



Technical Assistance Report

Project Number: 41139
November 2007

India: Energy Efficiency Enhancement in the Power Generation Sector

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 9 November 2007)

Currency Unit	–	Indian rupee/s (Re/Rs)
Re1.00	=	\$0.0254
\$1.00	=	Rs39.28

ABBREVIATIONS

ADB	–	Asian Development Bank
CDM	–	clean development mechanism
CER	–	certified emission reduction
CMI	–	carbon market initiative
DOE	–	designated operational entity
EEI	–	energy efficiency initiative
GHG	–	greenhouse gas
IA	–	implementing agency
IEP	–	Integrated Energy Policy
PDD	–	project design document
PFC	–	Power Finance Corporation
PIN	–	project idea note
R&M	–	renovation and modernization
TA	–	technical assistance
VER	–	verified emission reductions

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Energy
Subsector	–	Energy sector development
Themes	–	Sustainable economic growth, environmental sustainability
Subthemes	–	Fostering physical infrastructure development; cleaner production, control of industrial pollution

NOTE

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

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I. INTRODUCTION

1. During the Country Programming Mission from 9 to 23 July 2007, the Government of India (the Government) requested the Asian Development Bank (ADB) to provide assistance for Energy Efficiency Enhancement in the Power Generation Sector¹. ADB conducted the Fact-Finding Mission at the same time to reach an understanding with the Government on the impact, outcome, outputs, cost estimates, financing, implementing arrangements, and the consultants' terms of reference for the proposed technical assistance (TA). The design and monitoring framework of the TA is in Appendix 1.

II. ISSUES

2. Energy is a vital input to economic growth and poverty reduction in India. The Government has confirmed its mission, "Power for All by 2012", to provide all households with electricity at an affordable price by 2012. This mission has been elaborated into subsector policies in the National Electricity Policy, 2005, in accordance with the Electricity Act, 2003.

3. The magnitude of investment needed to achieve the goal is vast. Current energy needs are primarily met by fossil fuels, the increased consumption of which has negative economic and environmental impacts. Historically, the Indian power sector has coal as the predominant fuel source of power and hydro power is the next important source. By depending on fossil fuels, India is exposed to price and supply fluctuations that undermine its national energy security, as well as global and regional energy security, considering India's large and rapidly growing energy consumption share. Furthermore, the combustion of fossil fuels produces large amounts of greenhouse gas (GHG) emissions, thereby damaging the atmosphere and contributing to climate change.

4. Cognizant of these issues, the Government set out the Integrated Energy Policy (IEP) in August 2006 with a view to reliably meet the demand of all sectors for safe, clean, and convenient energy services in a technically efficient, economically viable, and environmentally sustainable manner. The IEP prescribes specific measures including (i) optimizing the power supply mix through greater use of indigenous hydropower resources and renewable energy, (ii) pursuing technologies that maximize energy efficiency, and (iii) continuing related power sector reforms to control technical and commercial losses.

5. Among the measures, energy efficiency enhancement in the power supply side is one of the most critical challenges in terms of reducing GHG emission. In addition, to bridge the gap between demand and supply, especially in the context of limited financial resources, it has become imperative to look for optimum utilization of existing installed generation capacity as continuous deterioration in the performance of thermal power stations had been observed during the early 1980s.

6. In this regard, renovation and modernization (R&M) schemes for improving the performance of existing power stations were drawn and executed. Before the IEP was set out, the Government had launched phase I of an R&M program in 1984 for implementation during the 7th plan period as a centrally sponsored scheme. The program covered 163 thermal units (13,570 megawatts) in 34 selected power stations. The program was completed in 1991–1992 with assistance from the central financial institutions.

¹ The TA first appeared in *ADB Business Opportunities* on 15 August 2007.

7. Encouraged by the results achieved and urged by the IEP, R&M phase II of the program is presently in progress. The total estimated cost of these works is \$600 million. Most of the state electricity boards (SEBs) and other generating agencies are facing financial constraints to carry out R&M activities. Therefore, the priority area has to be arranging financial assistance and applying clean development mechanism (CDM) to make the R&M projects financially viable. The Government has mandated the Power Finance Corporation (PFC) to give state power utilities assistance in preparing CDM projects. PFC was set up in July 1986 as a financial institution dedicated to power sector financing and committed to the integrated development of the power and associated sectors.

8. Despite the national initiatives, the state utilities planning R&M projects that are potentially CDM eligible face several challenges. First, there are no approved methodologies applicable for most of the planned R&M projects partly because demonstrating additionality² is difficult compared with green field projects. Second, many of the planned projects are relatively smaller than the endorsed projects and the transaction costs will be high if the smaller projects are processed independently. Third, the capacities of state utilities need to be further developed in terms of (i) project conceptualization to judge if a project they will undertake will be eligible for CDM, (ii) financial projection to properly value the certified emission reduction (CER) revenue stream in carbon purchase transactions, (iii) preparation of project idea notes and project design documents (PDDs), and (iv) interactions with the designated national authority and other stakeholders. Therefore, provision of a TA to address these aspects will support the initiative.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

9. The TA aims to assist state utilities in preparing CDM-eligible energy efficiency projects in the thermal and hydro power generation sector, which will enhance efficiency rates and reduce GHG emission of the existing power plants; and in replacing old units with more efficient new units.

10. In addition, the TA will provide assistance to non-CDM R&M and replacement projects. Although such non-CDM projects may not contribute in meeting the Kyoto targets, they can still get benefits from carbon trading. Such projects generate credits called verified emission reductions (VERs), which can be sold in voluntary carbon markets. The TA will also include assistance for carbon benefits in green energy generation projects.

B. Methodology and Key Activities

11. The TA will identify the pilot state utilities through the screening process for CDM-eligible projects and help design, process, and implement the projects. With the implementation of the TA, capacity development programs, e.g., CDM technical workshops, for the pilot state utilities and others will be conducted. The TA will be implemented in close coordination with activities under ADB's Carbon Market Initiative (CMI) and the Energy Efficiency Initiative (EEI) to ensure no duplication and maximize synergy. The key activities are the following.

² The concept of additionality was introduced in the Kyoto Protocol in Article 12.5, which states that emission reductions resulting from each project activity shall be certified by DOEs on the basis of reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

- (i) **Project identification.** Help the state utilities assess CDM and VERs eligibilities for the planned R&M projects.
- (ii) **Project development.** Assist in conducting preliminary screening of projects' CDM potential to assess projects' eligibility under CDM rules, conducting due diligence on clean energy projects potentially eligible under CDM rules, and supporting state utilities in drafting PDDs and new baseline and monitoring methodologies if required.
- (iii) **Validation and registration.** Help project developers obtain host country approvals and validation of PDDs from the designated operational entity (DOE) and have them registered with the CDM Executive Board.
- (iv) **Monitoring CDM implementation progress during project financing/construction.** Monitor the implementation of project milestones as specified in the PDD and the specific CDM methodology used, as agreed upon with ADB.
- (v) **CDM data monitoring.** Monitor data as specified in the PDD, and as described in the monitoring methodology of the specific CDM methodology used.
- (vi) **Verification and certification.** Assist state utilities to meet the requirements for validation and certification by the DOE. Provide technical guidance to meet the requirements of the DOE and the CDM Executive Board.
- (vii) **Issuance and transfer of CERs.** Assist state utilities to meet the requirements for the issuance and transfer of CERs.
- (viii) **Issuance of VERs.** Assist state utilities to acquire VERs for CDM non-eligible projects.
- (ix) **Workshop.** Hold a workshop to disseminate best practices to relevant stakeholders.

C. Cost and Financing

12. The total cost of the TA is estimated at \$1,300,000 equivalent. The Government has requested ADB to finance \$1,000,000. The TA will be financed on a grant basis by ADB's TA funding program. The Government will finance the remaining \$300,000 equivalent in kind through the provision of administrative setup, including office space, office equipment, and local transportation. The detailed cost estimates and financing plan are in Appendix 2.

D. Implementation Arrangements

13. PFC will be the Executing Agency (EA) and the pilot state utilities will be implementing agencies (IAs) for the TA. The utilities will be identified by PFC and ADB. PFC and the IAs will provide office space and local telephone access, and will help the TA consultants identify specific counterparts and facilitate data gathering in state utilities. The TA consultants will organize the workshops and an international seminar, if necessary, which will be designed in coordination with PFC, IAs and other multilateral and bilateral development partners. The TA will be implemented over 18 months, from 1 January 2008 to 31 June 2009.

14. A project implementation unit will be located in the office of PFC, which will assign a senior staff member as the project manager and a PFC counterpart team to work with the TA consultants. The project manager will regularly monitor the consultants' work, in close coordination with ADB. PFC will nominate the project manager and establish the steering committee before the TA consultants are mobilized and fielded. The team leader of the TA consultants will be responsible for overall coordination between the consultants, the Government, ADB, and the steering committee.

15. The TA will require a consulting team of international and national consultants. About 8 person-months of international and 110 person-months of national consulting services are envisaged. The international consultants should have extensive experience in CDM policy, regulatory practices, and market development. They should have demonstrated expertise in the areas of (i) power sector CDM project development and processing, (ii) project-level financial and economic analyses, and (iii) institutional development. International consultants will collaborate with and supplement the skills of national consultants, who will have similar expertise and be familiar with Indian power sector conditions and institutional structures. The outline terms of reference for consulting services are in Appendix 3. ADB will engage a consulting firm or a consortium of firms in accordance with ADB's *Guidelines on the Use of Consultants* (2007, as amended from time to time). Consultants will be recruited following the submission of full technical proposals under the quality- and cost-based selection method. The standard quality-cost ratio of 80:20 will be applied. Procurement of any equipment under the TA will follow ADB's *Procurement Guidelines* (2007, as amended from time to time).

16. The TA will be implemented in close coordination with activities under the two initiatives (CMI and EEI) to ensure no duplication and to maximize synergy through close consultation from project identification to implementation. The consultants will also work closely with other development partners, e.g., the World Bank, to ensure that all works are fully complementary. If other partners are developing a new methodology applicable to the planned R&M project, the consultants will fully share the information in preparing PDDs, if appropriate. The consultants will submit an inception report (a detailed work program with a specific timetable for important tasks), an interim report, and a draft final report by the end of months 1, 6, and 14, respectively, after their services start. Other deliverable reports will be submitted in accordance with milestones to be confirmed when the TA starts. The consultants will prepare monthly status and progress reports for the specific scopes of work. Tripartite meetings among representatives from PFC, ADB, and the consultants will be held in India to discuss the inception, interim, and draft final reports. Within 1 month of the tripartite meeting for the draft final report, the consultants will submit a final report, incorporating comments received from the Government and ADB. Establishing an advance payment facility for PFC, if necessary, will be considered. This facility, if appropriate, will be administered by PFC.

IV. THE PRESIDENT'S DECISION

17. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of \$1,000,000 on a grant basis to the Government of India for Energy Efficiency Enhancement in the Power Generation Sector, and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Monitoring Mechanism	Assumptions and Risks
<p>Impact Efficient reduction of GHGs through implementation of CDM projects in India</p>	<ul style="list-style-type: none"> Reduction in rate of GHG emissions at national level and in selected states Tons of CO₂ equivalent emission reduction achieved due to project implementation 	<ul style="list-style-type: none"> Annual GHG inventory reports; enterprise-level inventory reports CDM monitoring and verification report 	<p>Assumptions</p> <ul style="list-style-type: none"> Political and socioeconomic conditions remain stable. Economic growth in the region is stable. <p>Risks</p> <ul style="list-style-type: none"> International and regional dialogues on climate change action collapse. There are project delays.
<p>Outcome Increased number of clean energy CDM-eligible projects in the India power sector</p>	<ul style="list-style-type: none"> Completion of R&M phase 2 program with CERs and VERs Strengthened capacity of 3–7 state utilities 	<ul style="list-style-type: none"> Associated assessments, reports, review missions, and policy dialogue. 	<p>Assumption</p> <ul style="list-style-type: none"> Clean energy is on Central and state governments' development agendas. <p>Risks</p> <ul style="list-style-type: none"> The Project is delayed. CERs and VERs markets fluctuate.
<p>Outputs</p> <ol style="list-style-type: none"> Clean energy project concepts PDDs and new CDM methodologies developed (if necessary) Successful CDM validation of clean energy projects obtained A workshop to disseminate the outcomes to other state utilities 	<ul style="list-style-type: none"> CDM projects identified/to be identified by state utilities within the TA amount At least 5 draft PDDs and new methodologies developed, (as necessary) 1 R & M project and 1 replacement project with new methodology successfully validated. A workshop held successfully 	<ul style="list-style-type: none"> PFC annual report Country consultation meeting reports Report by DOE Action plans Draft PDDs and methodologies Designated operational entity reports Report by PFC 	<p>Assumption</p> <ul style="list-style-type: none"> Clean energy is on Central and state governments' development agendas <p>Risks</p> <ul style="list-style-type: none"> Project is delayed. Verification and certification of CERs and VERs are delayed

<p>Activities with Milestones</p> <p>1.1 Provide technical inputs to PFC to identify clean energy projects potentially eligible for the CDM.</p> <p>2.1 Assess the capacities of state agencies to develop CDM-eligible clean energy projects.</p> <p>3.1 Conduct preliminary screening of clean energy projects to assess their eligibility under CDM rules.</p> <p>3.2 Conduct due diligence on potential clean energy projects.</p> <p>3.3 Assist project developers and sponsors in drafting PDDs and new baseline methodologies, if necessary.</p> <p>3.4 Help project developers obtain validation from designated operational entities.</p>	<p>Inputs</p> <p>ADB: \$1,000,000</p> <p>Government: \$300,000 equivalent of cash and in-kind contribution</p>
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CDM = clean development mechanism, DOE = designated operational entity, GHG = greenhouse gas, PDD = project design document, PFC = Power Finance Corporation Ltd., R&M = renovation and modernization, TA = technical assistance.

COST ESTIMATES AND FINANCING PLAN
(\$'000)

Item	Total Cost
A. Asian Development Bank (ADB) Financing^a	
1. Consultants	
a. Remuneration and Per Diem	
i. International Consultants ^b	200.0
ii. National Consultants ^c	440.0
b. International and Local Travel	200.0
c. Reports and Communications	10.0
2. Seminars, Workshops, and Training	45.0
3. Representative for Contract Negotiations	5.0
4. Contingencies	100.0
Subtotal (A)	1,000.0
B. Government Financing	
1. Office Accommodation and Transport ^d	120.0
2. Remuneration and Per Diem of Counterpart Staff	40.0
3. Contingencies	140.0
Subtotal (B)	300.0
Total	1,300.0

^a Financed by ADB's technical assistance funding program.

^b Assuming 8 person-months of international consulting services at \$25,000 per month.

^c Assuming 110 person-months of national consulting services at \$4,000 per month.

^d Includes office facilities and local communications.

Source: ADB estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTING SERVICES

A. Introduction

1. A consulting team of international and national consultants with extensive experience in the areas of clean energy and the clean development mechanism (CDM) as well as the Indian power sector will be required for this technical assistance (TA). The national consultants will be familiar with local conditions and institutional structures. International consultants will be required to collaborate with and supplement the skills of the national consultants. About 8 person-months of international and 110 person-months of national consulting services are envisaged. The international consultant should have adequate demonstrated experience in the power generation sector and first-hand experience in developing new CDM methodologies.

2. The consulting team will provide the services through a consultative process with the Power Finance Corporation (PFC) and Asian Development Bank (ADB) to ensure no duplicative works. The consulting team (India-CDM Team) will ensure that all work and outputs under the TA comply fully with all relevant ADB policies and guidelines. The consultants will be expected to be familiar with ADB's guidelines for technical, financial, and economic analyses and social safeguards. They will develop and use a comprehensive evaluation framework for all workshops and seminars to determine effectiveness.

B. Scope of Work

3. Consulting services will be provided by the following international and national consultants.

1. **Clean Energy and CDM Specialist and Team Leader** (international, 8 person-months)

4. The responsibilities of the consultant will include, but will not necessarily be limited to, the following

- (i) Review the past experience of PFC and other utilities with respect to undertaking renovation and modernization (R&M) projects.
- (ii) Review the project pipelines of the pilot states utilities to identify opportunities for developing CDM-eligible projects and for replacing thermal and or hydro power generation plants.
- (iii) Advise PFC and the pilot states on procedural criteria for screening and selecting CDM-eligible projects in conjunction with the CDM project cycle.
- (iv) Prepare a long list of project idea notes and project concept papers, select the most promising projects for which to conduct required due diligence and develop project documentation, and register them as CDM-eligible projects under the Kyoto Protocol rules.
- (v) Assist project developers in getting approval from the designated national authority.
- (iv) Assist state utilities to monitor the implementation of project milestones as specified in the PDD and the specific CDM methodology used, as agreed upon with ADB and to monitor data as specified in the PDD, and as described in the monitoring methodology of the specific CDM methodology used.
- (vi) Assist state utilities to meet the requirements for validation and certification by the DOE. Provide technical guidance to meet the requirements of the DOE and the CDM Executive Board.
- (vii) Assist state utilities to meet the requirements for the issuance and transfer of CERs.

- (viii) Assist state utilities to acquire VERs for CDM non-eligible projects.
- (vi) Assign national consultants to the selected portfolio of projects and provide overall coordination between the India-CDM Team, carbon market initiative (CMI) team, the energy efficiency initiative (EEI) team, the governments, ADB, and other stakeholders.
- (vii) Provide direction to the national consultants and offer technical support to ensure the quality of the project design document (PDD) for a R&M project and new CDM methodologies for a replacement project.
- (viii) Hold a workshop to invite relevant stakeholders including state utilities to disseminate the outcome of the TA.
- (ix) Prepare a report highlighting the potential of R&M projects to reduce greenhouse gas emission.

5. The team leader will be responsible for overall coordination between consultants, the Government, ADB, and the steering committee. In case the single consultant cannot handle both R&M and replacement projects, two consultants will be recruited to distribute the tasks.

2. Project Specialist (national, 10 person-months)

6. The project specialist will help the international consultants and team leader by undertaking the following activities.

- (i) Conduct research and undertake data collection and analysis in relation to the CDM potential of ADB's clean energy projects.
- (ii) Collect and collate project-related data and information for preparing CDM project documentation.
- (iii) Research CDM-related issues and monitor new developments in the participating country and at the international level.
- (iv) Follow up regularly on new methodologies approved and apply them in calculating emissions
- (v) Review decisions made by the CDM Executive Board and other relevant developments at the United Nations Framework Convention on Climate Change, and apprise team members regularly.
- (vi) Prepare technical reports, briefing notes, and presentations as necessary.
- (vii) Conduct an initial evaluation of the national technical experts' outputs and recommend actions.
- (viii) Assist the team leader in all aspects of TA implementation.

3. Technical Experts (national, 100 person-months)

7. The national technical experts will undertake the following tasks.

- (i) Identify potential clean energy projects and their CDM potential.
- (ii) Prepare a pipeline of clean energy projects.
- (iii) Screen potential clean energy projects and their CDM potential.
- (iv) Manage CDM projects.
- (v) Develop and prepare PDDs and new baseline methodologies, if necessary, in line with the standard format developed by the CDM Executive Board.
- (vi) Assist PFC and pilot state utilities and participate in capacity-building workshops for project developers, project sponsors, and host governments.
- (vii) Prepare technical reports and information, and marketing materials.

(viii) Assist the team leader in all aspects of TA implementation.

C. Deliverable Outputs

8. The TA consultants will provide (i) clean energy project concepts, (ii) workshop reports for disseminating best practices, (iii) PDDs and methodologies, and (iv) VERs if CDM is not applicable.

D. Reporting Requirements and Other Responsibilities

9. The consultants will submit three hard copies and an electronic copy of each of the following reports to ADB: (i) an inception report (a detailed work program with a specific timetable for important tasks) by the end of the first month of the start of the TA; (ii) an interim report with findings in relation to the project portfolio, status of near-term project opportunities, and capacity-building requirements, within 6 months of the start of the TA; (iii) a draft final report covering material similar to that in the interim report, 15 months after the TA starts; and (iv) other reports in accordance with milestones to be confirmed at the start of the TA. In addition, the consultants will prepare monthly status and progress reports in relation to the specific scope of work that will highlight issues that could become critical for timely completion of the TA.

10. The team leader will be responsible for coordinating with the ADB project officer and with the EEI team, CMI team, international and national consultants, governments, and other stakeholders.