ASIAN DEVELOPMENT BANK

TAR: IND 38312

TECHNICAL ASSISTANCE

TO

INDIA

FOR PREPARING THE

NORTH EAST POWER DEVELOPMENT PROJECT

December 2004

CURRENCY EQUIVALENTS

(as of 1 December 2004)

Currency Unit	–	Indian rupee/s (Re/Rs)
Re1.00	=	$0.0227
$1.00	=	Rs44.07

ABBREVIATIONS

ADB	–	Asian Development Bank
EIA		environmental impact assessment
FIRR	–	financial internal rate of return
IPDP	–	indigenous peoples' development plan
MDONER	–	Ministry of Development of North East Region
MOP	–	Ministry of Power
NEC	–	Northeast Council
NER	–	North East Region
PMO	–	project management office
SEB	–	state electricity board
TA	–	technical assistance
WACC	–	weighted average cost of capital

WEIGHTS AND MEASURES

kV	–	kilovolt (1,000 volts)
kWh	–	kilowatt-hour (1,000 watts)
MW	–	megawatt (1,000 kilowatts)

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Energy
Subsector	–	Energy sector development
Theme	–	Sustainable economic growth
Subtheme	–	Fostering physical infrastructure development

NOTE

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

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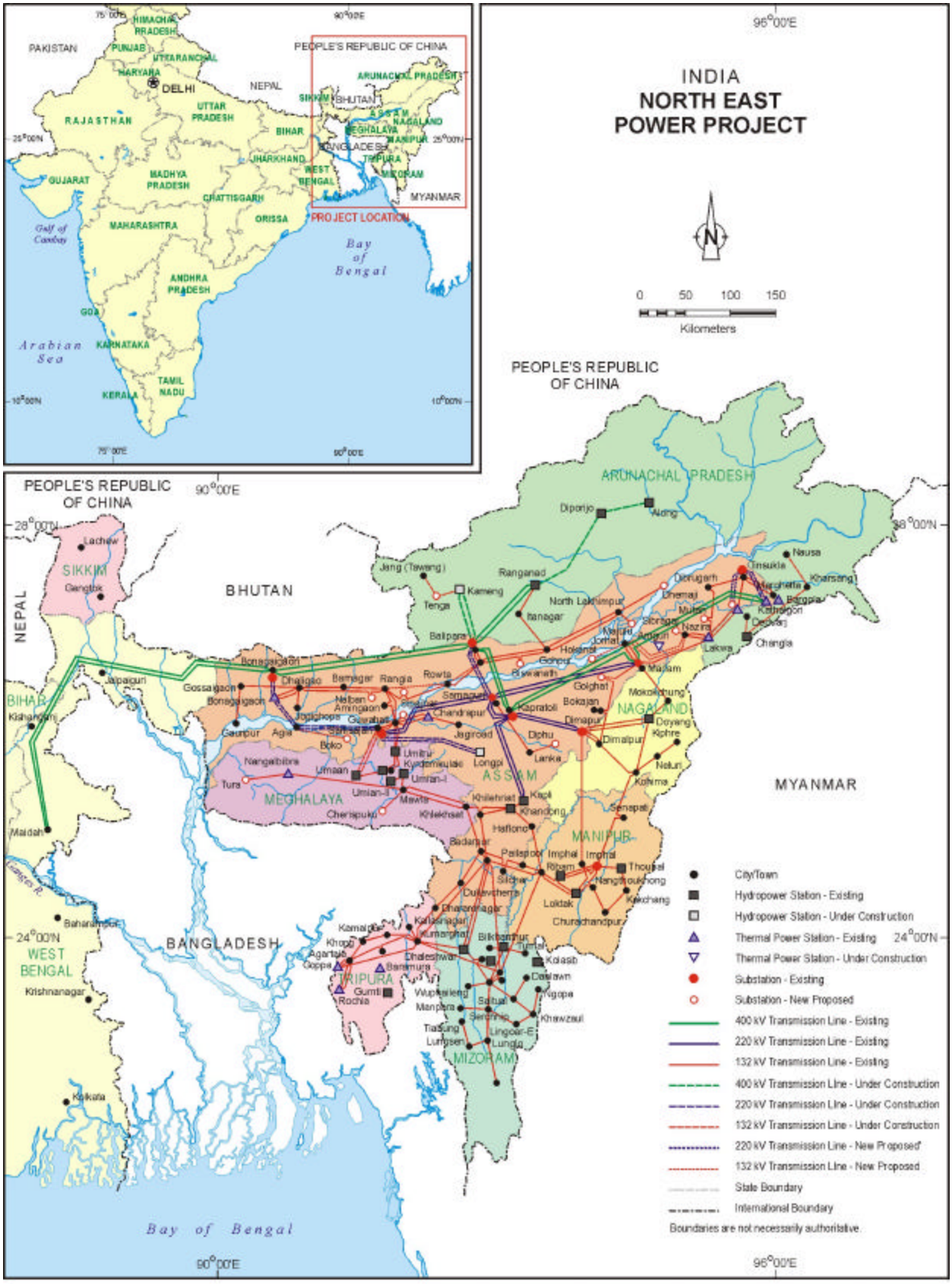
INDIA
NORTH EAST
POWER PROJECT
PEOPLE'S REPUBLIC OF CHINA
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
MYANMAR
PROJECT LOCATION
Bay of Bengal
Arabian Sea
Gulf of Cambay
DELHI
HARYANA
PUNJAB
UTTARANCHAL
HIMACHAL PRADESH
RAJASTHAN
UTTAR PRADESH
BIHAR
SIKKIM
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
JHARKHAND
WEST BENGAL
ORISSA
CHATTISGARH
MADHYA PRADESH
GUJARAT
MAHARASHTRA
GOA
KARNATAKA
ANDHRA PRADESH
TAMIL NADU
KERALA
0 50 100 150
Kilometers
City/Town
Hydropower Station - Existing
Hydropower Station - Under Construction
Thermal Power Station - Existing
Thermal Power Station - Under Construction
Substation - Existing
Substation - New Proposed
400 kV Transmission Line - Existing
220 kV Transmission Line - Existing
132 kV Transmission Line - Existing
400 kV Transmission Line - Under Construction
220 kV Transmission Line - Under Construction
132 kV Transmission Line - Under Construction
220 kV Transmission Line - New Proposed
132 kV Transmission Line - New Proposed
State Boundary
International Boundary
Boundaries are not necessarily authoritative.

I. INTRODUCTION

1. During the country programming mission of the Asian Development Bank (ADB) in 2004, the Government of India requested technical assistance (TA) to prepare for the proposed North East Power Development Project.[1] An ADB fact-finding mission visited India from 20 to 29 October 2004 for field visits and discussions with representatives from the Department of Economic Affairs, the Ministry of Power (MOP), the Ministry of Development of North East Region (MDONER), and other relevant agencies. The mission also met with a cross section of local residents in the proposed project area. The mission and the Government reached an understanding on the rationale, objectives, scope, implementation arrangements, terms of reference, and cost estimates of a project preparatory TA for the Project. The preliminary project framework is in Appendix 1.

II. ISSUES

2. **Background**. The North East Region (NER)[2] is one of the poorest regions in India, with 32% of its 39 million people living below the poverty line. Despite its strategic location (bordering countries belonging to the Association of Southeast Asian Nations and the South Asian Association for Regional Cooperation, see map) it remains economically isolated. Moreover, because of its geography and rugged terrain, connections within the region are poor. Access to basic infrastructure facilities and services, particularly in rural areas, is minimal, as is private sector investment. Environmental conditions are poor because of inadequate investments in infrastructure, especially in urban areas. The net state domestic product in the period 1993–2000, has grown at an average of 3.6% per year, much lower than the national average of 6.7%. An initial poverty and social assessment is in Appendix 2.

3. Recognizing that economic growth is essential for poverty reduction, in 1998 the Government decided to commit 10% of the annual budget to strengthen development assistance to the NER. Recently, law and order has significantly improved, although insurgencies still pose obstacles to economic development. MDONER is the central Government's development focal point and has a mandate to coordinate and manage the flow of infrastructure developments by state governments, the North East Council (NEC),[3] MOP, and public sector utilities (e.g., the North Eastern Electric Power Corporation Ltd. [NEEPCO]), among others.[4] Any unspent funds of the 10% fiscal allocation are to be pooled for development activities coordinated by MDONER.[5] While MDONER, NEC, and state governments have addressed immediate regional necessities, basic infrastructure is still a major constraint on economic development in the NER.

4. **Energy Sector**. The NER power sector suffers from problems common to those in other parts of India. Transmission and distribution losses are high, because of technical losses, unmetered connections, theft, and subsidies to agricultural consumers. Current generating capacity is theoretically sufficient to meet regional demand, but about 5% of power demand is met by imports from the eastern region of India. Intraregional power demand has been suppressed, mainly because of the weak regional grid. Demand–supply forecasts indicate an

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[1] The TA first appeared in the *ADB Business Opportunities* (Internet edition) on 12 October 2004.
[2] The region comprises Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura.
[3] NEC comprises representatives of each state in the NER, and has responsibility for channeling some investment funds to NER and state-level projects.
[4] Another key stakeholder is the Brahmaputra Board, a river basin agency responsible for all development involving abstraction or use of the watershed, e.g., flood control, hydropower, irrigation, and municipal supply.
[5] Each line ministry allocates 10% of its budget to NER. MDONER is responsible for managing the unutilized portion of non-lapsable funds of these ministries as well.

increase in power shortages unless significant investments are made in generating, transmission, and distribution capacity. A lack of institutional integration is also problematic. In the NER, two states have state electricity boards (SEBs), and five states have power departments that perform similar functions. The NER states are beginning to implement sector reforms required by the Electricity Act of 2003, and the SEBs and power departments have begun unbundling work to the extent possible.

5. Insufficient delivery capacity and the lack of interconnectivity between regional transmission and local distribution networks limit economic development in the NER. Three major factors constrain further development of NER energy resources: (i) physical space constraints in West Bengal, which limit expansion of gas and electric power transmission capacities; (ii) a lack of standing agreements for energy trading with neighboring countries (especially with Bangladesh) which could help to eliminate the transmission bottleneck;[6] and (iii) a weak regional grid with limited interconnections between 400 kilovolt (kV), 220 kV, and 132 kV lines; insufficient capacity; and weak distribution networks providing an unreliable service. The master plan for power development prepared by NEC identifies improvements to transmission and distribution systems and the provision of additional generating capacity as critical areas for short-term investment.

6. Of the Indian regions, the NER has the second largest concentration of crude oil and natural gas resources, representing about 20% of national reserves. Assam and Tripura have gas-fired power plants with power-generating capacity of 785 megawatts (MW). Current NER natural gas reserves could provide about 2000 MW of power generating capacity.[7] Current hydropower capacity of about 1,130 MW will increase by 369 MW during the Tenth Five-Year Plan period (2002–2007) and by 8,800 MW during the Eleventh Plan period. Additional hydropower potential is estimated at over 10,000 MW, including 2000 MW of small projects (less than 25 MW per site).[8]

7. India's Country Strategy and Program Update (2005-2007) pays special attention to power, transport, and urban development in response to the Government's request for support for accelerated development in the NER. A greater focus on the NER is consistent with ADB's efforts to promote economic development in remote areas. The Government has requested assistance for power sector improvements in the NER and the TA and ensuing Project will support grid strengthening, power generation to supply the NER grid, and institutional strengthening to assist ongoing sector reforms.

III. THE TECHNICAL ASSISTANCE

A. Purpose and Output

8. The TA will support preparation of the proposed North East Power Development Project, which is integral to the Government's "Power for all by 2012" initiative in the NER. The proposed project will develop locally available resources, including hydropower, natural gas, and

[6] ADB has provided assistance to POWERGRID through a loan including subprojects in NER. ADB. 1995. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Power Grid Corporation of India Limited for the Power Transmission (Sector) Project.* Manila. However, the existing 400 kV line constructed by POWERGRID is operating below capacity (220 kV) because of pricing and contractual issues.

[7] In 2003, Oil and Natural Gas Corporation Limited discovered a major natural gas field nearby in offshore waters of Myanmar, with an estimated 4 trillion to 6 trillion cubic feet (113 billion to 169 billion cubic meters) of commercial reserves. Transport options being considered include pipelines through NER and a subsea pipeline across the Bay of Bengal.

[8] Central public sector utilities (e.g., NEEPCO, and National Hydro-Electric Power Corporation) are developing large power projects, mainly intended for export to the rest of India.

renewable energy sources; provide critical transmission and distribution facilities; and support institutional strengthening. The TA will be implemented in two phases: (i) an energy sector assessment for the NER, and (ii) a review of feasibility studies for investment components in selected states of the NER.[9] Phase I will include compiling existing reports and analysis on energy sector issues and recommend strategy and investment priorities. Phase II will evaluate investment proposals prepared by MDONER in selected states and will include technical, environmental, financial, economic, social, and institutional analysis.

9. The expected outputs of Phase I are as follows.

(i) A review of sector issues; an assessment of energy demand; a least-cost energy development plan; an analysis of energy resource availability and supply, location, potential, capacity, and economic feasibility; a survey of social and environmental limitations; a review of the potential for off-grid energy sources; and an assessment of the need for critical transmission and distribution facilities development and/or rehabilitation.
(ii) Well-defined priorities and strategies for developing the energy sector of the NER as a whole and for each of its states; and proposed investment packages developed in consultation with central, regional, and state government agencies, local stakeholders, potential investment agencies and private sector partners. Phase I will identify proposed investment packages, consistent with least-cost expansion plans, to be analyzed in detail in phase II.

10. The expected outputs of Phase II are as follows.

(i) An assessment of the technical merits of proposed generation schemes (e.g., gas-fired power, hydropower, and renewable energy sources), and the most necessary development or rehabilitation of transmission and distribution facilities.
(ii) A policy matrix for energy development, taking into account possible sector reforms, economies of scale, and other factors.
(iii) An assessment of the technical, financial, social, economic, and environmental viability of investments that are being proposed for external financial support.
(iv) An assessment of capacity building, training, and institutional strengthening needs and a plan to address them.
(v) Proposals for best-practice guidelines for energy development with special emphasis on small and medium-sized hydropower systems.

B. Methodology and Key Activities

11. The objective of the TA and ensuing investment project is to support least-cost expansion of the regional power system in the NER in an economically, financially, environmentally, and socially sustainable manner. Phase I will cover an energy sector review, including resource availability, power supply and demand analysis, existing policies and sector reform agenda assessment, and indicative economic assessments, including a thorough review of least-cost expansion plans. Phase II will review feasibility studies prepared for investments in generation, transmission, distribution, and efficiency enhancements in the power system. It will also review the appropriateness of due diligence and compliance requirements of investment

[9] Resource availability and geographical differences may not allow all NER states to be covered under one investment project.

options, including the need for institutional strengthening and capacity building, so that the ensuing project will enable sustainable economic growth that will help to reduce poverty.

12. The ensuing investment project will have the following components.

13. **Component A: Grid Strengthening**. This will include critical system improvements such as (i) interconnections between 400 kV, 220 kV, and 132 kV lines to allow efficient delivery of power within the NER; (ii) renovation, maintenance, and upgrade of local grids less than 132 kV, including distribution systems; and (iii) upgrade of dispatch and metering systems.

14. **Component B: Power Development**. This will support expansion of commercial generating capacity serving the NER grid, targeting investments that can be locally developed and managed as far as possible. Proposed projects may include small to medium-sized hydropower, gas-fired power plants, and possibly renewable energy (e.g., biomass). Least-cost expansion analysis will be used to define investments for components A and B.

15. **Component C: Institutional Strengthening**. This will support improving the technical, financial, and management capabilities of SEBs, power departments, and other agencies in accordance with the outcomes of components A and B. This will also help sustain sector reforms at the state level as required by the Electricity Act of 2003. The outputs from components A and B will be disseminated through national and regional workshops for stakeholders, including those in the private sector.

C. Cost and Financing

16. The total cost of the TA is estimated at $1,100,000 equivalent, comprising $555,000 in foreign exchange cost and $545,000 equivalent in local currency cost. ADB will finance $750,000 comprising $555,000 in foreign exchange cost and $195,000 in local currency cost. The TA will be financed on a grant basis from ADB's TA funding program. The Government will finance the remaining $350,000 equivalent in local currency cost. TA cost estimates are presented in Appendix 3. The Government has been advised that approval of the TA does not commit ADB to finance any ensuing investment projects.

D. Implementation Arrangements

17. The Executing Agency for the TA will be MDONER. A senior staff member from MDONER will be appointed as the project director. A project management office (PMO) will be established at MDONER in Delhi and a field representative will be designated in the NER.[10] The PMO will be responsible for the day-to-day management of the TA and will coordinate with all government (including state and local governments) and nongovernment stakeholders. In consultation with relevant agencies, the PMO will facilitate all TA-related workshops, meetings, and field visits of consultants and ADB representatives. An advisory committee will be established to provide strategic directions to the TA and preparation activities for the ensuing investment project. The advisory committee will include representatives from MOP, MDONER, NEC, the Brahmaputra Board, and other agencies as deemed appropriate and necessary by the Government and ADB. A PMO office will also be established to facilitate the ensuing loan-processing activities.

[10] Possibly at the NEC office in Shillong or Guwahati.

18. International consultants will be engaged for a total of 18 person-months, and domestic consultants for 38 person-months. The consulting team will be selected and engaged through a firm in accordance with ADB's *Guidelines on the Use of Consultants*, and other procedures acceptable to ADB for selection and engagement of domestic consultants. Simplified technical proposal format and the quality- and cost-based selection method will be used. For Phase I, the consulting team will comprise international experts in (i) power policy and systems analysis and (ii) energy resource assessment. For Phase II, the consulting team will include international experts in (i) power engineering, (ii) geological and geotechnical engineering, (iii) financial analysis, (iv) energy economics, (v) environmental assessment, and (vi) social analysis. The domestic experts will include (i) an institutional development specialist, (ii) a tariff analyst, (iii) an electrical engineer, (iv) a resettlement and social development specialist, (v) a poverty reduction specialist, (vi) a financial management specialist and financial analyst, (vii) a power sector specialist, (viii) a power economist and policy specialist, (ix) a geology and geotechnical specialist, and (x) an environment specialist. The power engineer or energy economist will be the team leader and will coordinate the work of all consultants. The terms of reference for the consultants are in Appendix 4.

19. The TA will be implemented over a period of 6 months, from February to August 2005.[11] The team leader will submit an inception report within 1 month commencement of services. An interim report will be submitted 3 months after TA commencement, and a draft final report after 5 months. The Government and ADB will provide their comments about 2 weeks after receipt of these reports. Review meetings will include stakeholders, to ensure maximum local inputs and ownership. A comprehensive approach will be developed to ensure a higher level of consultation and participation by various stakeholders. The draft final report will be finalized at the end of 6 months, after incorporating comments from the Government and ADB. There are no major risks associated with the TA, and the Government has expressed its strong support.

IV. THE PRESIDENT'S DECISION

20. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of $750,000 on a grant basis to the Government of India for Preparing the North East Power Development Project, and hereby reports this action to the Board.

[11] Phase II will be initiated 1–2 months after Phase I, with 1–2 months of overlap.

PRELIMINARY PROJECT FRAMEWORK

Design Summary	Performance Targets	Monitoring Mechanisms	Assumptions and Risks
Sector Goal (Ensuing Project) Economic growth, reduced poverty, enhanced energy resource base in the North East Region (NER) of India	Higher economic growth, and improved quality of life in NER	Increased per capita income, energy consumption, and quality of life	
Purpose (Ensuing Project) Remove bottlenecks in power development, transmission, and distribution to attain regional power demand–supply balance	Construction of transmission lines, substations, distribution systems, and power generation units; training for the Executing Agency (MDONER) and Implementing Agencies (AIs)	SEB, power department, and other reports documenting new generating capacity, transmission and distribution system improvements, power delivery and load shedding	**Assumption** Government, MDONER and implementing agencies (IAs) have appropriate development framework. Willingness of the Government to undertake ensuing project investments
TA Outputs 1. Review and assess energy sector issues 2. Assess environmental, poverty, social, financial, economic, and other assessment reports for potential investment components 3. Well-defined investment project for energy development, transmission and distribution	Energy sector assessment Review of economic, social, environmental, and other assessments Design of investment components completed	Environment, poverty, and social assessment reports reviewed and approved by Government and ADB; review missions and progress reports Provision of project designs, review missions, and progress reports	**Assumption** Access to data is restricted and all reports are made available. **Risk** MDONER and IAs obtain required government clearances in a timely manner
TA Activities 1. Review and undertake energy sector assessment 2. Review environmental, economic, social and poverty assessments, and resettlement plan for the investment components 3. Conduct national and regional workshops to disseminate TA findings	Develop an energy sector assessment. Prepare summary environmental impact assessment , resettlement plan and framework, and poverty impact assessment of investment components	Policy dialogue, review missions, and periodic reports; contract requirements for specified reports	**Assumption** Lessons learned in the power sector and other related ADB projects are considered, particularly those related to definition of project baselines and design of mitigation measures

Continued on next page

Design Summary	Performance Targets	Monitoring Mechanisms	Assumptions and Risks
TA Inputs Consulting services	International consulting services for 18 person-months Domestic consulting services for 38 person-months	Policy dialogue, review missions and periodic reports	**Assumption** Capable international consultants are engaged, and domestic consultants provide required expertise and support Counterpart funds are available to meet local currency costs
Total Cost	Estimated total cost of $1,100,000 comprising $555,000 in foreign exchange and $545,000 in equivalent local currency	Policy dialogue, review missions and periodic reports	
Financing	ADB will finance $750,000 equivalent on a grant basis. The Government will finance $350,000 equivalent.		

INITIAL POVERTY AND SOCIAL ANALYSIS

A. Linkages to the Country Poverty Analysis

Sector identified as a national priority in country poverty analysis? Yes	**Sector identified as a national priority in country poverty partnership agreement?** Yes

Contribution of the sector/subsector to reduce poverty in India:

The North Eastern Region (NER) is one of the poorest regions in India, despite its considerable natural resources (water, gas, coal and oil, among others), and its strategic location, bordering countries in both the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC). Limited access to basic infrastructure facilities and services, economic insularity, political instability, and lack of both connections within the region and private investment are the main causes of the NER's high level of poverty.

This TA is meant to draw a map of NER's energy resources to guide the financing of the most urgently needed power-related investments, which will, ultimately, help NER break out of the present unsustainable economic conditions.

Power sector development, focused on generation and transmission, is a necessary step for the country's growth strategy. India is at present a net importer of energy. Power sector development is particularly critical in the NER. Given the region's unique socioeconomic conditions, the TA needs to be exceptionally thorough and detailed to support sustainable investments that lead to an optimal power system.

Power development in the NER can help the region to develop cottage industries and provide jobs for women. It can also bring income to the states. The local population will benefit both directly and indirectly: (i) directly, by having access to electricity for both private and productive consumption—with positive impacts on employment and labor productivity; (ii) indirectly, through the increased income generation by local authorities, which will be able to provide improved services.

Finally, NER's power generation and transmission capacity can provide the region with the power needed to develop economically.

B. Poverty Analysis

Proposed Targeting Classification: General Intervention

What type of poverty analysis is needed?

The NER is a region with both a very high prevalence of poverty and a unique social dimension. To better understand the Project's impact on poverty and society, the TA will use local consultants to prepare a social impact assessment and a poverty impact assessment. It is important to note that the number of person-months devoted to poverty and social issues reflects the relevance of these matters for the project's success.

A socioeconomic survey will be undertaken to provide a basis for the assessments. Analyses of resettlement and indigenous people will be fundamental to the social assessment, although they will be undertaken separately from the poverty impact assessment. From the analysis, consultants will prepare land acquisition and resettlements plans, if required, and incorporate mitigation measures and their costs into the project's cost estimates. The poverty impact assessment will include a poverty profile, an assessment of the impact of the proposed project on the poor, and quantified information on poor beneficiaries. Finally, tariff, willingness-to-pay, and affordability analyses will also be undertaken to improve understanding of the project's impacts on the poor.

C. Participation Process

Is there a stakeholder analysis? Yes, stakeholder analysis will be undertaken. A stakeholder analysis will be particularly relevant because of the unique social dimensions and strong community-based participation in decision-making processes.

Is there a participation strategy? Yes, a participation strategy will be devised during the project preparatory TA stage. Options will be reviewed to enhance stakeholder participation and local ownership. Participation and stakeholder analysis are critical aspects of the project design.

D. Gender Development

Strategy to maximize impacts on women: The poor and women will be carefully considered in conducting participatory activities and included in the project design.

Has an output been prepared? No

E. Social Safeguards and other Social Risks

Item	Significant/ Not significant/ None	Strategy to Address Issues	Plan Required
Resettlement	☐ Significant ☐ Not significant ☒ Not known	At present, project sites have not been identified. The TA will provide the list of eligible locations. Locations will be chosen in order to minimize adverse impacts, including resettlement.	☐ Full ☒ Short ☐ None
Indigenous Peoples	☐ Significant ☐ Not significant ☒ Not known	The ethnic composition of the NER is unique. Minorities share access and distribution of socio-political power throughout the region. Local participation in decision-making process and the lack of dominance of one ethnic group over the others constitute a strong case for inclusive and fair distribution of benefits.	☐ Yes ☒ No
Labor	☐ Significant ☐ Not significant ☒ Positive	The project will require construction labor and will result in permanent employment for the operation and maintenance of project facilities.	☐ Yes ☒ No
Affordability	☐ Significant ☒ Not significant ☐ None	The project is unlikely to result in increased prices of goods and services accessed by the poor, and project design will maximize beneficial impacts to the poor. The electricity tariff is regulated by the Government, and will include a lifeline tariff for poor consumers. More information will be gathered during the TA, especially in relation to the poverty assessment and tariff analysis work.	☐ Yes ☒ No
Other risks and/or Vulnerabilities	☐ Significant ☐ Not significant ☒ Not known	Political risks will be thoroughly assessed and taken into consideration. There is no other risk or vulnerability involved, at present stage.	☐ Yes ☒ Not identified

COST ESTIMATES AND FINANCING PLAN
($'000)

Item	Foreign Exchange	Local Currency	Total Cost
A. Asian Development Bank Financing[a]			
1. Consultants			
a. Remuneration and Per Diem			
i. International Consultants	360.0	0.0	360.0
ii. Domestic Consultants	0.0	140.0	140.0
b. International and Local Travel	50.0	20.0	70.0
c. Reports and Communications	10.0	5.0	15.0
2. Equipment/Software[b]	10.0	5.0	15.0
3. Training, Consultation, and Workshops	60.0	5.0	65.0
4. TA Contract Negotiations	5.0	0.0	5.0
5. Contingencies	60.0	20.0	80.0
Subtotal (A)	**555.0**	**195.0**	**750.0**
B. Government (MDONER) Financing (in kind)			
1. Office Accommodation and Transport	0.0	120.0	120.0
2. Remuneration and Per Diem of MDONER Staff	0.0	120.0	120.0
3. Others[c]	0.0	110.0	110.0
Subtotal (B)	**0.0**	**350.0**	**350.0**
Total	**555.0**	**545.0**	**1,100.0**

MDONER = Ministry of Development of North East Region , TA = technical assistance.
[a] Financed by Asian Development Bank's technical assistance funding program.
[b] Desktop computers, printers, facsimile machine, and computer software. Equipment will be transferred to the MDONER at end of the TA.
[c] To provide for unforeseen expenses such as data acquisition, data processing, and map preparation.
Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

(detailed terms of reference are in the supplementary appendix)

1. The consultants will ensure that all works and outputs under the TA are fully compliant with all relevant ADB policies and guidelines. The TA will be implemented in two Phases. Phase I will review the sector issues and will be completed in 2–3 months; Phase II will review feasibility studies and will be completed in 4–5 months beginning 1-2 months after Phase I.

A. Phase I: Energy Sector Assessment

1. International Consultants

2. **Power System Analyst and Policy Specialist** (2 person-months). The specialist will perform the following tasks.

(i) Review the energy policies and regulations applicable to India and the states of the NER and identify critical issues (e.g., tariffs, tariff-setting procedures) that need to be resolved for sustainable growth of a competitive energy market in the NER.
(ii) Identify incentives for energy source diversification and investment promotion and develop a list of such incentives for short- to medium-term planning periods.
(iii) Assess the least-cost generation expansion plan, and transmission and distribution systems in the relevant states and in the NER.
(iv) Assess reliability of power systems, their impacts, potential problems, and opportunities in the NER.
(v) Prepare a report based on institutional analysis and identify constraints for sector development. Propose a time-bound plan for institutional capacity building.
(vi) With assistance from other team members, prepare a summary report of energy resource development options, including potential hydropower and fossil-fuel-based power generation, and improvements to transmission and distribution systems. The report will identify sector strategies and priorities based on least-cost expansion planning, with recommendations for investments to be evaluated in Phase II.

3. **Energy Resource Assessment Specialist** (2 person-months). The specialist will perform the following tasks.

(i) Analyze energy resource availability in the NER and its relevant states with respect to locations, realistic potential, and capacity for economic use.
(ii) Assess social and environmental limitations of energy resource development.
(iii) Assess current off-grid energy use and evaluate the potential expansion of off-grid energy services.
(iv) Assess the status of the existing NER grid and make prioritized recommendations for development or rehabilitation of transmission and distribution facilities that are consistent with demand–supply forecasts.

2. Domestic Consultants

4. **Power System Analyst and Policy Specialist** (3 person-months). The specialist will perform the following tasks.

(i) Assist the international consultants to prepare a summary of the status of energy resources, demand–supply forecasts, and other energy sector requirements for India and the NER grid and to review the least-cost generation expansion planning

of the NER grid up to 2020; discuss the assumptions, methodology, computer models, and completeness of data used; and present an analysis of the results.

(ii) Examine the tariff-setting procedures and identify the issues that need to be resolved to improve the competitive power market.

(iii) Analyze the institutional framework of the NER power sector, identify constraints on sector future development and draft a plan for institutional capacity building.

(iv) Assess the macroeconomic and strategic importance of the energy resource base in the NER as a whole and in each state. This assessment should include the potential economic feasibility of proposed investments to develop the energy resource base.

(v) Review the potential supply and demand for off-grid energy sources in the NER and its states.

5. **Energy Resource Assessment Specialist** (3 person-months). The specialist will perform the following tasks.

(i) Compile available reports and data on NER energy resources, and assist the international Energy Resource Assessment Specialist to review and analyze the energy resource availability in the NER and its states.

(ii) Identify locations, potential, and capacity for economic use of energy resources.

(iii) Assess social and environmental limitations of future energy development.

(iv) Identify current applications and potential for further development of off-grid energy sources.

(v) Identify the operational status of transmission and distribution systems and recommend development or rehabilitation needed to ensure reliable power supply.

B. Phase II: Feasibility Analysis for Investment Project

1. International Consultants

6. **Power System Planning and Engineering Specialist** (3 person-months). The specialist will perform the following tasks.

(i) Review the least-cost generation expansion planning of the NER power grid and NER states' power system up to 2020. Verify that the proposed investment is included in the least-cost plan and that all alternatives have been fully assessed to provide economic and technical justification for the selection of a specific project.

(ii) Evaluate the proposed project design, and ensure that lessons learned in previous ADB and other donor-funded projects are incorporated, particularly with respect to availability of appropriate baseline information, and necessary risk mitigation measures. Suggest measures to reduce construction time and costs while maintaining physical integrity.

(iii) Assess the impact of hydropower development on the availability of water for human consumption, irrigation, and other downstream uses in areas where water could be in short supply. Recommend pro-poor or other components that could improve sustainability in local communities in the project area.

(iv) Prepare project cost estimates, including unit costs and estimates of quantities for project components, identification of local and foreign cost components, and physical and price contingencies. Define contract packages and recommend improvements to those proposed by the implementing agencies (IAs).

(v) Confirm financing requirements of the project, identify options for cofinancing, and evaluate the possibility of future private sector participation in proposed small

hydropower and other generation projects. Help the ADB Fact-Finding mission draft the logical framework for the ensuing loan project.

(vi) Prepare Gantt charts for the implementation schedule for each component, including key procurement milestones. Review technical specifications and bid documents, and propose revisions to comply with ADB procurement procedures.

(vii) Assess the project's technical risks and its viability through sensitivity analysis. Prepare terms of reference, expertise requirements, and person-month estimates for ensuing loan project implementation consulting services.

7. **Geological and Geotechnical Aspects Specialist** (2 person-months). The specialist will perform the following tasks.

(i) Review the geological and geotechnical conditions along the proposed transmission corridors and at proposed hydropower plant sites. Review data and results of testing from previous studies that could be used to assess ground conditions, including, e.g., reports prepared for natural hazard assessment.

(ii) Recommend additional geological and geotechnical investigations to (a) supply information where none exists, and (b) calibrate data from earlier investigations. Identify any other work required to ensure adequate geological and geotechnical engineering data are available for project risk analysis.

(iii) Review project design to ensure that earthquake effects have been adequately addressed, and recommend appropriate measures to mitigate seismic risks. Develop a geological and seismic risk checklist for use on transmission and generation projects to facilitate future site selection, design, construction, and maintenance.

8. **Financial Analysis Specialist** (3 person-months). The specialist will perform the following tasks.

(i) Review the accounting and financial records of IAs (project-related agencies, including state electricity boards and power departments) for the last 5 years; project their financial performance for the next 10 years, taking into account issues affecting financial performance; and indicate financial targets for a sound financial position.

(ii) Present the transmission and hydropower capacity addition and investment program for the next 10 years; present the financing plan for this proposed investment program; examine the financial feasibility of this plan. Prepare cost estimates, a financing plan, and financial projections in domestic currency units and take into account possible effects of inflation and potential exchange rate fluctuations.[1]

(iii) Explore and recommend cofinancing opportunities, including private sector investment in power generation (component B).

(iv) Recommend measures that will improve the financial position of IAs, including tariff adjustments, better cost-recovery mechanisms, cost-control measures, adjustments to capacity addition and investment programs, and improvements in the performance of affiliated units.

(v) Analyze the financial viability of the project and each of its components in accordance with ADB's *Guidelines for the Preparation and Presentation of Financial Analysis*, using the financial internal rate of return (FIRR) method and comparing it with the

[1] The project cost estimates and financial projections in nominal terms should be converted to real terms by removing the projected effects of foreign and domestic inflation and currency fluctuations. Incremental costs and benefits should form the basis for the financial evaluation.

relevant weighted average cost of capital (WACC). FIRR and WACC should be computed on an after-tax basis in real terms using constant 2004 prices.

9. **Energy Economic Analysis Specialist** (3 person-months). The specialist will perform the following tasks.

(i) Assess the short-term (three-year) and long-term (system planning period) demand forecasts for consumer categories in the project area. Provide detailed analysis of the assumptions and methodology used in the demand forecast.
(ii) Review the proposed investment project design and ensure that economic analyses are conducted in accordance with ADB's *Key Areas of Economic Analysis of Projects: An Overview* (November 2003), as well as ADB's *Economic Analysis Retrospective 2003 Update* (June 2004).
(iii) Provide quantitative and qualitative benefits for the proposed investment project. Carry out an economic analysis of (a) power demand, (b) least-cost and equalizing discount rate, (c) economic viability, and (d) risk analysis. Confirm that the calculated economic internal rate of return is greater than the FIRR. The analysis should be in accordance with ADB's *Guidelines for the Economic Analysis of Projects* and *Handbook for Integrating Risk Analysis in the Economic Analysis of Projects*. Discuss alternative methodologies for carrying out the economic analysis and justify the method(s) chosen.
(iv) Provide a table detailing the conversion of economic cost from the financial cost of the Project and the specific conversion factors used. Incorporate an economic quantification of environmental impact due to the Project in accordance with ADB's *Guidelines on the Economic Analysis of Projects* (1997) and *Workbook on Economic Evaluation of Environmental Impacts* (1996).
(v) Lead the analysis of tariff issues in consultation with other experts, examine cost recovery, economic, and social issues.

10. **Social Assessment Specialist** (2 person-months). The specialist will perform the following tasks.

(i) Ensure that project design follows ADB's *Involuntary Resettlement Policy* (1995), and other social safeguard policies.
(ii) Summarize poverty reduction effects of the project. Identify any complementary activities that would enhance those effects, including (a) poverty-related measures considered at project design and implementation stage, and (b) strategies used to enhance participation of the poor in project design and implementation.
(iii) Together with MDONER and IAs, confirm the viability of development interventions incorporated into the project structure to assist in improving the welfare and economic conditions of persons and communities in the project area.
(iv) Identify impacts on tribal groups, determine the need for an indigenous peoples' development plan (IPDP), and, if necessary, prepare an IPDP.
(v) If a stand-alone IPDP is not necessary, incorporate specific provisions in the resettlement plan that are appropriate to address the needs of such indigenous groups and are consistent with ADB's policies and procedures on indigenous peoples. Ensure that all plans (both IPDP and IR plan) are prepared in full consultation with people affected by the Project and other stakeholders.
(vi) Together with MDONER and IAs, identify any development interventions that may be incorporated into the project structure to assist in improving the welfare and economic conditions of persons and communities in the project area, in particular of indigenous and other vulnerable groups.

(vii) Prepare the draft land acquisition and resettlement plan in full consultation with affected people and other stakeholders and authorities and submit it to ADB for comments and approval, which should subsequently be incorporated into a final land acquisition and resettlement plan agreed with the authorities.

11. **Environmental Assessment Specialist** (1 person-month). The specialist will perform the following tasks.

(i) Based on the review of rapid and comprehensive environmental impact assessment (EIA) reports prepared for the projects, provide the MDONER and IAs with specific and detailed recommendations for revisions and/or additional studies, if necessary, to make the environmental assessments and EIA conform to ADB's requirements based on *Operations Manual F1/BP and F1/OP (2003)*, *Environment Policy (2002)*, *Environmental Guidelines for Selected Industrial and Power Projects* and *Environmental Assessment Guidelines (2003)*.[2] Consider lessons learned from past and ongoing transmission and hydropower projects financed by ADB and other international financial institutions.
(ii) Assist the IAs to strengthen environmental management plans for specific investment components. Assist MDONER and IAs to prepare a summary EIA circulated to the ADB Board of Directors and published on the ADB Web site.
(iii) Evaluate whether the proposed power projects in Component B qualify for emissions reductions trading under the Kyoto Protocol clean development mechanism (CDM). Identify the necessary follow-up steps, including technical and institutional requirements, to develop the candidate CDM projects.[3]
(iv) Evaluate the possibility of creating community-based organizations to rehabilitate and manage small hydropower facilities. Identify technical, financial, and institutional requirements for these community organizations to become self-sustaining energy service entities.

2. Domestic Consultants

12. Domestic consultants will assist international consultants to fulfill the terms of reference noted above, and conduct additional work included in detailed terms of reference (Supplementary Appendix). The expected tasks are:

(i) poverty impact assessment (3 person-months),
(ii) resettlement, indigenous peoples, and social assessment (4 person-months),
(iii) tariff analysis (3 person-months),
(iv) financial issues (4 person-months),
(v) institutional issues (3 person-months),
(vi) hydrological investigations (3 person-months),
(vii) environmental assessment (4 person-months),
(viii) power planning and engineering specialist (3 person-months),
(ix) power economic analysis (3 person-months), and
(x) geological and geo-technical aspects (2 person-months).

[2] The project has been assigned environment category A, requiring a full EIA, based on inclusion of hydropower investments in Component B. Content and format of the required EIA and other environmental assessments can be found in the noted operations manual, policy, and guidelines.
[3] Projects qualifying for CDM are eligible to sell emission reduction credits, with revenue accruing directly to project owners. ADB currently is supporting three candidate CDM projects in the People's Republic of China; revenue from sale of emission reduction credits is estimated to be about 5–10% of total project costs. ADB is processing a TA for capacity building in India. Additional information on ADB's CDM Facility can be found at www.adb.org/cdmf.