	\$ Million Cost	ADB						Government / NEA			
		ADF	% of Cost Category	CCF	% of Cost Category	CEF	% of Cost Category	Subtotal	% of Cost Category		
<b>A. Investment Costs</b>											
1. Civil works and erection <sup>a</sup>	13.09	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0	13.09	100
2. Equipment <sup>a,b</sup>	61.85	57.48	92.9	0.00	0.0	3.74	6.1	61.28	99	0.56	1
3. Consultants											
a. Project management, design, and supervision <sup>c</sup>	0.68	0.34	49.4	0.27	39.9	0.11	10.7	0.68	100	0.00	0
b. capacity development <sup>b</sup>	0.29	0.23	79.7	0.00	0.0	0.09	27.9	0.29	100	0.00	0
<b>Subtotal (A)</b>	<b>75.90</b>	<b>58.05</b>	<b>76.5</b>	<b>0.27</b>	<b>0.4</b>	<b>3.94</b>	<b>5.2</b>	<b>62.25</b>	<b>82</b>	<b>13.65</b>	<b>18</b>
<b>B. Other Investment Costs</b>											
1. Land	4.30	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0	4.30	100
2. Environmental and social mitigation	1.25	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0	1.25	100
3. Project management and construction supervision	1.99	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0	1.99	100
<b>Subtotal (B)</b>	<b>7.54</b>	<b>0.00</b>	<b>0.0</b>	<b>0.00</b>	<b>0.0</b>	<b>0.00</b>	<b>0.0</b>	<b>0.00</b>	<b>0</b>	<b>7.54</b>	<b>100</b>
<b>Total Base Cost</b>	<b>83.44</b>	<b>60.32</b>	<b>72.3</b>	<b>0.27</b>	<b>0.3</b>	<b>3.94</b>	<b>4.7</b>	<b>64.52</b>	<b>75</b>	<b>18.92</b>	<b>23</b>
<b>C. Contingencies</b>											
1. Physical <sup>c</sup>	5.01	4.71	94.0	0.03	0.6	0.26	5.2	5.01	100	0.00	0
2. Price	3.00	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0	3.00	100
<b>Subtotal (C)</b>	<b>8.01</b>	<b>4.71</b>	<b>58.8</b>	<b>0.03</b>	<b>0.4</b>	<b>0.26</b>	<b>3.4</b>	<b>5.01</b>	<b>63</b>	<b>3.00</b>	<b>38</b>
<b>D. Financing Charges During Implementation</b>											
1. Interest during implementation	2.23	2.23	100.0	0.00	0.0	0.00	0.0	2.23	100	0.00	0
2. Commitment charges	0.00	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0	0.00	100
3. Front-end fees	0.00	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0	0.00	100
<b>Subtotal (D)</b>	<b>2.23</b>	<b>2.23</b>	<b>100.0</b>	<b>0.00</b>	<b>0.0</b>	<b>0.00</b>	<b>0.0</b>	<b>2.23</b>	<b>100</b>	<b>0.00</b>	<b>0</b>
<b>Total Project Cost (A+B+C+D)</b>	<b>93.67</b>	<b>65.00</b>	<b>69.0</b>	<b>0.30</b>	<b>0.3</b>	<b>4.20</b>	<b>4.5</b>	<b>69.49</b>	<b>74</b>	<b>24.19</b>	<b>26</b>

CCF = Climate Change Fund, ADB = Asian Development Bank, CEF = Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility.

<sup>a</sup> Items include all taxes and duties.

<sup>b</sup> Item is financed parallelly by ADF and CEF

<sup>c</sup> Item is financed parallelly by ADF, CCF and CEF

Note: Bank charges for imprest account operations will be charged to CEF.

Sources: Nepal Electricity Authority and Asian Development Bank estimates.

Table A4.3: Detailed Cost Estimates by Project Component

Project Component	Cost in NRs Million			Cost in \$ Million		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
<b>A. Facilitating Access to Clean Energy</b>						
1. Middle Marsyangdi-Dumre-Marsyangdi 132 kV transmission line and substation	886.40	131.55	1,017.95	11.08	1.64	12.72
2. Construction of Chapali 132 kV substation and 66kV cable link for Lainchaur-Chabel	528.70	93.30	622.00	6.61	1.17	7.78
3. Butwal - Kohalpur 132 kV transmission line (2nd circuit stringing)	964.80	137.67	1,102.47	12.06	1.72	13.78
4. Matatirtha 132 kV substation	236.66	26.78	263.44	2.96	0.33	3.29
5. Capacitor banks	148.80	23.80	172.60	1.86	0.30	2.16
Items not funded by ADB	0.00	553.88	553.88	0.00	6.92	6.92
<b>Subtotal (A)</b>	<b>2,765.36</b>	<b>966.98</b>	<b>3,732.34</b>	<b>34.57</b>	<b>12.09</b>	<b>46.65</b>
<b>B. Energy Access Quality Enhancement</b>						
1. Construction of Baniyani 33/11 kV substation and related 33 kV and 11 kV circuits	92.80	28.72	121.52	1.16	0.36	1.52
2. Construction of Mirchaiya 33/11 kV substation and related 33 kV and 11 kV circuits	106.16	35.00	141.16	1.33	0.44	1.76
3. Construction of Dharapani 33/11 kV substation and related 33 kV and 11 kV circuits	86.13	30.25	116.38	1.08	0.38	1.45
4. Construction of Paraul 33/11 kV substation and related 33 kV and 11 kV circuits	82.19	30.37	112.56	1.03	0.38	1.41
5. Construction of Barahathwa 33/11 kV substation and related 33 kV and 11 kV circuits	80.80	29.97	110.77	1.01	0.37	1.38
6. Construction of Dhikurpokhari 33/11 kV substation and related 33 kV and 11 kV circuits	103.60	26.54	130.14	1.30	0.33	1.63
7. Construction of Kusma 33/11 kV substation and related 33 kV and 11 kV circuits	96.87	26.50	123.37	1.21	0.33	1.54
8. Construction of Mainapokhar 33/11 kV substation and related 33 kV and 11 kV circuits	59.20	25.34	84.54	0.74	0.32	1.06
9. Construction of Mirmi 11 kV switching substation and related 11 kV circuits	27.45	23.73	51.18	0.34	0.30	0.64
10. Construction of Mulpani 11 kV switching substation and related 11 kV circuits	29.80	23.39	53.19	0.37	0.29	0.66
11. Construction of Swoyambhu 11 kV switching substation and related 11 kV circuits	29.80	22.39	52.19	0.37	0.28	0.65
Items not funded by ADB	0.00	45.85	45.85	0.00	0.57	0.57
<b>Subtotal (B)</b>	<b>794.80</b>	<b>348.05</b>	<b>1,142.85</b>	<b>9.94</b>	<b>4.35</b>	<b>14.29</b>
<b>C. Clean Energy Plant Improvement</b>						
1. Modernisation of weir control and excitation systems at Lower Marshyangdi hydropower plant	251.68	3.95	255.63	3.15	0.05	3.20
2. Design, fabrication and installation of trash rack cleaner at Gandak hydropower plant	13.04	0.25	13.29	0.16	0.00	0.17
Items not funded by ADB	0.00	1.50	1.50	0.00	0.02	0.02
<b>Subtotal (C)</b>	<b>264.72</b>	<b>5.70</b>	<b>270.42</b>	<b>3.31</b>	<b>0.07</b>	<b>3.38</b>
<b>D. Supply-Side Energy Efficiency Improvement</b>						
1. Rehabilitation and upgrading of 11 kV distribution in Baktapur distribution center	22.55	6.60	29.15	0.28	0.08	0.36
2. Rehabilitation and upgrading of 11 kV distribution in Birgunj distribution center	189.12	55.39	244.51	2.36	0.69	3.06
3. Rehabilitation and upgrading of 11 kV distribution in Kathmandu distribution centers	452.44	130.32	582.77	5.66	1.63	7.28
4. Rehabilitation and upgrading of 11 kV distribution in Kirtpur distribution center	61.85	13.43	75.28	0.77	0.17	0.94
5. Rehabilitation and upgrading of 11 kV distribution in Lalitpur distribution center	28.21	8.26	36.47	0.35	0.10	0.46
6. Rehabilitation and upgrading of 11 kV distribution in Pulchowk distribution center	14.74	3.44	18.18	0.18	0.04	0.23
Items not funded by ADB	0.00	2.00	2.00	0.00	0.03	0.03
<b>Subtotal (D)</b>	<b>768.91</b>	<b>219.44</b>	<b>988.35</b>	<b>9.61</b>	<b>2.74</b>	<b>12.35</b>
<b>E. Energy Efficiency in Lighting</b>						
1. Supply of CFLs and Equipment for DSM unit	120.00	0.00	120.00	1.50	0.04	1.50
2. Public awareness campaign in support of part E(1) and workshops and training	0.00	16.00	16.00	0.00	0.16	0.20
<b>Subtotal (E)</b>	<b>120.00</b>	<b>16.00</b>	<b>136.00</b>	<b>1.50</b>	<b>0.20</b>	<b>1.70</b>
<b>F. Renewable Energy for Street Lighting</b>						
1. Supply and installation of solar street lighting	184.00	0.00	184.00	2.30	0.00	2.30
<b>Subtotal (F)</b>	<b>184.00</b>	<b>0.00</b>	<b>184.00</b>	<b>2.30</b>	<b>0.00</b>	<b>2.30</b>
<b>G. Capacity Building</b>						
(consulting support only)						
<b>H. Consulting Services</b>						
1. System designing and implementation support for component D (component G)	17.68	5.89	23.57	0.22	0.07	0.29
2. Design and implementation support and capacity building for component E(1)	4.73	5.68	10.41	0.06	0.07	0.13
3. Design, implementation support and capacity building for component F	0.00	5.84	5.84	0.00	0.07	0.07
4. Support and capacity building for distribution PPP (component G)	18.62	3.28	21.90	0.23	0.04	0.27
<b>Subtotal (H)</b>	<b>41.03</b>	<b>20.69</b>	<b>61.72</b>	<b>0.51</b>	<b>0.26</b>	<b>0.77</b>
<b>Total Base Cost</b>	<b>4,938.83</b>	<b>1,576.86</b>	<b>6,515.69</b>	<b>61.74</b>	<b>19.71</b>	<b>81.44</b>
<b>Taxes and Duties</b>	0.00	159.78	159.78	0.00	2.00	2.00
<b>Contingencies</b>						
Physical	289.89	104.43	394.32	3.62	1.35	5.01
Price	43.48	198.46	241.94	0.53	2.47	3.00
<b>Financing Charges During Implementation</b>	177.60	0.00	177.60	2.22	0.00	2.22
<b>Total Project Cost</b>	<b>5,449.79</b>	<b>2,039.54</b>	<b>7,489.33</b>	<b>68.11</b>	<b>25.52</b>	<b>93.67</b>

CFL = compact fluorescent lamp, DSM = demand side management; kV=kilovolt.  
Source: Nepal Electricity Authority.



**PROJECT IMPLEMENTATION SCHEDULE**  
**Table 5.2: Grant Components**

Project Component	2009												2010												2011											
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
<b>E. Energy Efficiency in Lighting</b>																																				
Consulting Support (CFL implementation)	<div style="display: flex; justify-content: space-between; width: 100%;"> <span>EOI</span> <span>CA</span> <span>M</span> </div>																																			
Consulting Support (Waste management policy)	<div style="display: flex; justify-content: space-between; width: 100%;"> <span>EOI</span> <span>CA</span> <span>M</span> </div>																																			
<b>F. Renewable Energy for Street Lighting</b>																																				
Solar Street Lights	<div style="display: flex; justify-content: space-between; width: 100%;"> <span>EOI</span> <span>TP</span> <span>TF</span> <span>CA</span> <span>CW</span> <span>C</span> </div>																																			
Consulting Support (solar street lighting capacity building, and implementation support)	<div style="display: flex; justify-content: space-between; width: 100%;"> <span>EOI</span> <span>CA</span> <span>M</span> </div>																																			

C = commissioning, CA = contract award, CW = commencement of work, EOI = expression of interest; M = mobilization, TF = tender float, TP = tender preparation.  
 Source: Nepal Electricity Authority.



## PROCUREMENT PLAN

### Basic Data

<b>Project Name</b>	Energy Access and Efficiency Improvement Project
<b>Country</b>	Nepal
<b>Executing Agency</b>	Nepal Electricity Authority (NEA)
<b>Loan (Grant) Amount</b>	\$69.5 Million
<b>Loan (Grant) Number</b>	40553-01
<b>Date of First Procurement Plan</b>	8 July 2009
<b>Date of This Procurement Plan</b>	18 September 2009

#### A. Process Thresholds, Review, and 18-Month Procurement Plan

##### 1. Project Procurement Thresholds

1. Except as the Asian Development Bank (ADB) may otherwise agree, the following process thresholds shall apply to procurement of good, works, and consulting services.

##### Procurement of Goods, Works, and Consulting Services

Procurement Method	Threshold
<b>Procurement of Goods and Works</b>	
International Competitive Bidding Works	At least \$1,000,000
International Competitive Bidding Goods	At least \$500,000
National Competitive Bidding Works	Less than \$1,000,000
National Competitive Bidding Goods	Less than \$500,000
Shopping Works	Less than \$100,000
Shopping Goods	Less than \$100,000
<b>Recruitment of Consulting Firms</b>	
Quality- and Cost-Based Selection	At least \$200,000
Consultants' Qualifications Selection	Less than \$200,000
Least-Cost Selection	Less than \$100,000

##### 2. ADB Prior or Post Review

2. Except as ADB may otherwise agree, the following prior- or post-review requirements apply to the various procurement and consultant recruitment methods used for the project.

Procurement Method	Prior or Post	Comments
<b>Procurement of Goods and Works</b>		
International Competitive Bidding Works	Prior	
International Competitive Bidding Goods	Prior	
National Competitive Bidding Works	Prior	
National Competitive Bidding Goods	Prior	
Shopping Works	Post	
Shopping Goods	Post	
<b>Recruitment of Consultants</b>		
Quality- and Cost-Based Selection	Prior	
Consultants' Qualifications Selection	Prior	
Least-Cost Selection	Prior	
Individual Consultants	Prior	

### 3. Goods and Works Contracts Estimated to Cost More Than \$1 Million

3. The following table lists goods and works contracts for which procurement activity is either ongoing or expected to commence within the next 18 months.

General Description	Contract Value (\$ million)	Procurement Method	Prequalification of Bidders (Yes/No)	Advertisement Date (Quarter/Year)	Comments
<b>Asian Development Fund Component</b>					
Turnkey contract for 132 kV transmission system for Middle Marsyangdi–Dumre–Damauli–Marsyangdi	\$12.7 million (2 packages)	ICB	No	Q4 2009	Financed by ADB
Turnkey contract for 132 kV Chapali S/S and 66 kV Lainchaur S/S	\$7.8 million	ICB	No	Q4 2009	Financed by ADB
Turnkey contract for 132 kV transmission system for Butwal–Kohalpur	\$13.8 million (2 packages)	ICB	No	Q4 2009	Financed by ADB
Turnkey contract for 132 kV Matatirtha S/S	\$3.3 million	ICB	No	Q4 2009	Financed by ADB
Turnkey contract for 33 kV and 11 kV capacitor banks	\$2.2 million	ICB	No	Q4 2009	Financed by ADB
Turnkey contract for eight 33 kV S/S and three 11 kV SW/S	\$10.7 million (2 packages)	ICB	No	Q4 2009	Financed by ADB
Supply and related installation works for 33 kV and 11 kV distribution network	\$3.0 million (3 packages)	ICB	No	Q4 2009	Financed by ADB
Turnkey contract for excitation system at Lower Marsyangdi hydroelectric project	\$2.3 million	Direct Contracting	No	Q4 2010 (submission of draft contract to ADB)	Financed by ADB
Supply and related installation works for rehabilitation of 11 kV/0.4 kV distribution network	\$12.3 million (3 packages)	ICB	No	Q1 2010	Financed by ADB
<b>Climate Change Fund Component</b>					
Supply and installation of solar street lights	\$2.2 million (2 packages)	ICB	No	Q4 2009	Financed by ADB

ICB = international competitive bidding; kV = kilovolt.

#### 4. Consulting Services Contracts Estimated to Cost More Than \$100,000

4. The following table lists consulting services contracts for which procurement activity is either ongoing or expected to commence within the next 18 months.

General Description	Contract Value (\$ million)	Recruitment Method	Advertisement Date (Quarter/Year)	International/ National Assignment	Comments
<b>Asian Development Fund Component</b>					
Consulting services for system designing and implementation support for rehabilitation of 11 kV/0.4 kV distribution network	\$0.3 million	Individual	Q4 2009	International and national	Financed by ADB
Consulting services for capacity building, formulation, and implementation of distribution PPP pilot program	\$0.3 million (3 packages)	Individual	Q4 2009	International and national	Financed by ADB
<b>Climate Change Fund Component</b>					
Consulting services for design and implementation support and waste management policy formulation for compact fluorescent lamp program	\$0.1 million (2 packages)	Individual	Q4 2009	International and national	Financed by ADB

#### 5. Goods and Works Contracts Estimated to Cost Less Than \$1 Million and Consulting Services Contracts Less Than \$100,000

5. The following table groups smaller-value goods, works, and consulting services contracts for which procurement activity is either ongoing or expected to commence within the next 18 months.

General Description	Contract Value (Cumulative) (\$ million)	Number of Contracts	Procurement/ Recruitment Method	Comments
<b>Asian Development Fund Component</b>				
Turnkey contracts for weir control system at Lower Marshyangdi HEP and trash rack cleaner at Gandak HEP	\$1.1 million	2	ICB	Financed by ADB
<b>Clean Energy Fund Component</b>				
Consulting services for design, implementation, monitoring, and capacity building for solar street lighting	\$0.07 million	1	Individual national	Financed by ADB

HEP = hydroelectric plant

## B. Indicative List of Packages Required Under the Project

6. The following table provides an indicative list of all procurement (goods, works, and consulting services) over the life of the Project.

**List of Contract Packages**

Contract No.	Item	Total Estimated Value		Domestic Preference (Yes/No)	Procurement Mode
		NRs million	\$ million		
<b>Procurement</b>					
<b>Part A</b>	<b>Facilitating Access to Clean Energy</b>	<b>3,178.5</b>	<b>39.7</b>		
A-1	Construction of 132 kV transmission line for Middle Marsyangdi–Dumre–Damauli–Marsyangdi	432.0	5.4	Yes	ICB
A-2	Construction of 132 kV Marshyangdi S/S, extension of Middle Marshyangdi and Marshyangdi SW/S, and reinforcement of Damauli S/S	586.0	7.3	Yes	ICB
A-3	Construction of 132 kV Chapali S/S, extension of 66 kV Lainchaur S/S, and installation of related 66 kV and 11 kV underground cables	622.0	7.8	Yes	ICB
A-4	Stringing of second 132 kV circuit for Butwal–Kohalpur	496.0	6.2	Yes	ICB
A-5	Extension of 132 kV Butwal, Shivapur, Lamahi, Kusum, and Kohalpur S/S	606.5	7.6	Yes	ICB
A-6	Expansion of 132 kV Matatirtha S/S	263.4	3.3	Yes	ICB
A-7	Construction of 232 MVAR 33 kV and 11 kV capacitors	172.6	2.2	Yes	ICB
<b>Part B</b>	<b>Energy Access Quality Enhancement</b>	<b>1,097.0</b>	<b>13.7</b>		
B-1	Construction of 33/11 kV S/S at Baniyani, Mirchaiya, Dharapani, Paraul, and Barahathwa	472.7	5.9	Yes	ICB
B-2	Construction of 33/11 kV S/S at Dhikurpokhari, Kusma, and Mainapokhar; and 11 kV switching stations at Mirmi, Mulpani, and Swoyambhu	386.3	4.8	Yes	ICB
B-3	Supply of ACSR conductor	80.7	1.0	Yes	ICB
B-4	Supply of insulators, lightning arrestors, and dropout fuses	15.0	0.2	Yes	ICB
B-5	Supply and related installation works of poles, cross arms, and accessories	142.3	1.8	Yes	ICB
<b>Part C</b>	<b>Clean Energy Plant Improvement</b>	<b>269.0</b>	<b>3.4</b>		
C-1	Modernization of weir control system at Lower Marshyangdi HP/P	70.8	0.9	NA	ICB
C-2	Modernization of excitation system at Lower Marshyangdi HP/P	184.9	2.3	NA	Direct Contracting
C-3	Design, fabrication, and installation of trash rack cleaner at Gandak HP/P	13.3	0.2	NA	ICB
<b>Part D</b>	<b>Supply-Side Energy Efficiency Improvement</b>	<b>986.3</b>	<b>12.3</b>		
D-1	Supply of 11/0.4 kV transformers	250.0	3.1	Yes	ICB
D-2	Supply of ACSR and ABC conductors	414.4	5.2	Yes	ICB
D-3	Supply and related installation works of MCCB, cross arms, and accessories	322.0	4.0	Yes	ICB

Contract No.	Item	Total Estimated Value		Domestic Preference (Yes/No)	Procurement Mode
		NRs Million	\$ Million		
<b>Part F</b>	<b>Renewable Energy for Street Lighting</b>	<b>176.0</b>	<b>2.2</b>		
F-1	Supply and installation of solar streetlights	158.4	2.0	Yes	ICB
F-2	Supply and installation of solar and solar-wind hybrid streetlights	17.6	0.2	Yes	ICB
<b>Subtotal: Procurement (A+B+C+D+F)</b>		<b>5,706.7</b>	<b>71.3</b>		
<b>Consulting Services</b>					
a	System designing and implementation support for part D (part G)	23.6	0.3		Individual Biodata
b	Design and implementation support for part E	5.7	0.07		Individual Biodata
c	Waste management policy advisory for part E	4.7	0.06		Individual Biodata
d	Supervision, monitoring, and capacity building for part F	5.8	0.07		Individual Biodata
e	Capacity building and implementation support for distribution PPP (part G)	18.6	0.2		Individual Biodata
f	Legal support for distribution PPP (part G)	3.3	0.06		Individual Biodata
<b>Subtotal: Consulting Services (a+b+c+d+e+f)</b>		<b>61.8</b>	<b>0.8</b>		
<b>Total Cost</b>		<b>5,768.6</b>	<b>72.1</b>		

ACSR = aluminum conductor steel reinforced, HP/P = hydropower plant, PPP = public-private partnership, S/S = substation, SW/S = switching station.

Sources: Nepal Electricity Authority and Asian Development Bank estimates.

## NEPAL ELECTRICITY AUTHORITY FINANCIAL PERFORMANCE

### A. Nepal Electricity Authority Past Financial Performance

1. Since 2001, the already poor financial position of the Nepal Electricity Authority (NEA) has been steadily deteriorating. The NEA last made a profit from operations in FY1998 (NRs154 million). In FY2007, the NEA made an accounting profit of NRs262 million; this resulted from foreign exchange rate gains on Japanese yen loans. Details of past performance are in Supplementary Appendix A.

2. The NEA's underlying performance has been one of declining profitability, with no tariff increases since FY2001, but rising costs of energy purchases and other operating costs. The budgeted loss for FY2009 was NRs2,700 million, the highest in the NEA's history. The NEA has only been able to meet its cash operating expenses and maintain ongoing capital investment in recent years by deferring interest and principal repayments, and delaying royalty payments. At the end of FY2008, interest during construction and interest arrears totaled NRs18.8 billion, and unpaid royalties<sup>1</sup> totaled NRs602 million. Meanwhile debtors represented 4.8 months of sales with municipal street lighting arrears accounting for NRs2.0 billion<sup>2</sup> and representing 39% of accounts receivable at the end of FY2008. In its FY2009 budget, the NEA projected NRs1,748 million of debt service out of the NRs4,671 million that was actually due for payment.

3. Existing Asian Development Bank (ADB) financial covenants are (i) rate of return of 6.0% per annum on revalued net fixed assets in service,<sup>3</sup> (ii) self-financing ratio of 23% on an average of 3 years capital expenditure, (iii) debt service ratio of 1.2 times debt service, and (iv) accounts receivable of less than 3 months. For FY2008 none of these covenants were met, with the NEA being in partial or full noncompliance for most of the last 5 years.

**Table A7.1: Nepal Electricity Authority Key Financial Indicators**

Covenant	2001	2004	2005	2006	2007	2008
Return on average NFA	6.7%	1.8%	4.3%	2.8%	6.1% <sup>a</sup>	1.3%
Debt-service ratio	1.8	0.9	0.9	0.8	1.1	1.0
Self financing ratio (3 year average)	11.3%	18.5%	26.3%	18.7%	47.4%	12.4%
Accounts receivable (months)	2.5	3.8	3.5	3.7	4.3	4.8

NFA = net financial assets.

<sup>a</sup> Includes revaluation on yen loans. If this is excluded then return on average NFA is 5.1%.

Source: Nepal Electricity Authority.

### B. Financial Management Assessment

4. A financial management assessment questionnaire was completed for the NEA, and a financial management review and assessment of existing accounting and reporting procedures is set out in Supplementary Appendix C. While internal controls are in place, they are not

<sup>1</sup> The Nepal Electricity Act (1989) provided for 1% of the electricity sales as royalty to be paid by the NEA and independent power producers (IPPs). In the case of IPPs the royalty is based on costs of generation. Those of the NEA are based on sales revenues from hydro generation. Later, the NEA argued for royalty payments to be also based on its generation costs. The compromise agreed upon was that the NEA's royalty calculation would be based on the average generation costs of IPPs times NEA's total generation from hydropower sources.

<sup>2</sup> Subsequent to balance date, the Ministry of Local Development has paid the NEA NRs1.0 billion and the NEA has written off NRs1.0 billion of street lighting arrears. The ministry has appointed a consultant to devise a long-term payment procedure for street lighting satisfactory to the NEA.

<sup>3</sup> It is proposed that this covenant be revised to read "rate of return of 6% on net fixed assets in service on a historic basis" so that it is consistent with World Bank covenants.

adequate. This has led to a series of audit queries surrounding cash, stock, and fixed assets over the years. The NEA sets up task forces to deal with these matters, which were never properly resolved to the satisfaction of the auditors. The NEA's accounting and financial management systems are being upgraded and computerized with support from the World Bank. This includes computerization and integration of all systems, revised manual procedures, and extensive staff training. This should result in improved and timely management and financial reporting and a marked reduction in auditing issues. As a consequence of these initiatives,<sup>4</sup> the proposed project financial management arrangements are considered satisfactory.

### C. Financial Projections and Nepal Electricity Authority Financial Restructuring

5. Financial projections were prepared for the NEA up to FY2020. There is unlikely to be any major additions to generation capacity prior to FY2013, with power purchases needing to increase to bridge the gap in generation, and the NEA needing to find funding to meet both generation and transmission investments necessary to improve the present supply. Accordingly, the discussion below concentrates on FY2010–FY2015. In the absence of tariff increases, the NEA's cash shortfall after meeting forecast capital expenditure and all debt service obligations would be NRs60.2 billion. Tariff increases necessary to ensure a positive cash position by FY2015 would be 10.0% per annum, with the average tariff increasing from NRs6.74 per kilowatt-hour (kWh) to NRs11.95/kWh. Accordingly, in the absence of any major tariff increases to improve the NEA's cash flow, other options such as financial restructuring of the NEA need to be examined to improve the NEA's financial position. These are outlined below. While capital expenditure could be deferred, this would exacerbate the present supply situation. However, prioritization of expenditure is essential.

### D. Restructuring Plan for the Nepal Electricity Authority

6. **Balance Sheet Items.** These are to (i) convert grants to the Government that are currently onlent to the NEA as loans to equity (value of loans was NRs188 billion at 15 July 2008), (ii) convert Government loans to the NEA for Middle Marsyangdi hydropower station to equity (value of loan was NRs5.0 billion as at 15 July 2008), (iii) convert ADB's Eighth Power Project<sup>5</sup> loan for rural electrification to equity (value of loan was NRs3.5 billion as at 15 July 2008), (iv) convert current interest arrears and interest during construction arrears to equity, and (v) pass ADB's proposed loan to the Government of \$65 million for the Clean Energy Access Improvement Project and ADB's proposed grant of \$4.5 million from the Climate Change Fund and Clean Energy Fund to the NEA as grant or equity.

7. **Revenue and Expense Items.** These are (i) to reduce onlending rates on all other Government loans to the NEA from 8% to 5%; (ii) to utilize a share of royalties paid by the NEA to the Government (about 40% of total royalties) to partly cover the NEA's operating losses on rural electrification; (iii) for the Government to fund unit cost escalation, on FY2009 prices, for the NEA's electricity purchases from India and independent power producers;<sup>6</sup> (iv) to capitalize interest during construction rather than being paid out by the NEA; (v) for future street lighting arrears for municipalities and village development committees to be paid by the Government once these are 3 months in arrears; (vi) for the Government to finance all rural electrification investments as equity with no contribution from the NEA; (vii) for the Government to directly

<sup>4</sup> ADB is also proposing technical assistance for 2010 that will include financial management as one of its areas of attention, with the objective of strengthening the NEA's financial management skills, especially in the area of financial planning, so that the NEA will be better placed to assess its long-term funding and tariff requirements.

<sup>5</sup> ADB. 1999. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to Nepal for the Rural Electrification, Transmission and Distribution Project*. Manila.

compensate the NEA for the recently announced elimination of the demand charge and for any future adverse changes to the NEA's earnings; and (vii) to defer a proportion of remaining debt repayments as required for FY2010–FY2015 until such time as the NEA is able to meet its reduced debt service.

8. Converting onlent grants has a total cash flow benefit of NRs16.0 billion, and reducing interest rates has a total cash flow benefit of NRs13.6 billion. Converting the Middle Marsyangdi government loan and ADB's Eighth Power Project loan to equity adds a further NRs6.4 billion of total cash flow benefit during FY2010–FY2015. Using a share of royalties (40%) to cover rural electrification operating losses results in a NRs3.7 billion total cash flow benefit to the NEA. A further NRs8.7 billion of total cash flow benefit accrues to the NEA with the Government meeting the unit cost escalation, on FY2009 prices, for the NEA's electricity purchases from India and independent power producers. When these measures are combined with debt restructuring, the total cash flow benefit to the NEA is NRs42.6 billion over FY2010–FY2015.

9. Financial projections for the restructured NEA, following the above Government initiatives, require tariff increases of 8.0% per annum from FY2012 to FY2015 (i.e., 4 years of 8% annual tariff increases) to achieve a cash-neutral position for the NEA by FY2015. Such increases would be acceptable to the public once the NEA's electricity supply and service improves. This tariff increase would allow ADB and World Bank loan covenants of a debt service ratio of 1.2 times debt service and the rate of return on historic net fixed assets of 6.0% to be achieved by FY2013 (Table A7.2).

10. To allow the NEA to meet essential capital expenditure requirements, the Government will need to provide additional debt repayment relief by deferral of principal repayment on debt. This will be required until tariff increases take effect and purchases from India decline from 23% of the electricity sales mix in FY2013 to approximately 1% of the mix in FY2015. A total of NRs13.6 billion of debt repayment deferral will be necessary through to FY2013.

**Table A7.2: NEA Financial Projections after Restructuring Options and Tariff Increases**

FY (15 July)	2009	2010	2011	2012	2013	2014	2015	2020
<b>Summary Ratios and Tariffs</b>								
Return on Average NFAs (%)	-0.7	4.7	2.9	5.6	9.2	9.4	9.3	6.0
Debt-service Ratio (DSR, times)	0.5	1.2	1.1	1.4	1.5	1.7	1.8	1.5
Self Financing Ratio (%), 3-year average	10	21	-2	4	11	38	127	392
Debt (LT)/Debt+Equity Ratio (%)	53	38	44	48	49	48	46	32
Average Tariff (NRs/kWh)	6.74	6.74	6.74	7.28	7.87	8.50	9.18	9.18
% Change per annum	0.0	0.00	0.00	8.00	8.00	8.00	8.00	0
IPP Purchases (NRs/kWh)	5.77	5.94	6.12	6.30	6.49	6.69	6.89	7.98
Indian Purchases (NRs/kWh)	5.52	5.83	6.15	6.49	6.84	7.22	7.62	9.96
Average Costs (NRs/kWh)	7.87	6.93	7.37	7.40	7.17	7.04	7.16	8.33

DSR = debt service ratio, IPP = independent power producer, kWh = kilowatt-hour, LT = long term, NFA = net financial assets, RoR = rate of return.

Source: Asian Development Bank estimates.

<sup>6</sup> Forecast electricity generation and sales are based on: NEA. 2008. *System Planning Report*. Kathmandu, revised to reflect expected timing of generation projects. In the absence of major hydro investments prior to FY2013, electricity sales would be met by increased imports from India and IPPs (assumed to increase by around 40 megawatts per year). Annual escalation in IPP tariffs of 3.0% and purchase prices from India of 5.5% are anticipated.



## FINANCIAL ANALYSIS

### A. Methodology and Major Assumptions

1. The financial analysis of the proposed subprojects has been carried out in accordance with the Asian Development Bank's *Financial Management and Analysis of Projects*<sup>1</sup>. All financial costs and benefits have been expressed in constant 2009 price levels. Cost streams used for the purposes of financial internal rate of return (FIRR) determination reflect the costs of delivering the estimated benefits. Financial analysis was undertaken for the major components (1, 2, and 4) of the Project.

2. The weighted average cost of capital (WACC) of the Nepal Electricity Authority (NEA) was calculated for the proposed subprojects and compared with the project FIRRs to ascertain the financial viability of the subprojects. The sensitivity of the FIRR to adverse movements in the underlying assumptions was also assessed.

3. Financial viability was examined by comparing the incremental costs and benefits of the with-investment and without-investment scenarios. The incremental benefits arise through the increased electricity sales and avoidance of incremental generating costs at peak and off-peak times over both the summer and winter supply periods. Average incremental generation costs were determined based on the NEA's generation expansion plan, and average incremental transmission costs were added to derive total costs of supply to transmission subprojects. To this, estimated distribution average incremental costs were added to give total costs of supply to distribution subprojects.

4. It is assumed that the subprojects will have a 30-year economic life and residual value of 33% of the original investment at the end of the 20-year evaluation period.

5. The current average the NEA retail tariff of NRs6.74 per kilowatt-hour (kWh) was adopted for evaluation purposes because sales, although predominantly in the Kathmandu valley, would also benefit other parts of the country as a result of improved reliability and increased transmission capacity. In the case of grid interconnections with India, the current purchase price of energy is valued at NRs5.24/kWh.

### B. Calculating the Weighted Average Cost of Capital

6. To compute the WACC, it is assumed that the financing sources would consist of the NEA and Government equity contributions and foreign sources by way of the proposed Asian Development Fund grant. On this basis, project funding might be described as being "all equity." However, this does not reflect the cost of capital faced by the NEA for the bulk of its projects, and also its current poor financial status. The NEA is borrowing funds on the domestic bond market at around 10.5%, essentially to provide equity contributions to the Project and other projects. The NEA's standard project funding structure is 80% foreign loan—currently at an interest rate of 8%—and equity contributions with 75% from the NEA and 25% from the Government.

7. The NEA's equity was therefore valued by adding issuing costs (1.5%) and a risk premium (3.0%) to the domestic bond rate (10.5%), giving an estimated cost of equity of 15.0%. The analysis assumes that, for standard project financing, any concessional loans or grants are

---

<sup>1</sup> ADB. 2005. *Financial Management and Analysis of Projects*. Manila.

passed through to the NEA in rupees with an interest rate including allowance for the implicit Government guarantee fee and foreign exchange premium (the current onlending rate is 8%). The WACC is calculated on a post-tax basis, but because the NEA currently does not pay tax and is unlikely to do so in the foreseeable future, the interest tax shield has been ignored in determining WACC. As shown in Table A8.1, the average WACC is calculated as 1.3%.

**Table A8.1: Weighted Average Cost of Capital**

Item	ADB Loan	Equity	Total
Weighting	80.0%	20.0%	100.0%
Nominal Cost	8.0%	15.0%	
Tax Rate	0.0%	0.0%	
Tax Adjusted Nominal Cost	8.0%	15.0%	
Inflation Rate	8.0%	8.0%	
Real Cost	0.0%	6.5%	
WACC	0.0%	1.3%	1.3%

WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

### C. Calculation of Financial Internal Rate of Return, Risk Assessment, and Sensitivity Analyses

8. FIRRs for component 1 (transmission) subprojects are shown in Table A8.2.<sup>2</sup>

**Table A8.2: Summary of Subproject Financial Internal Rates of Return for Transmission Component**

Transmission Subprojects	FIRR
T1. Marshyangdi transmission line and substation upgrades	(5.8%)
T2. Chapali transmission substation and 66 kV cable circuit	3.2%
T3. Butwal–Mahendranagar transmission line and substation upgrades	17.8%
T4. Matatirtha transmission substation	24.0%
T5. Shunt capacitor banks	31.4%
Aggregate Component 1 (transmission)	12.2%

( ) = negative, kV = kilovolt.

Source: Asian Development Bank estimates.

9. Only subproject T1 has an FIRR below the WACC of 1.3%. This subproject is primarily driven by the need to improve security of supply for evacuation of electricity from Marshyangdi hydropower station, and a secondary benefit arises from improvement to security of supply through an important transmission corridor. Since Marshyangdi hydropower station represents around 10% of the NEA's installed capacity, a tripping of the single circuit that currently evacuates electricity from this station could cause severe instability in the system, and may result in a cascade outage over the entire network. The cost of this low-probability event would be extreme. Therefore, this subproject needs be considered as an integral part of the transmission investment program even though its FIRR is below the hurdle rate.

<sup>2</sup> Subproject T3 as considered in this financial analysis involves stringing a second 132 kV transmission circuit from Butwal to Mahendranagar. However, the proposed loan will only fund the line from Butwal to Kohalpur (the line's midpoint), with an expectation that the balance of the second circuit stringing will be funded from a follow-up ADB loan or from NEA's own resources. Analysis of the entire line has been undertaken to overcome the difficulties inherent in attempting to ascribe benefits to an upgrade to only part of a transmission line

10. The FIRR for component 2 (distribution) is estimated at 8.0%, and for component 4 (loss reduction) it is estimated at 5.9%. The aggregate FIRR is 11.0%. These FIRRs compare favorably with the estimated value of WACC at 1.3%. Therefore, the analysis substantiates the financial viability of the subprojects and the overall project.

#### D. Risk Assessment and Sensitivity Analyses

11. **External Risks.** Regulatory or tariff revision risk for the subprojects is minimal as no tariff increases have been assumed in the financial analysis. The current tariff has not been increased since May 2001 and the Government has assured that any declines in nominal tariff will be directly compensated.

12. Electricity demand risk is minimal since the country is already experiencing daily load shedding of 16–18 hours during winter months. Geopolitical and political risks are present for all projects in Nepal. However, the nature of the investments and the overall shortage of power in Nepal serve to diversify this risk. Therefore, the overall risk to the financial sustainability of the NEA is deemed to be minimal, with the Project seen as a necessary step in improving the supply situation, especially through improved interconnection with India, thus improving the NEA's financial situation.

13. **Project-Specific Risks.** Financial risks at subproject level include (i) increase in price of civil works and equipment, (ii) delays in project implementation, and (iii) failure to have access to necessary counterpart funds. These risks are considered to be low because (i) the cost estimates were based on recent tenders received, and advanced procurement will lessen the time between loan effectiveness and disbursement; (ii) the NEA's implementation capacity is low but adequate, and consulting support will be provided for implementation of the loss reduction component; and (iii) the projections prepared for the NEA demonstrate that, with restructuring and Government support, cash flows will improve by 2015 and that thereafter the NEA will be able to meet the repayment of debt associated with the investments.

14. **Sensitivity Analysis.** Separate analyses were carried out to examine the sensitivity of projected financial returns to adverse changes in key variables. The variables considered for the sensitivity analyses were (i) a 10% increase in capital costs, (ii) a 10% increase in operating and maintenance costs, (iii) a 10% decrease in revenues, and (iv) a 2-year implementation delay with a 20% increase in costs and no allowance for residual values. Table A8.3 demonstrates that the results are robust for each component and for the overall Project, with the sensitivities exceeding the WACC. Components are most sensitive to cost overruns and delays.

**Table A8.3: Financial Internal Rate of Return Sensitivity Analyses**

Sensitivity Parameter	Component			Aggregate
	Transmission	Distribution	Loss Reduction	
<b>Base Case</b>	<b>12.2%</b>	<b>8.0%</b>	<b>5.9%</b>	<b>11.0%</b>
Capital +10%	11.2%	7.3%	5.1%	10.0%
Operating +10%	12.1%	7.9%	5.7%	10.8%
Benefits -10%	11.0%	7.1%	4.8%	9.8%
All the above	9.9%	6.2%	3.8%	8.8%
Two-year delay and 20% capital cost increase	9.1%	6.0%	3.9%	8.2%
No Residual Value	12.0%	7.6%	5.0%	10.7%
Weighted Average Cost of Capital	1.3%	1.3%	1.3%	1.3%

Source: Asian Development Bank estimates.

## ECONOMIC ANALYSIS

### A. Background and Approach

1. Economic analysis was undertaken to determine the economic viability of project components. The analysis sought to

- (i) verify electricity demand and supply projections,
- (ii) review the least-cost approach to system and project planning in Nepal,
- (iii) undertake cost–benefit analysis of the proposed transmission and distribution loan components, and
- (iv) identify distribution of project costs and benefits among key stakeholders.

2. Economic benefits will accrue from incremental electricity consumption and from displacement of more expensive sources of energy. The incremental costs and benefits of subprojects were estimated by comparing with-project and without-project scenarios. Transmission subprojects were analyzed separately; distribution subprojects were aggregated for the purposes of analysis, as were loss reduction subprojects. The generation component focuses on minor plant modernization for which benefits are difficult to quantify, and has therefore been excluded from the analysis.

### B. Calculation of Economic Internal Rate of Return, Risk Assessment, and Sensitivity Analysis

3. **Demand Forecast.** The demand forecasting methodology and model of the Nepal Electricity Authority (NEA) were originally prepared during the 1998 Power System Master Plan<sup>1</sup>. The NEA has updated key model assumptions periodically since 1998. The model estimates demand for electrical energy and peak power on the integrated Nepal power system. It uses a standard econometric approach, linking the demand for electrical energy to economic and income growth (measured by growth in gross domestic product) and electricity prices (measured by real changes in electricity tariffs). The NEA translates this aggregate demand forecast to a regional and substation demand forecast by pro-rating on the basis of previous years' demand. The NEA models five customer groups: domestic, industrial, irrigation, commercial, and others (government, religious, and temporary). Overall, the NEA forecasts electricity demand to grow by 9.9% per annum in 2009–2017. Peak demand is forecast by the NEA to grow by 9.7% over the same period, with a decline in losses from 23% to 18.5%.

4. **Least-Cost Planning.** For all subprojects, the NEA's planners have identified and analyzed alternatives where they exist, and have confirmed that the proposed subprojects are least-cost. The NEA conducts informal least-cost analysis for its distribution subprojects. This means that that desired outcomes are identified, and the NEA's senior engineers discuss and identify the best approach to achieving the desired outcomes. While not ideal, this approach does implicitly include consideration of technical practicalities and expected costs, and given that the distribution network is almost entirely radial with no interconnection, there are typically few if any alternatives open to the NEA. The NEA's standard distribution substation and circuit designs are considered reasonable from a cost perspective, striking a good balance between simplicity, reliability, and flexibility for future upgrading. For all distribution subprojects, the NEA has confirmed that it has considered a reasonable range of alternatives and that the proposed subprojects represent the least-cost means of achieving the desired outcomes.

<sup>1</sup> Nepal Electricity Authority. 1998. *Power System Master Plan*. Kathmandu.

5. **Project Costs.** All costs and benefits have been expressed at a constant 2008 price level; the world price numeraire was used. Traded inputs were valued at their border price equivalent values. Nontraded inputs were valued at domestic prices and then adjusted to the world price numeraire by multiplying by the estimated standard conversion factor of 0.94. The standard conversion factor was calculated using a simple trade-weighted approach. Capital costs included physical contingencies but excluded taxes, price contingencies, and financial charges during construction. Based on international experience, the operating costs for the transmission subprojects were estimated at 1.5% of capital costs, and 2% for the distribution subprojects. It was assumed that there are no significant distortions in the wage rates for skilled labor. In the case of unskilled labor, underemployment exists in the economy, and a shadow wage rate of 0.75 was adopted. The World Bank's projections of crude oil prices, which were extended to 2030 by assuming flat real prices beyond 2020, were used for establishing the international parity values of petroleum fuels that would be consumed if electricity was not available due to electricity supply constraints. These prices were also used for estimating the cost of thermal electricity generation. Average incremental generation costs were determined based on the NEA's generation expansion plan. Average incremental transmission costs were added to derive total costs of supply to transmission subprojects. To this, estimated distribution average incremental costs were added to give total costs of supply to distribution subprojects.

6. **Project Benefits.** Current capacity constraints in both transmission and distribution networks mean that frequent supply interruption is required to ensure that networks are not overloaded. The proposed subprojects are primarily concerned with removing these network constraints, improving reliability of supply, and reducing losses. This will be achieved through additional line and substation capacity, network reconfiguration, and the addition of capacitor banks to reduce reactive power flows. Analysis of the current and forecast electricity demand and supply balance in Nepal reveals that during winter there is always a generation shortage through to 2013. This means that during winter through to 2013 any reduction in losses will lead to reduction in unserved demand and displace other forms of alternative power supplies, including captive generation. During other periods any reduction in losses will result in only a resource cost savings as generation is reduced. Further, any increases in network capacity to relieve constraints will only have value during generation surplus periods since demand downstream of constraints can only be supplied if there is a generation surplus.

7. Nonincremental outputs from transmission and distribution components of the Project were valued at the resource cost savings that would accrue if the Project were to proceed. In valuing the output of subprojects, it was assumed that most captive generation and kerosene lighting would be displaced before incremental consumption occurs. Benefits were allocated across consumer groups on the basis of estimated use of alternative energy sources for each group.

8. Incremental outputs were valued using the estimates of willingness of Nepali consumers to pay for additional electricity, adjusted to the appropriate voltage level of each subproject. Demand functions relating energy price to energy demand were estimated for each of the four main consumer types (domestic, commercial, industrial, and agricultural). The form of the demand function follows ADB's Economics and Research Department Technical Note No. 3 *Measuring Willingness to Pay for Electricity*.<sup>2</sup> Demand functions were derived using two data points for each consumer type: (i) the long term average economic cost and quantity of alternative energy sources; and (ii) the NEA's marginal tariffs for consumers consuming the

---

<sup>2</sup> ADB. 2002. *Measuring Willingness to Pay for Electricity. ERD Technical Note No. 3.* Manila.

average quantity of electricity, adjusted for reported and estimated suppressed demand and collection efficiency. Regression analysis was then used to derive the four demand functions. The derived demand functions were then applied and solved, on a year-by-year basis, to value the incremental consumption enabled by each subproject and for each consumer type. Benefits were allocated across consumer groups on the basis of the current consumer mix.

9. Some of the transmission subprojects aim to reduce the high number of unscheduled, short-duration power outages that are currently experienced. These outages carry a high economic cost in terms of lost production and output. For the purposes of analysis, Nepal's domestic product per unit of electricity sold, adjusted downwards to account for the fact that a few large industries and commercial consumers self-generate, was taken as a proxy for the value of energy not served due to unscheduled short-duration outages.

10. Benefit quantities and unit values for the first few years after Project commissioning are summarized in Table A9.1. The ongoing and extreme generation shortages that Nepal is experiencing are apparent in this table. Generation shortages mean that benefits cannot be fully realized and actually decline for the first few years as generation shortages worsen. The high economic cost of these shortages is apparent in the initially increasing average unit benefit of Project output through to 2014, especially when compared to the current average tariff of \$0.07 per kilowatt-hour (kWh).

**Table A9.1: Economic Benefits**

<b>Economic Benefits</b>	<b>Units</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
Quantity								
Incremental output	GWh	38.4	23.7	13.7	19.6	24.8	46.1	64.8
Non-Incremental output	GWh	13.4	10.0	5.3	5.4	10.7	19.2	26.5
Reduced energy not served	GWh	2.0	2.0	2.1	2.1	2.1	2.1	2.2
Unit Value								
Average willingness to pay	\$/kWh	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Average resource cost saving	\$/kWh	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Average value of energy not served	\$/kWh	2.85	2.85	2.85	2.85	2.85	2.85	2.85
Aggregate average unit benefit	\$/kWh	0.27	0.34	0.56	0.44	0.38	0.28	0.25

Source: Asian Development Bank estimates.

11. **Estimated Economic Internal Rate of Return.** A period of 25 years was used for economic evaluation. The detailed cost–benefit calculations show investments are expected to deliver significant economic benefits, as summarized in Table A9.2.<sup>3</sup> The aggregated estimated EIRR is 19.1% (Table A9.2). Only the Marshyangdi transmission line and substation upgrade subproject has an EIRR below the hurdle rate of 12%. This subproject is primarily driven by the need to improve security of supply for evacuation of electricity from Marshyangdi hydropower station. Marshyangdi hydropower station represents around 10% of the NEA's installed

<sup>3</sup> Subproject T3 as considered in this economic analysis involves stringing a second 132 kilovolt (kV) transmission circuit from Butwal to Mahendranagar. However, the proposed loan will only fund the line from Butwal to Kohalpur (the line's midpoint), with an expectation that the balance of the second circuit stringing will be funded from a follow-up ADB loan or from the NEA's own resources. Analysis of the entire line has been undertaken to overcome the difficulties inherent in attempting to ascribe benefits to an upgrade to only part of a transmission line.

generating capacity, and a tripping of the single circuit that currently evacuates electricity from this station could cause severe instability in the system. The cost of this low-probability event would be high. Therefore, it is recommended that this subproject be considered as an integral part of the transmission expansion program and that it be included in the investment program even though its EIRR is below the hurdle rate.

**Table A9.2: Economic Internal Rate of Return Results**

<b>Subproject</b>	<b>EIRR</b>
Transmission Component	
T1. Marshyangdi transmission line and substation upgrades	7.0%
T2. Chapali transmission substation and 66 kV cable circuit	14.9%
T3. Butwal–Mahendranagar transmission line and substation upgrades	17.8%
T4. Matatirtha transmission substation	24.3%
T5. Shunt capacitor banks	48.3%
<b>Aggregate Transmission</b>	<b>19.5%</b>
Distribution Component	16.8%
Loss Reduction Component	21.0%
<b>Combined Subprojects</b>	<b>19.1%</b>

EIRR = economic internal rate of return.

Source: Asian Development Bank estimates

**Table A9.3: Economic Internal Rate of Return Calculation for Combined Transmission and Distribution Components**  
(\$ million)

Year	Benefits		Costs			Net Benefits
	Incremental Output	Non-Incremental Output	Capital	Supply	O&M	
2009	0.0	0.0	0.0	0.0	0.0	0.0
2010	0.0	0.0	18.3	0.0	0.0	18.3
2011	0.0	0.0	51.3	0.0	0.0	51.3
2012	9.1	5.4	17.7	2.5	0.0	17.7
2013	7.8	4.3	0.0	0.0	0.0	12.1
2014	7.0	4.8	0.0	0.0	1.3	10.5
2015	7.6	4.3	0.0	0.0	1.5	10.4
2016	8.2	6.0	0.0	0.0	1.6	12.6
2017	10.2	8.8	0.0	0.0	1.6	17.3
2018	11.9	11.2	0.0	0.0	1.6	21.5
2019	12.8	11.9	0.0	0.3	1.6	22.8
2020	15.1	16.2	0.0	2.6	1.6	27.1
2021	16.6	18.6	0.0	4.0	1.6	29.5
2022	17.2	19.3	0.0	4.5	1.6	30.4
2023	17.7	20.1	0.0	4.9	1.6	31.2
2024	18.1	20.9	0.0	5.3	1.6	32.1
2025	18.6	21.8	0.0	5.6	1.6	33.1
2026	18.9	22.7	0.0	5.9	1.6	34.1
2027	19.3	23.7	0.0	6.2	1.6	35.3
2028	19.8	24.8	0.0	6.5	1.6	36.5
2029	20.3	26.0	0.0	6.9	1.6	37.8
2030	20.4	26.0	0.0	6.9	1.6	38.0
					<b>EIRR</b>	<b>19.1%</b>

EIRR = economic internal rate of return, O&M = operation and maintenance.

Source: Asian Development Bank estimates.

12. **Sensitivity and Risk Analysis.** The risks that the subprojects do not achieve such high levels of economic returns were identified from both cost and benefit side. For each of the risks identified, the sensitivity of the EIRR was tested and switching values were calculated.<sup>4</sup> On aggregate, the EIRR exceeds 12% in all cases. EIRR sensitivity results are shown in Table A9.4. Based on these results, the Project appears to be economically viable.

**Table A9.4: Sensitivity Analysis for Combined Transmission and Distribution Components**

Sensitivity Parameter	Variation	EIRR	Switching Value
Base case		19.1%	
1 Project capital costs	+ 10%	17.7%	48.7%
2 Benefits	- 10%	17.3%	-38.3%
3 Cost of supply	+ 20%	18.9%	532.9%
4 Operation and maintenance	+ 20%	18.9%	752.2%
5 Commissioning Delayed	1 year	16.5%	
6 Combined (1, 2, 3, 4, and 5)		13.4%	

Source: Asian Development Bank estimates.

13. **Distribution Analysis.** The distribution of costs and benefits among stakeholders was assessed by comparing financial costs and benefits to economic costs and benefits. Overall, the economic net present value exceeds the financial net present value by \$75.8 million. Consumers are the greatest beneficiaries, with net benefits of about \$42.2 million. Unskilled labor benefits by approximately \$0.7 million, and Nepal's economy benefits by approximately \$32.8 million. The NEA is a net loser in this analysis (\$34.8 million), as its weighted average cost of capital and therefore its expected financial internal rate of internal on the investment is well below the 12% discount rate used in the analysis.

14. **Sustainability.** The proposed investments represent the most urgent subprojects. Taken together they will make a discernable difference to the quality of electricity supply received by many consumers. With appropriate institutional support to the NEA and the Government, economic benefit flow is expected to be financially and institutionally sustainable. In the medium term, the sector will be supported by a more transparent tariff-setting regime that will, over time, permit full recovery of efficient costs. This tariff regime will ensure that the NEA can implement its proposed investment program in the knowledge that new capital and operating costs are recoverable and that it will earn an acceptable return on capital. Investment funds will come from different sources including government equity, bilateral partners, the World Bank, and the Asian Development Bank. Internal generation of funds is not forecast to be a viable financing source for the NEA until 2015 at the earliest, as a consequence of the current gap between cost of supply and tariffs.

### C. Conclusion

15. The economic analysis confirms that the proposed investment is least-cost and economically viable. The analysis yields an overall EIRR of 19.1%. Sensitivity and risk analysis demonstrates that the expected economic performance is robust. From an economic perspective the proposed investment should proceed.

<sup>4</sup> A switching value measures the percentage change in the variable required to reduce the EIRR to the assumed hurdle rate.



## DESCRIPTION OF ENERGY EFFICIENCY IN LIGHTING COMPONENT

### A. Background and Rationale

1. Nepal is presently experiencing critical power shortages. Both supply- and demand-side options can be used to reduce the gap between the demand for and the supply of electricity. Supply-side management measures tend to have medium- to long-term gestation periods, whereas demand-side management (DSM) options can be implemented in a short period of time, are often low cost, and are characterized by high benefit–cost ratios. Among various DSM alternatives that can be implemented quickly, a compact fluorescent lamp (CFL) distribution program has been identified as a viable option.

2. The proposed CFL program provides for the distribution of 1 million energy-efficient CFLs to residential consumers drawing electricity from Nepal's electricity grid. CFLs will be distributed free of charge to lifeline households<sup>1</sup> and on a buy-one-get-one-free basis to nonlifeline households. CFL models of 9–11 watts (W) will replace 40 W incandescent bulbs, 12–15 W CFLs will replace 60 W incandescent bulbs, and 20–23 W CFLs will replace 100 W incandescent bulbs.

3. The Government has approved the National Electricity Crises Mitigation Plan 2065<sup>2</sup> to manage the present acute energy supply shortages. Under the plan, the government intends to mobilize its resources to mitigate the adverse impacts of the power sector supply deficits. The plan identifies the CFL buy-one-get-one-free scheme as a pilot program for immediate implementation. It is estimated that there are more than 3.6 million incandescent bulbs currently sold every year in the market. Although the use of CFLs has significantly increased in the last few years, the proliferation of low-quality CFLs has distorted consumer perceptions of CFLs as reliable substitutes for incandescent bulbs. It is expected that the distribution of high-quality CFLs to residential customers will influence the consumption habit toward the adoption of CFLs in light points previously fitted with incandescent bulbs.

### B. Impact and Outcome

4. The impact of the proposed CFL program will be more efficient electricity end-use. The outcomes of this CFL program component include

- (i) peak demand reduction of about 10 megawatts (MW),
- (ii) deferred investments in new generating capacities amounting to \$18 million,
- (iii) energy savings of about 23 gigawatt-hours (GWh) per annum,
- (iv) increased sales and reduced price of good quality CFLs, and
- (v) proportionally decreased sales of incandescent bulbs and low-quality CFLs.

### C. Outputs

5. The outputs of the proposed CFL program will be the replacement of approximately 1 million incandescent bulbs with CFLs for residential consumers.

<sup>1</sup> Typically households with a 5 ampere electricity connection and/or consuming less than 20 units per month.

<sup>2</sup> Government of Nepal. 2009. *National Electricity Crisis Mitigation Plan 2065*. Kathmandu.

## D. Cost Estimates and Financing Plan

6. In its objective to reduce load shedding, the Nepal Electricity Authority (NEA) expressed interest to scale up the pilot CFL program with a \$1.7 million grant assistance sourced from the Clean Energy Fund under the Clean Energy Financing Partnership Facility and \$0.3 million from Climate Change Fund of the Asian Development Bank (ADB). Both the NEA and ADB agreed to that the scaled up nationwide program can be built on the implementation design of the pilot CFL program. The cost estimate is in Table A10.

**Table A10: Compact Fluorescent Lighting Program Cost Estimate**  
(\$'000)

Item	Total Cost
<b>A. ADB Financing</b>	
1. Consultants (CCF)	
a. Remuneration and Per Diem	
i. National Consultants (15 person-months) <sup>a</sup>	60
ii. International Consultant (2 person-months) <sup>b</sup>	45
b. International and Local Travel	15
c. Reports and Communications	10
2. Workshops, Training and/or Seminars and Conferences (CEF)	30
3. Investment on CFLs (CEF)	1,500
4. Equipment support for Demand-Side Management Unit (CEF)	40
5. Miscellaneous expenses (awareness campaign, surveys)	
CCF	140
CEF	60
6. Contingencies	
CCF	30
CEF	70
<b>Subtotal (A)</b>	<b>2,000</b>
<b>B. Government of Nepal Financing</b>	
1. Office Accommodation and Remuneration and Per Diem of Counterpart Staff	100
<b>Subtotal (B)</b>	<b>100</b>
<b>Total</b>	<b>2,100</b>

CCF=Climate Change Fund; CEF=Clean Energy Fund; CFL=compact fluorescent lamp.

<sup>a</sup> One national consultant will be recruited for implementation support and monitoring.

<sup>b</sup> International consultant will prepare the required lamp waste management study.

Sources: Nepal Electricity Authority and Asian Development Bank estimates.

## E. Implementation Arrangements

7. The NEA will be the executing agency responsible for project execution and monitoring of its operational performance. To implement the program, the proposed DSM unit will be established and staffed with qualified personnel. The DSM unit will be responsible for technical, procurement, due diligence, evaluation, monitoring, and reporting aspects of implementation. The NEA will work with CFL suppliers and distribution channels as program partners.

8. International voluntary product specifications and energy performance standards will be used for the CFLs purchased. In no case will the adopted CFL standards fall below those required under the efficient lighting initiative (ELI) technical specifications. Bayonet-capped self-

ballasted CFLs will typically be used. Power ratings and distribution quantities will be finalized after the baseline survey of domestic consumers across different meter-type classifications, monthly kilowatt-hour (kWh) consumption brackets, and geographical areas has been conducted.

9. CFL suppliers will be accredited by the NEA to establish a network of transaction and redemption points within existing CFL distribution and sales networks in Nepal. The sale or handover of each CFL will remain between the CFL supplier and the participating domestic consumer. A \$1.5 million portion of the proposed grant assistance will be used to reduce the effective selling price in each transaction. Both the NEA and ADB will pursue discussions on the possibility of collecting incandescent bulbs from participating domestic consumers as a measure to help ensure the attainability of the virtual power plant capacity target, as well as other detailed mechanics of the CFL transaction. The NEA will secure ADB clearance prior to the adoption of the final distribution plan and the accreditation of CFL suppliers.

10. As soon as the target consumers have received all 1 million CFLs, the NEA will perform a random verification survey involving households with a sampling methodology similar to that of the baseline survey. ADB will be provided with a copy of this verification survey report. Both the NEA and ADB shall then jointly evaluate the impact of the program and discuss the feasibility of further expanding the program through a subsequent CFL program phase to cover remaining incandescent bulb light points and low-quality CFLs among domestic consumers, if any.

11. The duration of this project will be 24 months including activities such as design, procurement and distribution, and monitoring.

## **F. Benefits**

12. The CFL program will result in reduced peak demand on the national electricity grid of approximately 10 MW, and 23 GWh of annual energy savings. Given the peak demand and energy constraints frequently experienced in Nepal, these savings have high economic value to the nation and high financial value to the NEA.

## DESCRIPTION OF RENEWABLE ENERGY FOR STREET LIGHTING COMPONENT

### A. Background

1. This component under the proposed Energy Access and Efficiency Improvement Project will assist the Government of Nepal to promote solar powered streetlights and wind-solar hybrid streetlights in urban areas of Nepal. This will include purchase of solar-powered street lighting and hybrid systems, replacements, and setting up a system to ensure proper maintenance and system reliability. Under this pilot project, around 1,000 streetlights will be installed in selected areas in Kathmandu valley municipalities, focusing mainly on heritage areas, major temples or other religious areas, tourist hotspots, major shopping streets, and some other main road areas.

2. Presently, Nepal faces significant electricity supply constraints and consumers have to undergo long periods of power interruptions, especially during evening peak hours. By replacing 1,000 streetlights with solar-powered streetlights, around 0.2 megawatts (MW) of peak load on the grid and 750 megawatt-hours (MWh) of annual energy can immediately be saved. The Government and the Nepal Electricity Authority (NEA) have therefore identified solar-powered street lighting as a priority activity.

3. Municipal streetlights are owned and managed by municipalities, although the NEA is carrying out maintenance on them in a few areas. Nonpayment or delay in payment of electricity arrears owed by the municipalities to the NEA for street lighting has been a contentious issue that has aggravated the financial situation of the NEA. Use of solar-powered streetlights would provide some relief to the NEA through (i) avoided diesel-fired generation at a unit cost of approximately NRs30 per kilowatt-hour (kWh) for around 40% of the year,<sup>1</sup> and (ii) avoided purchases from India for the rest of the year at around NRs5.24/kWh. The benefit to the NEA would be around NRs12 million per year.

4. Existing streetlight installations are mostly sodium vapor lamps, halogen lamps, mercury vapor lamps, and incandescent bulbs of 70 watts (W), 150 W, 250 W, and 400 W. The larger sizes tend to be used in main streets; the smaller sizes are used in less important streets, temples, and government offices. It is estimated that around 45,000 streetlights are currently installed in the Kathmandu valley.

5. Justifications for implementation of a solar-powered streetlight program include the following:

- (i) Solar power is a clean and renewable source of energy.
- (ii) Nepal has a good solar resource (300 sunny days per year, with approximately 4.5 kWh per square meter per day of energy intensity).
- (iii) Payment for street lighting energy is a problem for municipalities. This problem will be resolved by solar-power streetlights, and the NEA's revenue leakage will be reduced.
- (iv) The program will mitigate the effects of capacity and energy shortages during peak demand periods.

---

<sup>1</sup> The current supply shortfalls that affect the integrated Nepal power system for most of winter mean that any peak capacity and energy that is freed up through the introduction of solar-powered streetlights will be consumed by other consumers, and there will actually be an increase in sales rather than a reduction in generation.

- (v) Where solar-powered streetlights are deployed to areas that currently have no public lighting, there will be reductions in crime and fear of crime, and improvements in the safety and security of pedestrians.

## B. Impact and Outcome

6. The impact of the solar street lighting component will be reduced burden on the national electricity grid allowing greater energy access to people. The outcome would be gradual shifting of street lighting load away from the national electricity grid through renewable energy-based street lighting systems.

## C. Outputs

7. The program will have the following outputs:
- (i) Replacement of incandescent bulbs, sodium vapor lamps, and mercury vapor lamps with compact fluorescent, low-pressure sodium, or light-emitting diodes (LEDs) powered by solar and wind energy.
  - (ii) Retrofitting of existing conventional street lighting systems with solar lights and wind-solar hybrid lights systems.
  - (iii) Installation of turnkey package systems of solar-powered street lighting systems and wind-solar hybrid street lighting systems.

## D. Cost Estimate and Financing Plan

8. The total program cost will be \$2.7 million, as shown in Table A11. The Government will finance \$0.2 million of this and the balance will be financed from ADB's Multi-Donor Clean Energy Fund under the Clean Energy Financing Partnership Facility.

**Table A11: Solar and Solar-Wind Streetlight Program Cost Estimate**  
(\$'000)

Item	Total Cost
<b>A. Asian Development Bank Financing</b>	
1. Consultants	
a. Remuneration and Per Diem	
i. National Consultant (15 months)	60
b. Local Travel	5
c. Reports and Communications	1
2. Workshops, Training and/or Seminars, and Conferences	20
3. Investment on Street Lighting (supply and maintenance)	2,200
4. Miscellaneous Expenses (surveys, etc.)	20
5. Contingencies	194
<b>Subtotal (A)</b>	<b>2,500</b>
<b>B. Government of Nepal Financing</b>	
1. Office Accommodation and Remuneration and Per Diem of Counterpart Staff	200
<b>Subtotal (B)</b>	<b>200</b>
<b>Total</b>	<b>2,700</b>

Source: Asian Development Bank estimates.

## **E. Implementation Arrangements**

9. The NEA will be the executing and implementing agency for this component. The NEA will establish a technical team that will procure the solar streetlight components following ADB's *Procurement Guidelines* (2007, as amended from time to time) and install and maintain them. Consulting services will be provided to the NEA to help (i) identify the exact locations of the streetlights to be replaced and/or installed, (ii) design the system, (iii) assist in preparing bids and procurement, and (iv) supervise the installation of solar streetlights. NEA staff will also be trained in operation and maintenance of solar streetlights.

10. A coordination committee will be established comprising representatives from the Ministry of Local Development (chair), NEA, participating municipalities, the Alternative Energy Promotion Center, and other relevant personnel. The committee will identify key areas for installation of solar streetlights and oversee the implementation of the program. The Alternative Energy Promotion Center will assist in testing the solar equipment, and will provide other technical inputs to the technical team in the NEA and the committee. Community groups and/or committees will be mobilized in each program area to work with the NEA to maintain the streetlights.

## **F. Benefits**

11. The energy consumed by 1,000 conventional streetlights is equivalent to about 750 MWh per year, all of which is drawn from the grid. If this amount of energy at the user end is replaced by solar-powered streetlights, the potential energy savings is 750 MWh annually. The benefit to the NEA would be around \$0.15 million (cost of avoided diesel generation plus cost of avoided purchases from India). The total physical investment cost of the program is \$2.1 million. On this basis, the simple payback period would be around 14 years.

## **G. Potential Program Areas**

12. The following have been identified as potential pilot areas for the program (with proposed number of streetlight installations in parentheses); all are in the Kathmandu valley.

- (i) Thamel (63 installations);
- (ii) New Road (62 installations);
- (iii) Pashupatinath, Bouddha, and Swoyambhunath stupas (40 installations);
- (iv) Patan and Bhaktapur heritage sites (25 installations);
- (v) Kingsway (33 installations); and
- (vi) main roads leading to Kathmandu Airport (245 installations).

## SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

<b>Country and Project Title:</b> Nepal/Energy Access and Efficiency Improvement Project			
<b>Lending/Financing Modality:</b>	Project	<b>Department/ Division:</b>	South Asia Department/ Energy Division
<b>I. POVERTY ANALYSIS AND STRATEGY</b>			
<b>A. Link to the National Poverty Reduction Strategy and Country Partnership Strategy</b>			
<p>Nepal is one of the poorest countries in the world with a per capita gross domestic product of around \$383. More than 80% of the country's population lives in rural areas, where poverty is more prevalent and severe than in urban areas. Poverty incidence in Nepal is high, and is more severe among unprivileged social groups. The 2003–2004 Nepal Living Standard Survey shows that, although poverty in Nepal declined between 1995–1996 and 2003–2004, 31% of Nepalese people are still below the national poverty line as of 2003–2004. The rate of poverty reduction was lower in rural areas (20%) compared with urban areas (56%) between 1995–1996 and 2003–2004.</p> <p>In Nepal, electricity has been considered as important to improving quality of life and is the most important factor in increasing economic development.</p> <p>About 39% of the population have an electricity connection, although there are regional and urban and/or rural disparities. Lack of grid connectivity and network capacity shortfalls have proved to be an impediment to efficient energy consumption. Severe bottlenecks impinge on day-to-day operation, and energy losses in some parts of the network are large. Lack of transmission connectivity and capacity has been hindering development of hydropower generation spread across the country. The distribution network capacity constraints as well as outdated network planning, design, operation, and maintenance have led to inefficient supply of electricity to consumers. The Project aims to improve the efficiency of supply and use, improve grid connectivity, and control electricity leakage. Benefits of the Project will be contributing to meeting the daily energy requirements and to providing efficient services. This will result in enhanced economic activity and employment opportunities, including for poor and socially disadvantaged people during the implementation phase.</p>			
<b>B. Poverty Analysis</b>		<b>Targeting Classification:</b> General intervention	
<b>1. Key Issues</b>			
<p>The Government of Nepal formulated its 10th Five-Year Plan (2002–2007) as its principal policy and strategy for poverty reduction. The plan is based on four pillars of poverty reduction: (i) sustainable and broadly based economic growth, (ii) social sector development, (iii) a targeted program for excluded groups, and (iv) good governance. The key goals and targets of the plan include increasing gross domestic product growth rates by improving social and physical facilities and infrastructure. The Government's Interim Plan 2008–2010 is committed to the policies and strategies adopted by the 10th Five-Year Plan. Among other things, the underlying constraints on achieving the goals of poverty reduction include low access to social and economic facilities and services including electricity, limited economic opportunities, and low income and consumption.</p> <p>The transmission network expansion components will increase power transfer capacity between hydropower generation areas (including export-oriented hydropower schemes) and the load centers, while the distribution network capacity will reduce distribution losses and improve access to efficient electricity. Economic benefits of the project are expected to accrue through the delivery of efficient energy to consumers. Removal of network constraints will reduce the need for consumers to use less-efficient energy sources, and reduced losses will allow electricity to be delivered more efficiently to consumers. This will also contribute to using the Government's Interim Plan priority of expanding hydropower as the foundation of overall economic development. The project's benefits are directly and indirectly related to the increased economic activity, particularly due to creation of income-generating opportunities through small-enterprise and industrial development.</p>			

The poverty reduction potential of this project is significant since Nepal is currently facing peak supply constraints due to lack of generation and network capacity. Grid-connected consumers in Nepal are facing as much as 100 hours (or more) of planned supply interruption per week in winter. The project's benefits are directly linked to providing efficient electricity, thus significantly improving the overall social and economic situation, as efficient electricity supply directly contributes to increased production and creates employment opportunities.

## II. SOCIAL ANALYSIS AND STRATEGY

### A. Findings of Social Analysis

The proposed project aims to improve (i) grid connectivity, (ii) efficiency of electricity distribution, and (iii) demand-side management through appropriate interventions to ease the supply and shortage constraints in the proposed project locations and in other parts of the country.

The Project will strengthen the transmission system and distribution capacity in the northern part of the Kathmandu valley where demand is growing rapidly due to urban and commercial expansion to the north of the city and extension of the Budhanilkantha residential area. The strengthened system will also meet the demand for electric supply in the western part of Kathmandu, and improve reliability. The Kathmandu valley is one of the main load centers, consuming about 37% of the total energy.

Finally, the project will provide adequate power supply to western Nepal, thereby promoting industrial growth. It will also help to import more power from Tanakpur (India), and evacuate the power from the Chameliya and Upper Karnali hydropower plants which are under construction in the western region. The second circuit stringing will also help to meet the demand of additional energy (19 megavolt-amperes [MVA]) required for the Danish International Development Agency (Danida)-funded Rural Electrification Project by 2012, and add around 13 MVA for the Asian Development Bank-funded Eighth Power Rural Electrification Project<sup>a</sup>. Implementation of the project will contribute to filling the daily energy requirements and provide efficient services resulting in increased economic activity and employment opportunities.

### B. Consultation and Participation:

#### 1. Provide a summary of the consultation and participation process during the project preparation

Consultation with NEA officials was focused to solicit project-related data and documents and to gather further information required for project preparation activities. District stakeholders were consulted to inform them about the project, collect required information and suggestions relevant to the project, and seek their support for project preparation. Consultation with the local community, including the project-affected families, was undertaken to (i) disseminate information about the proposed project and likely impacts, (ii) solicit their view and suggestions, (iii) collect socioeconomic and census data, (iv) assess the scope of effects on private and community assets, (v) collect information about different assets likely to be affected, and (vi) make provisions and determine other financial assistance to be made to the affected people.

#### 2. What level of consultation and participation (C&P) is envisaged during the project implementation and monitoring?

Information sharing     Consultation     Collaborative decision making     Empowerment

3. Was a C&P plan prepared?  Yes     No

If a C&P plan was prepared, describe key features and resources provided to implement the plan (including budget, consultant input, etc.). If no, explain why.

C&P plan required for project implementation will be included in the resettlement plan.

### C. Gender and Development

#### 1. Key Issues:



Based on the findings of field observation, socioeconomic survey, and community consultation in different project locations, women (particularly in rural areas) have secondary status compared to their male counterparts. Low levels of literacy, high unemployment, the tradition of early marriage, and women's extensive involvement in household activities are socially prescribed roles of women in the study area.

The findings of the study also reveal that women's role in decisions related to financial and social matters are limited. However, more than 90% of decisions on household chores are made by women. Collectively (i) the majority of the women are illiterate, (ii) women have a higher level of vulnerability, (iii) incomes for female heads of households are less than those of male heads, (iv) women's daily wage rates in the study area are about 10%–25% less than those of men, and (v) none of the households were using clean energy (electricity) for cooking purposes. Instead, firewood is main the source of cooking energy and most of the women's time is spent on household activities and cooking food in a smoky environment. Women are expected to continue using firewood for cooking, but will use a cleaner source of energy for lighting.

The Project is expected to improve health conditions for women (who mainly remain at home), and increase security on the streets as a result of the improved street lighting.

An increased trend of mobility (mostly male population) in search of employment in India and overseas has increased the risk to women of both trafficking and HIV/AIDS.

**2. Key Actions:** Measures included in the design to promote gender equality and women's empowerment—access to and use of relevant services, resources, assets, or opportunities and participation in decision-making process. No specific gender-related impact is foreseen during the implementation of the Project.

Gender plan     Other actions/measures     No action/measure

Summarize key design features of the gender plan or other gender-related actions/measures, including performance targets, monitorable indicators, resource allocation, and implementation arrangements.

### III. SOCIAL SAFEGUARD ISSUES AND OTHER SOCIAL RISKS

Issue	Significant/Limited/ No Impact	Strategy to Address Issue	Plan or Other Measures Included in Design
Involuntary Resettlement	A full resettlement plan is required for the construction of new transmission lines and related substations  No acquisition, resettlement, or damage is expected for the stringing of 132 kV second circuit lines	A full resettlement plan has been prepared to guide the acquisition of land and compensate for other affected assets (crops, trees, structures)	<input checked="" type="checkbox"/> Full Plan <input type="checkbox"/> Short Plan <input type="checkbox"/> Resettlement Framework <input type="checkbox"/> No Action
Indigenous People	The project will not have significant negative impact on indigenous people communities. As the indigenous people also do not face any barriers to accessing the benefits of the project, no special provisions, mitigation measures, or indigenous peoples development plan will be required to protect them against such vulnerability	Specific provisions in the resettlement plan	<input type="checkbox"/> Plan <input checked="" type="checkbox"/> Other Action (in resettlement plan) <input type="checkbox"/> Indigenous Peoples Framework

Issue	Significant/Limited/ No Impact	Strategy to Address Issue	Plan or Other Measures Included in Design
<b>Labor</b> <input checked="" type="checkbox"/> Employment opportunities <input type="checkbox"/> Labor retrenchment <input checked="" type="checkbox"/> Core labor standards	The project will provide short- and long-term employment opportunities. Contractors will be urged to use labor-intensive technology where possible. Equal opportunities and wages will be given to men and women, with priority to those affected by land acquisition and other vulnerable groups (female heads of households, and disadvantaged ethnic groups and castes). The Project will monitor compliance with core labor standards		<input type="checkbox"/> Plan <input checked="" type="checkbox"/> Other Action <input type="checkbox"/> No Action
<b>Affordability</b>	No issues of affordability.		<input type="checkbox"/> Action <input checked="" type="checkbox"/> No Action
<b>Other Risks and/or Vulnerabilities</b> <input checked="" type="checkbox"/> HIV/AIDS <input type="checkbox"/> Human trafficking <input type="checkbox"/> Others (conflict, political instability, etc), please specify	In Nepal HIV infection is spread throughout the country. It is further concentrated in districts with high mobility and migration. Programs raising awareness program about HIV/AIDS and antitrafficking have been included in the resettlement plan.		<input checked="" type="checkbox"/> Plan <input type="checkbox"/> Other Action <input type="checkbox"/> No Action
<b>IV. MONITORING AND EVALUATION</b>			
Are social indicators included in the design and monitoring framework to facilitate monitoring of social Development activities and/or social impacts during project implementation? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			

<sup>a</sup> ADB.1999. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to Nepal for the Rural Electrification, Transmission and distribution Project*. Manila.