Document of
The World Bank

Report No: ICR0000910

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(Loan No 45710, 33960, GEF Grant No. 20169)

ON A

IBRD LOAN IN THE AMOUNT OF US$ 80.00 MILLION

AND A

IDA CREDIT IN THE AMOUNT OF SDR 37.20 MILLION
(US$ 50.00 MILLION EQUIVALENT)

AND A

GLOBAL ENVIRONMENTAL FACILITY GRANT
IN THE AMOUNT OF US$ 5.00 MILLION

TO

THE REPUBLIC OF INDIA

FOR A

SECOND RENEWABLE ENERGY PROJECT

September 30, 2008

Sustainable Development Department
India Department
South Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective March 31, 2008)

Currency Unit = INR
INR 1.00 = US$ 0.025
US$ 1.00 = INR 39.97

FISCAL YEAR

April 1 – March 31

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
BEE	Bureau of Energy Efficiency
CAS	Country Assistance Strategy
CER	Certified Emission Reduction
CUF	Capacity Utilization Factor
DNES	Department of Non-Conventional Energy Sources
DO	Development Objectives
DPR	Detailed Project Report
DSM	Demand Side Management
EE	Energy Efficiency
EEC	Energy Efficiency and Conservation
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
ESCO	Energy Service Company
FIRR	Financial Internal Rate of Return
FM	Financial Management
GEF	Global Environment Facility
GEO	Global Environment Objectives
GHG	Greenhouse Gas
GoI	Government of India
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IDA	International Development Association
IREDA	Indian Renewable Energy Development Agency Limited
IPP	Independent Power Producer
KfW	Kreditanstalt fur Wiederaufbau
LoC	Line of Credit
MNES	Ministry of Non- Conventional Energy Sources
MNRE	Ministry of New and Renewable Energy
MoU	Memorandum of Understanding
M&E	Monitoring & Evaluation
M&V	Measurement & Verification
MPSEB	Madhya Pradesh State Electricity Board
MU	Million Units
NEAP	National Environmental Action Plan
NGO	Non Governmental Organization
NPA	Non Performing Asset

O&M	Operations & Maintenance
OTS	One Time Settlement
PAD	Project Appraisal Document
PCN	Project Concept Note
PDO	Project Development Objective
PFC	Power Finance Corporation
PMR	Progress Management Report
PPA	Power Purchase Agreement
PTC	Power Trading Corporation
PwC	PricewaterhouseCoopers
QPR	Quarterly Progress Report
RE	Renewable Energy
RFP	Request For Proposal
RoR	Run of River
SARFAESI	Securitization and Reconstruction of Financial Assets and Enforcement of Security Interests
SEB	State Electricity Board
SERC	State Electricity Regulatory Commission
SHP	Small Hydropower
SME	Small and Medium Enterprise
TA	Technical Assistance
TAP	Technical Assistance Plan
TF	Trust Fund
WB	World Bank
USAID	U. S. Agency for International Development
WHR	Waste Heat Recovery

Vice President:	Isabel Guerrero
Country Director (Acting):	Rachid Benmessaoud
Sector Manager:	Salman Zaheer
Project Team Leader:	Mikul Bhatia
ICR Team Leader:	Jeremy Levin

INDIA
Second Renewable Energy Project

CONTENTS

A. Basic Information			
Country:	India	Project Name:	Second Renewable Energy
Project ID:	P049770,P055906	L/C/TF Number(s):	IBRD-45710,IDA-33960,
ICR Date:	09/30/2008	ICR Type:	Core ICR
Lending Instrument:	SIL,SIL	Borrower:	GOVERNMENT OF INDIA AND IREDA
Original Total Commitment:	USD 130.0M,USD 5.0M	Disbursed Amount:	USD 107.4M,USD 5.0M
Environmental Category: B,C		**Focal Area**: C	
Implementing Agencies: Indian Renewable Energy Development Agency			
Cofinanciers and Other External Partners:			

B. Key Dates				
Second Renewable Energy - P049770				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	01/17/1997	Effectiveness:	01/31/2001	01/31/2001
Appraisal:	07/14/1997	Restructuring(s):		
Approval:	06/27/2000	Mid-term Review:		07/14/2003
		Closing:	03/31/2006	03/31/2008

ENERGY EFFICIENCY - P055906				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	01/17/1997	Effectiveness:	11/11/2000	01/31/2001
Appraisal:	07/14/1997	Restructuring(s):		
Approval:	06/27/2000	Mid-term Review:		07/14/2003
		Closing:	03/31/2006	03/31/2008

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes	Satisfactory
GEO Outcomes	Satisfactory
Risk to Development Outcome	Low or Negligible
Risk to GEO Outcome	Low or Negligible

Bank Performance	Satisfactory
Borrower Performance	Moderately Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry	Satisfactory	Government:	Moderately Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance	Satisfactory	Overall Borrower Performance	Moderately Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Second Renewable Energy - P049770			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating:**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA)	None
DO rating before Closing/Inactive status	Satisfactory		

ENERGY EFFICIENCY - P055906			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating:**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA)	None
GEO rating before Closing/Inactive Status	Satisfactory		

D. Sector and Theme Codes		
Second Renewable Energy - P049770		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Central government administration	4	4
Power	96	96

Theme Code (Primary/Secondary)		
Climate change	Primary	Primary
Other financial and private sector development	Primary	Primary
Rural services and infrastructure	Primary	Secondary
Water resource management	Secondary	Secondary

ENERGY EFFICIENCY - P055906		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Renewable energy	100	100

Theme Code (Primary/Secondary)		
Climate change	Primary	Primary
Infrastructure services for private sector development	Primary	Primary
Other financial and private sector development	Primary	Primary
Pollution management and environmental health	Primary	Primary
Regulation and competition policy	Secondary	Secondary

E. Bank Staff

Second Renewable Energy - P049770

Positions	At ICR	At Approval
Vice President:	Isabel M. Guerrero	Mieko Nishimizu
Country Director:	Rachid Benmessaoud	Edwin R. Lim
Sector Manager:	Salman Zaheer	Alastair J. McKechnie
Project Team Leader:	Mikul Bhatia	Magdalena V. Manzo
ICR Team Leader:	Jeremy Levin	
ICR Primary Author:	Chandrasekar Govindarajalu	

ENERGY EFFICIENCY - P055906

Positions	At ICR	At Approval
Vice President:	Isabel M. Guerrero	Mieko Nishimizu
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ICR Primary Author:	Chandrasekar Govindarajalu	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)
The main project development objectives were to:
a) augment power supply through environmentally sustainable small hydro investments;
b) mobilize private sector investments in renewable energy projects; and
c) promote energy efficiency and demand side management (DSM) investments.

Revised Project Development Objectives (as approved by original approving authority)
The project development objectives were not revised.

Global Environment Objectives (from Project Appraisal Document)
The GEF-supported global environmental objective was to enhance and sustain improved end-use energy efficiencies with consequent reduction in carbon emissions.

Revised Global Environment Objectives (as approved by original approving authority
The project global environmental objectives were not revised.

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Increase in small hydro installed capacity under the project and sectorwide			
Value (quantitative or Qualitative)	IREDA project: 0 MW Sectorwide: 1206 MW	IREDA project: 200 MW Sectorwide: Not defined	IREDA project: 153 MW (Target reduced in proportion to reduction in loan/credit amount)	IREDA project: 95.65 MW (commissioned as of closing March 31 2008, out of 158.25 MW total) Sectorwide: 2180 MW
Date achieved	01/31/2001	01/31/2001	11/29/2006	03/31/2008
Comments (incl. % achievement)	The total capacity funded under the project when all schemes are commissioned will be 158.25 MW. (103%). It is expected that commissioning of all plants would be completed by March 2009.			
Indicator 2 :	Increased availability and utilization of energy efficient products and equipment and of ESCO services - measured as investme nt under Bank project and as equivalent generation capacity in MW			
Value (quantitative or Qualitative)	Investments : USD 0 million Equiv. Generation Capacity : 0 MW	Investments : USD 20 million Equiv. Generation Capacity : Not Defined		Investments : USD 16.93 million Equiv. Generation Capacity : 48 MW
Date achieved	01/31/2001	01/31/2001		03/31/2008
Comments (incl. %	Investments : 85% Equiv. Generation Capacity : Not Applicable			

achievement)	

(b) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Number of ESCOs operating in the country			
Value (quantitative or Qualitative)	4-8 ESCOs in 2002 per "An International Survey of the Energy Service Company (ESCO) Industry", Edward L. Vine, Lawrence Berke ley National Laborator	No target specified		There are more than 25 ESCOs currently operating in India.
Date achieved	01/31/2002	01/31/2002		03/31/2008
Comments (incl. % achievement)	The project provided technical assistance support for 8 ESCO sub-projects and a loan for one.			
Indicator 2 :	Avoidance of carbon emissions through energy effiociency investments under the project			
Value (quantitative or Qualitative)	Carbon Emissions avoided: 0 MTCO2	No target was specified.		Carbon emission reductions from IREDA EE projects are estimated to exceed 9.43 million tonnes (lifetime emission reductions).
Date achieved	01/31/2001	01/31/2001		03/31/2008
Comments (incl. % achievement)	The presented figures are for IREDA's complete EE loan portfolio, including projects under implementation for which emi ssion reduction figures have been estimated.			

(c) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Mobilization of Private Capital and management Resources into the Renewable Power Sector, measured as Promoter's Contrib ution to sub-projects, and number of promoters supported.			
Value (quantitative or Qualitative)	Promotor's Contribution : USD 0 million Number of Promoters Supported : 0	Promotor's Contribution : No target specified Number of Promoters Supported		Promotor's Contribution: USD 117 million Number of Promoters Supported: 33

		: No target specified		
Date achieved	01/31/2001	01/31/2001		03/31/2008
Comments (incl. % achievement)	This achievement measures promotor's contribution to renewable energy investments supported under the project, and not the broader sector investments, which also increased significantly during the project period.			
Indicator 2 :	IREDA is able to build up a sound and sustainable energy efficiency portfolio			
Value (quantitative or Qualitative)	No Energy Efficiency projects in IREDA portfolio	No targets were specified		IREDA has funded 17 energy effiency investments during the project - of which 12 recieved reimbursement under the Bank line o f credit.
Date achieved	01/31/2001	01/31/2001		03/31/2008
Comments (incl. % achievement)	Not Applicable			

G. Ratings of Project Performance in ISRs

-						
No.	**Date ISR Archived**	**DO**	**GEO**	**IP**	**Actual Disbursements (USD millions)**	
					Project 1	**Project 2**
1	12/28/2000	S	S	S	0.00	0.00
2	06/26/2001	S	S	S	3.00	0.00
3	12/21/2001	S	S	S	4.87	0.00
4	06/20/2002	S	S	S	8.54	0.50
5	12/19/2002	S	S	S	12.63	0.83
6	06/24/2003	S	S	S	17.50	1.23
7	09/19/2003	S	S	S	18.36	1.23
8	03/30/2004	S	S	U	23.17	1.43
9	10/05/2004	S	S	U	45.74	1.61
10	05/19/2005	S	S	U	53.33	2.01
11	06/24/2005	S	S	S	53.33	2.01
12	12/07/2005	S	S		64.80	2.54
13	06/25/2006	S	S	S	71.77	2.75
14	12/22/2006	S	S	S	81.02	3.14
15	06/19/2007	S	S	S	89.71	3.48
16	12/18/2007	S	S	S	95.88	4.20
17	12/20/2007	S	S	S	95.88	4.20
18	06/16/2008	S	S	S	107.37	4.85

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile

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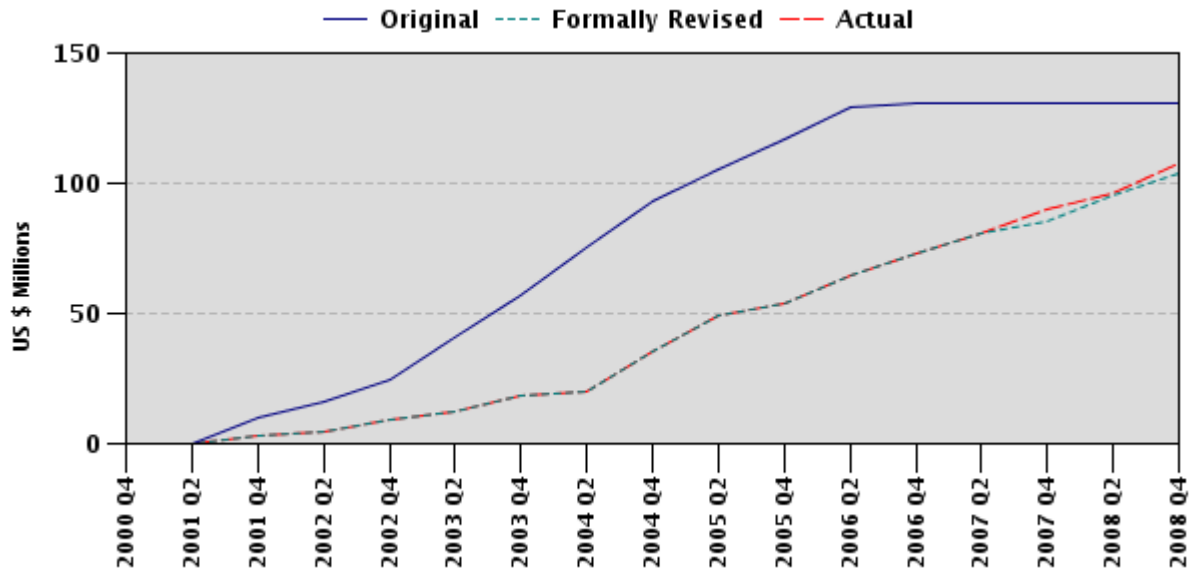

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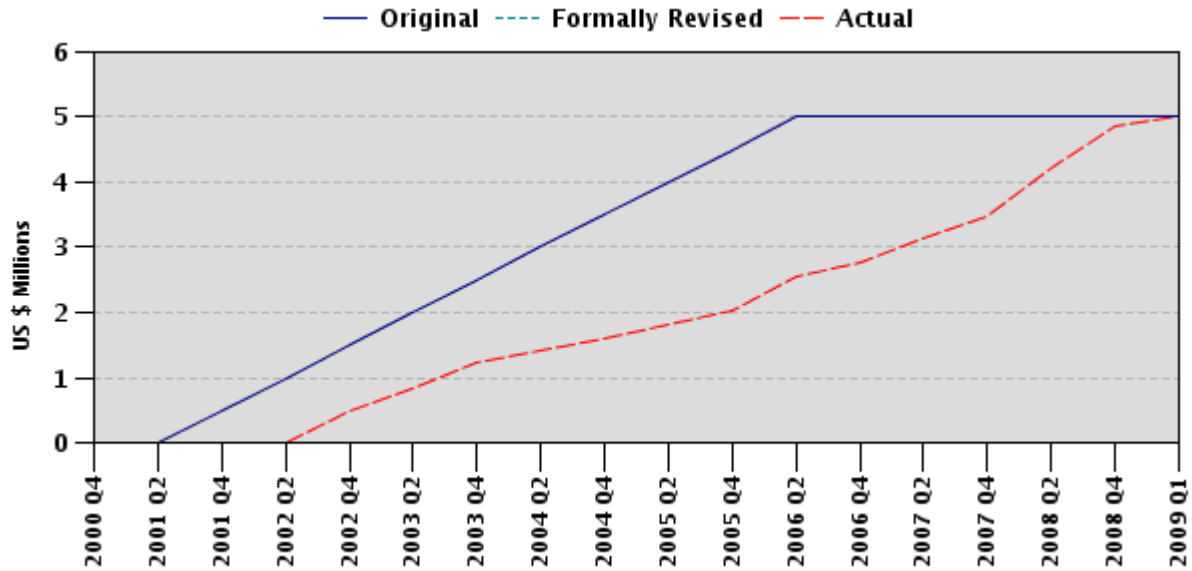

1. Project Context, Development and Global Environment Objectives and Design:

1.1 Context at Appraisal (brief summary of country and sector background, rationale for Bank assistance):

1.1.1 ***Country Background*** By the second half of the 1990s, India's reforms in the areas of investment, trade, and finance, initiated in response to the 1991 crisis, had helped stimulate the economy. During the period 1994- 1997, the country experienced high average rates of economic growth of 7 percent. The 1997 Country Assistance Strategy (CAS) document proposed Bank group assistance in reducing infrastructure bottlenecks and promoting private sector participation across sectors. The India Compact also called for the Bank to assist the Government to implement priorities identified in its National Environmental Action Plan (NEAP 1993), including development of the Alternative Energy Plan.

1.1.2 ***Sector Background*** At the time of project design, India's power industry was characterized by inadequate and inefficient power supply with peak capacity and energy supply shortages exceeding 20 percent and 10 percent, respectively. On the demand-side, inefficient pricing and a variety of market and non-market barriers contributed to the overall inefficient use of electricity and thermal energy, exacerbating the energy shortage and leaving a large unfulfilled market for financing investments in projects that could cost-effectively reduce energy costs in industrial units.

The Government of India's (GOI) response to the continuing power sector shortages was to provide additional support to states who were undertaking power sector reforms and to encourage entry of private sector investments in the sector. These reforms included unbundling of previously integrated State Electricity Boards (SEBs) and the establishment of independent regulatory agencies who worked at creating appropriate enabling environments to encourage private sector investment in power generation. The accelerated development of the country's renewable energy resources and of energy efficiency programs was a priority thrust area under India's NEAP, as the government was aware of the benefits of increased levels of environmentally sustainable energy investments.

At the national level, the government had a long record of support to Renewable Energy, including the establishment of a Department of Non-Conventional Energy Sources (DNES) and the establishment of the Indian Renewable Energy Development Agency Limited (IREDA) in 1987, under the administrative purview of the DNES. IREDA was given the dual mandate of promoting renewable energy technologies and of providing financial support to investments in the sector. The DNES was later elevated to the status of a ministry, the Ministry of New and Renewable Energy (MNRE), earlier called the Ministry of Non conventional Energy Sources (MNES), which has administered one of the largest renewable energy programs amongst developing countries. As part of its efforts to promote renewable energy, the Ministry issued guidance on appropriate power purchase tariffs which could be adopted by the states which recognized the positive externalities from renewable energy.

At the state level, each state adopted its own policies, but central government guidance was a key factor in establishing a supportive enabling environment for private sector development of renewables. Several Southern states adopted various policies in the early to mid 1990s to attract private sector development of small hydro and other small-scale renewable energy power facilities, including wheeling, banking, and third party sales arrangements. In contrast, the regulations in the Northern states were not as supportive of renewables, and the level of private sector SHP development remained low despite relatively high resource potential figures. Most of the small hydro projects in the Northern areas were primarily undertaken by public sector entities.

At the time of project appraisal, GOI support for energy efficiency was focused on provision of support for energy audits and information dissemination programs in the industrial sector by public sector institutions including the National Productivity Council, the Petroleum Conservation Research Association, the Industrial Development Bank of India (IDBI) and the Energy Management Center (EMC). These efforts

lacked a unified approach to overcome market barriers to energy efficiency, especially on financing identified efficiency investments. The passage of the energy conservation act and the creation of the Bureau of Energy Efficiency (BEE) in 2001 was a major step forward by the Government in advancing its energy efficiency strategy and signified the beginning of a comprehensive approach to address this important topic.

The Government's emphasis on clean energy development including both efficiency and renewables has increased since the time of appraisal. This is evidenced by the findings of the Planning Commission's Integrated Energy Policy Report (2006) and the renewable energy and energy efficiency missions presented as part of the National Climate Change Action Plan (2008).

Rationale for Bank Involvement The first line of credit to IREDA under the India: Renewable Resources Development Project (CPL-35440; COFN-03220; TF-20339; TF-28633) successfully facilitated early private sector interest in renewable energy development. A second line of credit to IREDA was considered appropriate for broadening the impact of the program and supporting the development of SHP in other areas of high potential throughout the country.

Additionally, a line of credit for energy efficiency was considered to be an appropriate complement to the renewable energy program given the unmet financing needs of industrial and commercial end-users who paid relatively high power prices but under-invested in energy efficiency. While the technical and economic potential for improving energy efficiency and thereby reducing carbon emissions in India was sizeable, several market barriers prevented realization of these savings. At the time of project appraisal, it was felt that IREDA could take a leadership role in implementing activities to overcome energy efficiency market barriers.

a. Original Project Development Objectives (PDO) and Key Indicators [as approved]:

Project Development Objectives	Key Performance Indicators
Augment power supply through environmentally sustainable SHP investments	Increase in SHP installed capacity under the project and sector wide
Mobilize private sector investments in renewable energy power projects	Private sector promoter's contributions to renewable energy sub-projects and number of sub-projects supported
Promote energy efficiency and demand-side management (DSM) investments	Increased availability and utilization of energy efficient products and equipment and of ESCO services – measured as investments under the Bank project and as equivalent generation capacity IREDA builds up a sound and sustainable energy efficiency portfolio

b. Original Global Environmental Objectives (GEO) and Key Indicators [as approved]:

Project Development Objectives	Key Performance Indicators
Enhance and sustain improved end-use energy efficiencies with consequent reduction in carbon emissions	Energy efficiency service providers are able to gain market entry – measured as number of ESCOs operating in the country Avoidance of carbon emissions resulting from energy efficiency investments under the project

c. Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification:

The Project Development Objectives were not revised.

d. Revised GEO (as approved by original approving authority) and Key Indicators, and reasons/justification:

The Global Objectives were not revised.

e. Main Beneficiaries:

Beneficiaries of Small Hydropower Component Private SHP developers were the direct beneficiaries of the Bank project in terms of funding for investments and building institutional capacities. The project paved the way for emergence of a new breed of entrepreneurs engaged in generation of power from SHP facilities. Many such developers in the southern states, who were introduced to the business through the first LoC to IREDA, expanded operations into some of the Northern states, notably Himachal Pradesh. State power distribution utilities which purchased electricity from small-hydropower plants and electricity consumers at large were the indirect beneficiaries of the Bank project. With augmentation of generation capacity (nearly 96 MW for 34 commissioned projects) and increased availability of power (estimated at 402 million units per annum – valued at over US$50 million annually at prevailing diesel-based generation costs - for 32 of these projects), the economy as a whole benefitted, especially in view of the prevailing acute power shortages. By mobilizing private sector capital and management expertise into the power sector the project helped diversify energy sources and moderately reduce heavy reliance of the power sector on fossil fuels.

Beneficiaries of Energy Efficiency and DSM Component: The main project beneficiaries were the industries, commercial establishments, communities and other electricity consumers who realized energy cost savings and productivity gains as a result of energy efficiency and DSM investments. The state distribution companies and the economy as a whole were the indirect beneficiaries of the reduced peak demand resulting from the implementation of the EE projects.

Beneficiaries of Technical Assistance: The project supported numerous training and capacity building activities for energy efficiency stakeholders including central and state government officials, commercial banks, EE consultants, businesses, universities and research institutions and non-governmental organization (NGO) groups. The awareness building activities carried out under the project also impacted end-users and helped in raising energy efficiency awareness to a broad section of the population. Institutional strengthening initiatives directly benefited IREDA which had no previous experience with lending for energy efficiency but is now well placed to continue providing finance for these types of investments.

f. Original Components (as approved):

Part A: The Small Hydro component built upon IREDA's experience with the first Renewable Resources Development Project. It was designed to finance 200 MW of small hydro capacity developed by the private sector. The target was revised to 153 MW after cancellation of US$26 million of IBRD proceeds which were unlikely to be utilized by the time of project closure.[1] The project was designed to support a range of eligible small hydro project types including (i) Canal-based and dam toe schemes; (ii) Run-of-river schemes; (iii) Rehabilitation and/or upgrading of old plants; (iv) Use of tail ends of cooling water systems of thermal power plants; and, (v) Stand alone micro-hydro sub-projects of up to 100kW each. Over 80

[1] Partial cancellation of funding was undertaken twice during project implementation – US$ 18 million in June 2005, and US$ 8 million in November 2006. The closing date of the project was extended by one year on each occasion.

percent of the sub-projects were expected to be categories (i) and (ii) projects, ranging in sizes from 1 MW to 25 MW. It was recognized during project preparation that some of these categories represented greater risks and would be less economically attractive to developers, but the experience gained would be an important input in mapping out future strategies for promotion of decentralized generation of power.

Part B: The Energy Efficiency/DSM component was designed to provide financing for energy efficiency as a new line of lending business that would complement IREDA's renewable energy financing activities. The component would cover a wide array of approaches including: (i) design, development and implementation of integrated energy management services operated by ESCOs and end-users on a performance guarantee basis; (ii) end user purchase and installation of energy efficiency and/or load management devices and systems; (iii) production of energy efficient equipment; and, (iv) end-user participation in SEB and other utility-sponsored DSM programs.

Part C: The Technical Assistance component was designed to support IREDA's efforts in the new area of energy efficiency by financing: (i) pre-investment activities to develop a sustainable pipeline of energy efficiency investments, preparation of standard bidding documents for procuring ESCO services, operational and business development modules and information dissemination; (ii) establishing in-house capacity within IREDA to appraise, supervise and promote energy efficiency services and schemes; (iii) assisting participating states in promoting end-use efficiency including development of appropriate policy incentives; and, (iv) training of public and private sector energy and industry officials and staff on energy conservation and DSM.

g. Revised Components:

The components were not revised.

h. Other significant changes (in design, scope and scale, implementation arrangements and schedule, and funding allocations):

There were no significant changes in project design during implementation. However, the scale of the project was reduced following cancellation of a part of the IBRD loan. The project closing date was extended by two years.

b) Key Factors Affecting Implementation and Outcomes

a. Project Preparation, Design, and Quality at Entry

Soundness of Background Analysis This project was prepared as a follow-up to the India: Renewable Resources Development Project which was instrumental in initiating private sector investments in renewable energy development and in strengthening IREDA's capacity. The second renewable energy project was specifically focused on providing continued support to the nascent private sector market for small scale power generation, particularly in the Northern states, and to build capacity within IREDA to finance energy efficiency projects.

The prevailing situation where industrial and commercial end-users paid high electricity prices but were unaware or unconvinced of the potential savings through investments in energy efficiency was correctly diagnosed at appraisal. Accordingly, a key project component was to catalyze an energy efficiency services industry in India by addressing market development barriers and helping develop entrepreneurial initiatives including support for the formation of Energy Service Companies (ESCOs). Background analysis also correctly identified the need for overcoming market barriers by strengthening institutional capacities, creating awareness and conducting appropriate studies to support pilot interventions in the area of energy

efficiency. Accordingly, these activities were supported through a Global Environment Facility (GEF) grant.

Assessment of Project Design The project design incorporated lessons from the implementation experience of the first Bank project with IREDA, such as development of a sufficient sub-project pipeline upfront and better estimation of civil works and interconnection costs. The project also incorporated lessons from the Bank's EE DSM experience as part of the power sector reform loans which identified the need to develop capacity in an Indian financial institution to appraise and finance energy efficiency investments.

The design of all the three components was found to be adequate. First, the small hydro component allowed IREDA an opportunity to enhance private sector project development capacities, develop new small-hydro project models and diversify its geographical outreach by reaching to the Northern and Eastern states. Second, the decision to include energy efficiency as a component was appropriate as many of the market barriers to energy efficiency are similar to those for renewable energy. The flexibility adopted for types of energy efficiency interventions eligible for support proved to be a crucial factor in allowing for implementation of approaches that worked in the Indian context. Third, the TA design was appropriate for enabling greater awareness about energy efficiency in the Indian industry, examining/testing different approaches for financing efficiency investments, and in creating and strengthening capacities in the market at large and in IREDA to finance efficiency investments. The TA design was revised at mid-term review to focus on near term market opportunities and reduced its emphasis on certain policy aspects, given the creation of the Bureau of Energy Efficiency (BEE) who assumed the lead role in Indian Energy Efficiency Policy work.

Adequacy of Client Commitment at Entry At the time of appraisal, IREDA had already built a large pipeline of sanctioned loans to be financed under the project. IREDA had also started building an energy efficiency pipeline in anticipation of a 1998 start date. This early start in project preparation allowed IREDA extra time in building a portfolio of loans in the new field of energy efficiency.

Assessment of Risks The assessment of risks at the time of appraisal was moderately satisfactory. While the risk from changes in government policy incentives for renewables was seen as low at appraisal, its actual impact during several years of project implementation was substantial with the lapse of the MNES tariff and the passage of the Electricity Act of 2003. Additionally, the risks emanating from multi-year variations in hydrology were not envisaged at appraisal, though such risks had a significant financial impact on loans for the sub-projects in Andhra Pradesh. The assessment of risk was appropriate regarding the nascent stage of ESCO based energy efficiency models and in the case where the demand for energy-efficiency investments did not materialize (or did not translate into bankable projects). Indeed, the project was seen as mechanism which could adequately assess and address the risks inherent in implementing such approaches.

b. Implementation (including any project changes/restructuring, mid-term review, Project at Risk status, and actions taken, as applicable):

Initial Delays: The project was initially prepared in 1997-98 but the Board presentation was delayed due to prevailing international sanctions against India. The project was finally approved by the Board in June 2000 and became effective in January 2001. In the interim period, some of the identified sub-projects were funded through IREDA resources and the ongoing first World Bank line of credit. However, disbursements under this second project were slow until the first line closed in December 2001. The slow initial off-take combined with factors mentioned below affected implementation and eventually led to cancellation of part of the proceeds.

Impact of Change in Policy and Regulatory Environment: The lapse of prevailing government guidelines[1] for renewable power purchase tariffs created significant challenges for SHP developers. Under the Electricity Act 2003 which was adopted several years after project effectiveness, the mandate for Renewable Energy tariff policies was given to state electricity regulatory commissions (SERCs). However, in the absence of clear central policy guidelines and inadequate tools to determine the economic cost of renewable energy vis-à-vis conventional power, most states could not swiftly issue new policies, leading to significant regulatory uncertainty for new project developers who were unable to get approval for proposed power purchase agreements (PPAs) for their potential plants. Several states took this opportunity to terminate and renegotiate existing PPAs to lower levels. This situation represented significant risk for SHP developers and lending institutions such as IREDA. Investment decisions and requests for disbursement against previously approved loans were frequently delayed until the regulatory uncertainty was removed. This problem was slowly resolved on a state-by-state basis over the course of the following three years. Project development and consequent disbursement by IREDA against the WB LoC increased once future revenue streams, as determined by state-specific regulatory PPA policies, became more secure.

Competition from Commercial Banks – Development of a Wider Market: During implementation IREDA faced increasing competition from commercial banks which were now more interested in financing small hydro and energy efficiency projects. At the time of project appraisal, commercial bank interest, experience, and comfort in these types of investments was quite low, but the demonstrated financial viability of the IREDA investments changed this perception. The credibility of IREDA's expertise in appraising potential projects became increasingly recognized by the financial sector over the course of the project, and several project developers who had initially applied for IREDA loans were able to obtain financing from other commercial sources with loan applications made stronger by the fact that IREDA sanctioning approval had been obtained. A total of thirty five sanctioned small hydro and energy efficiency projects representing loans of more than US$ 136 million were dropped from the IREDA sanctioned portfolio during implementation. Most of these projects obtained financing from other sources and have since been commissioned. This is evident from a sample analysis undertaken as part of the final evaluation of the project, which revealed that 15 out of 19 of these projects were commissioned, with one additional SHP project currently under construction. Additionally, several loans were prepaid by project sponsors who were able to obtain lower cost financing than could be provided by IREDA.

While this clearly signaled the "success" of the project in achieving overall goals of lowering barriers for private sector development of EE and RE and in mainstreaming financing for such projects in local commercial banks, it negatively impacted the disbursement of IDA/IBRD funds under the LoC, ultimately leading to partial cancellation of US$ 26 million of the IBRD proceeds which were not likely to be used by the time of project close. IREDA increasingly lost market share of a growing total market for RE and EE to other competing financial institutions who were able to offer more flexible products and services from local branch offices and who were not bound by many of IREDA's procedural processes. These processes were criticized by some developers as too cumbersome and bureaucratic. This experience tested IREDA as an institution, and proved ultimately useful by forcing IREDA to take several steps to improve the attractiveness of its loan offerings, such as revising loan terms and conditions, implementing several actions to streamline its business procedures and reducing documentation requirements.

Institutional and Governance Challenges: For a significant part of the project duration (about two and a half years) the position of Managing Director (MD) of IREDA was vacant. This affected the overall governance arrangements at IREDA, hampering institutional responsiveness in an increasingly competitive market. However, in June 2007 the MD post was elevated to that of Chairman and Managing Director (CMD) and the acting MD was formally appointed to this post. Soon after, the vacant post of Director (Technical) was also filled, and three Independent Directors were appointed to the IREDA board which was

[1] The MNES guidelines were issued in 1994 and recommended a set rate of Rs. 2.25 per unit with a provision for escalation of 5% per annum for 10 years.

a positive step in increasing IREDA operational independence from the Ministry of New and Renewable Resources, which continues to be the principle shareholder of IREDA. With these changes IREDA governance structure is much improved and oriented in a more commercial fashion.

Impact of Natural Causes: Natural causes also had a negative impact on the project. Six hydro sub projects were implemented in AP, a state which faced drought conditions for three years from 2001-02 to 2003-04. Consequently, these projects experienced a severe decrease in available discharge levels, leading to severely reduced opportunities to generate power, earn revenue and service debt. Not surprisingly, all of these projects were soon classified as non-performing assets (NPAs). In 2001-02, IREDA funded interest requirements and added the interest funded to the principal outstanding for these projects and revised their loan repayment schedules. The drought conditions persisted through 2002-03 and 2003-04. As a result of all of these events, IREDA came up with a restructuring package for these projects in 2005/6, and now all of the project sponsors are now servicing their loans in a timely manner. This temporal concentration of NPAs is a not unexpected outcome for a non-banking financial institution which is insufficiently diversified across sectors and geographic locations. While increased IREDA lending in other states and for other types of projects such as wind and energy efficiency will help mitigate future portfolio risk, IREDA will always carry higher levels of exposure to natural disasters due to the composition of its lending portfolio which supports its mission.

Implementation of the GEF TA Program (TAP): The GEF Technical Assistance Program (TAP) was closely monitored and modified to respond to changing conditions, most notably the formation of the BEE and the reduced prospects for utility-led DSM. With the establishment of the BEE, initial TAP work was undertaken to support BEE policy activities such as technical support for issuance of new codes and standards. As the BEE become more established, this policy support was no longer identified as a priority, and TAP activities were refocused on other EE market and pipeline development tasks, including an increased focus on increasing financial sector capacity to lend for EE. The GEF TAP also provided support to IREDA for a package of strategic assignments in the areas of new business development for IREDA, resource mobilization and organizational restructuring to enable better response to increasing competition in the Indian market for clean energy financing.

c. Monitoring and Evaluation (M&E) Design, Implementation and Utilization:

M&E Design The M&E plan for the project comprised of targets that were linked to achievements of different project outputs. This included a capacity addition target of 200MW of small hydro sub-projects (revised to 153 MW); commissioning energy efficiency sub-projects that had measurable energy and capacity savings; and developing a sustainable energy efficiency portfolio and institutional capacity through the TAP. This plan focused on monitoring and regular reporting of the progress in achieving the PDOs and project outputs through quarterly progress reports (QPRs) from IREDA, annual reports, energy audits, and direct feedback from relevant stakeholders.

During the mid-term review and in subsequent missions the M&E design was further strengthened to include additional key indicators, as targets were not specified for some of the key project objectives. Measurable indicators for the TA component were designed and an accompanying implementation plan with expected outputs and timeframes was agreed on. In addition, it was agreed to strengthen and streamline the information provided in the QPRs by adding an analysis of the critical areas of concern and a detailed implementation plan to address these. IREDA built and strengthened its overall M&E systems during the course of the project.

M&E Implementation: Targets for some of the project outcomes were not clearly defined at the beginning of the project. This was addressed by laying out action plans with timeframes. Corrective actions were taken when needed to revise action plans and timeframes for delivery.

M&E Utilization: QPR formats were revised during implementation to improve their effectiveness and identify the need for corrective action. M&E information from QPRs was used to provide feedback to IREDA on issues pertaining to project implementation, sectoral performance, contribution of the projects to the installed capacity of hydro projects, development of capacity in the energy efficiency sector, and to review outcomes of the project. This information helped IREDA/GoI and the Bank team maintain focus on key outstanding issues and their timely resolution, which enabled successful achievement of project development objectives.

d. Safeguard and Fiduciary Compliance (focusing on issues and their resolution, as applicable):

Environmental Safeguards: The primary focus of safeguard compliance for the small hydropower (SHP) sub-projects was managing adverse impacts on the water environment and sensitive areas such as forests. The potential negative impacts on air quality was the key issue to be addressed for the energy efficiency projects. Another common theme during implementation of subprojects in both types of projects related to ensuring sufficient worker and site safety. IREDA sub-projects were fully compliant with environmental safeguards and it is noted that IREDA proactively improved its internal systems to ensure compliance.

A separate environmental audit of the small hydro projects was undertaken during implementation and key recommendations of the audit were adopted by IREDA through the development of a more streamlined project appraisal process. Though this system could not be used on any of the sub-projects under the operation as they were developed before the audit was completed, the system will be a very useful tool for IREDA in the future especially as larger hydropower projects are pursued as part of the new business strategy. Pre-disbursement (post-sanction) inspections were used to encourage the project developers to improve on-site environmental management. In several small hydro locations, good practices on environmental management were noted indicating sensitized project developers. Some of the observed developer practices included tree plantations within the project sites, innovative arrangements for debris disposal, and changing design of intake weir to have better control on minimum downstream flow requirement. Common shortcomings included limited attention to workers' safety during implementation and delays in obtaining regulatory clearances, especially from pollution control boards.

Social Development aspects: Overall, the approach of SHP developers in encouraging effective community involvement has been positive. Provision of employment opportunities for local people, tree planting, provision of education, and support for recreational activities have been undertaken by several SHP developers as part of their business practices. Proactive efforts to enter into active partnerships with local communities fully respecting their needs is noted as a positive attribute of several of the SHP developers. Land acquisition for SHP involving common lands has been a bottleneck issue, particularly in states like Himachal Pradesh, and has been highlighted as an area requiring policy level attention.

Financial Management: FM arrangements from a fiduciary perspective under the project were implemented in a satisfactory manner. The project management report (PMR) formats designed at the appraisal stage were found to be cumbersome during implementation and were therefore refined in the second year. Thereafter, these were submitted on a regular basis, albeit a little delayed in a few instances. Entity audits were regular and did not contain any major accountability issues. Project audits for the IDA credit, GEF grant and IBRD loan were also submitted in time. Consolidated reporting for the three funding sources (IBRD, IDA, GEF) was done for the financial statements from 2006-07 onwards.

Procurement: Procurement undertaken by IREDA and its borrowers under the project was largely satisfactory. Procurement of TA services and goods under GEF funding was also satisfactory, although several activities experienced long procurement-related delays. There was considerable delay in awarding the contract for the installation of an improved FM system and loan accounting system for IREDA. This

was due to several reasons cited in the aide memoires, and at the end of the project this activity still remains incomplete.

e. Post-completion Operation/Next Phase (including transition arrangement to post-completion operation of investments financed by present operation, Operation & Maintenance arrangements, sustaining reforms and institutional capacity, and next phase/follow-up operation, if applicable)

Sustainability of sub-projects funded under the project: Of the 44 SHP sub-projects funded under the World Bank LoC, 34 have already been commissioned and the remaining 11 are expected to be commissioned by March 2009. Of the 12 energy efficiency sub-projects supported, 11 have been commissioned and the remaining one sub-project is expected to be commissioned by December 2008. Despite the cost and time escalations in several cases, and lower capacity utilization factors due to vagaries of hydrology in hydro sub-projects, it is seen that financial rates of return based on actual cost and generation data is higher than the cost of capital. The private developers have an adequate incentive to ensure appropriate operations and maintenance of these sub-projects. As a result, no significant post-completion operational issues are anticipated.

Institutional and Financial Sustainability of IREDA: IREDA has matured as a financial institution during the course of implementation of the two Bank projects, having financed over 200 projects in renewable energy and energy efficiency. IREDA is the lead "green energy" financial institution in the country and has won both regional and international recognition. IREDA's institutional capabilities have been enhanced significantly during this period in resource mobilization, disbursement and maintaining portfolio quality (as further detailed in Annex 10).

As a result of the strategic change consultancy studies, IREDA has a clear business development strategy which has been approved by the IREDA Board which, if successfully implemented, will allow IREDA to continue its leadership role in promotion and development of the RE and EE sectors. In additional to expanding lending in familiar areas such as small hydro and wind, IREDA will also pursue financing opportunities for medium sized renewable energy projects, supply-side efficiency, niche end-use energy efficiency projects (such as waste heat recovery), biomass gasification for thermal applications in industries, and solar photo voltaic projects.

As recommended in the strategic change studies, IREDA is also engaging with other financial institutions for consortium financing of larger projects. Increased outreach to other specialized financial institutions such as Power Finance Corporation (PFC) has helped forge new partnerships. While IREDA was not successful in sourcing additional low cost funds from the domestic market, new resources are being mobilized from international sources, including Asian Development Bank (ADB), European Investment Bank (EIB), KfW and others. As a result, the institutional gains over the course of the Bank-financed project are expected to sustain and expand going forward.

Next Phase / Follow-up Operation:

Rising global and local environmental concerns together with recent rapidly escalating fossil fuel prices have led to increased support for energy efficiency and renewable energy development and consequent increased demand for financing of these investments. The Government of India has also made a clear and strong commitment to support scaling-up of renewable energy and energy efficiency, most recently as part of the special missions under the National Climate Change Action Plan (2008). In this context, the enabling policy and implementation environment for clean energy is likely to become increasingly stronger, further supporting IREDA's future prospects for lending.

As a market leader in renewable energy financing, IREDA has built a unique capacity in this growing market that sets it apart from other financial institutions now entering the field. IREDA has also built up its capacity in energy efficiency financing and is also developing in-house carbon financing knowledge and

skills. IREDA has recently signed partnership agreements with larger institutions such as the Power Trading Corporation (PTC), Power Finance Corporation (PFC) and the Infrastructure Development Finance Company (IDFC) to structure and co-finance projects, which represents further evidence of the value these institutions place on IREDA's capacity and experience.

IREDA had previously focused on financing smaller sized projects (1-10 MW) but is now focusing its attention on larger projects as well, as was suggested by the outputs of the WB-supported strategic change TA provided under this project. Among the recent new flagship projects is the loan for the 100 MW Tata Power Wind Project, co-financed by IREDA and the private sector operations arm of the ADB.

There is a need for further financial support to IREDA at this critical juncture as it forges new partnerships and pursues larger projects, which could be an opportunity for a new engagement between the World Bank and IREDA. While the Indian market for commercial finance of clean energy investments has experienced rapid expansion, there remain several areas which are not being served by the commercial finance market. These areas including geographic zones such as in the Northeast where the level of private sector investment in RE and EE is low, new business models that have the potential to become commercial, and more complex project and financial structures. The ICR team recommends that the Bank engage with IREDA and the Government to discuss and develop possible options for a new operation aligned to the new IREDA business strategy and changing investment climate for clean energy. This recommendation is consistent with recent CAS discussions on the sustainable growth pillar, whereby the Bank has stated that it will assist the GOI to access additional funding for measures that further reduce GHG emissions.

c) Assessment of Outcomes

a. Relevance of Objectives, Design and Implementation (to current country and global priorities, and Bank assistance strategy):

The project objectives and design are considered to be highly relevant to the current national priorities and the Bank assistance strategy. The Government of India has placed a strong emphasis on clean energy development and climate change as evident from the passage of the Energy Conservation act of 2001 and the recently announced "National Action Plan on Climate Change."

The objectives of the project are fully consistent with Bank's 2004 CAS that supports partnerships for Global Environment and promotes private sector led growth by provision of infrastructure. The project also supports Millennium Development Goal 7: Ensuring Environmental Sustainability.

b. Achievement of Project Development Objectives and Global Environmental Objectives (including brief discussion of causal linkages between outputs and outcomes, with details on outputs in Annex 4):

PDO-(a): Augment power supply through environmentally sustainable small hydro investments

The project was successful in augmenting power supply through environmentally sustainable small hydro investments and mobilizing private sector investments in renewable energy power projects. The World Bank has supported 45 sub projects with an installed capacity of 158.25 MW through the second line of credit. Of these, 34 sub projects have been commissioned with installed capacity of 95.65 MW and 11 sub projects with installed capacity of 62.60 MW are expected to be commissioned by March 2009.

During the project a number of regulatory developments at the central and state levels occurred that now provide a good enabling environment for the development of SHP. Nineteen states have specific policies for SHP, 10 states have notified feed-in tariff orders for SHP, and MNRE has announced a new capital subsidy scheme to further support SHP. The total SHP capacity in the country exceeds 2100 MW as of March, 2008 and the target for capacity addition of SHP for the Eleventh plan is 1400 MW.

Out of the total capacity of 536.7 MW installed during the Tenth plan, this project directly supported 95.65 MW. Sub-projects that dropped out of the project but were completed with financing from other sources contributed another 38 MW. Hence, the project supported about 25 percent of the planned SHP additions during this period.

PDO-(b): Mobilize private sector investments in renewable energy power projects

Emergence of a Strong Segment of Private Sector SHP Developers: The project provided lending to 23 SHP entrepreneurs at a time when funding from other sources was not readily available. The successful implementation of these projects has led to some of these entrepreneurs leveraging their initial success to then set up multiple projects in the same location. It has also instilled confidence by certain developers previously only focused on local prospects to implement projects in new states, as was demonstrated when entrepreneurs from Andhra Pradesh successfully set up SHP plants in Northern states. In some cases large SHP players have also used the second LoC to develop expertise in project implementation and plant management.

Increased Development of SHP sub-projects by Private Sector: Initially, all most SHP projects were in the public sector in India. IREDA was a pioneer in fostering private sector based hydro development and, at present almost all such projects are developed by private sector developers.

Increased Financing of SHP sub-projects by Commercial Banks: The sub-projects funded under Bank line of credit took loans from IREDA at commercial terms or higher, and did not crowd out financing from the commercial market. In fact, the success of World Bank-IREDA funded schemes aroused greater interest from commercial banks, leading to the gradual emergence of a more competitive market for funding SHP schemes. As noted earlier, some of the project developers originally assisted by IREDA took up additional schemes with funding from other commercial sources. IREDA, however, is still widely recognized for its strength in appraising SHP sub-projects and a number of the commercial banks do not have the required expertise. Therefore, larger financial institutions have started partnering with IREDA through consortium financing to utilize IREDA's expertise in evaluation of projects which combines well with their larger loan limits and lower costs of funds. This has allowed IREDA to finance medium and large scale hydro projects.

PDO-(c): Promote energy efficiency and demand-side management (DSM) investments

Energy Efficiency Investments under the Project: The project was also successful in promoting energy efficiency and demand-side management (DSM) investments which further augmented power supply. Seventeen energy efficiency projects included in the portfolio at the time of project close are in various stages of implementation, financed by the project and IREDAs own resources representing over 90 MW in additional capacity / avoided peak demand. These projects have been financed by over US$ 36 million directly disbursed for EE investment at the time of project close. The total amount of investment for IREDA's energy efficiency loan portfolio, including sponsor's equity contributions and other cofinancing, will exceed $74 million[1] once final commissioning is complete. Twelve of these projects have been commissioned by project close, and the estimated savings projected for these projects is 249 million kWh equivalent per year.

Commercial Bank lending in Energy Efficiency: Based on IREDA's experience in energy efficiency financing, several local banks have also launched loan programs for energy efficiency. Five banks, namely State Bank of India, Canara Bank, Union Bank, Bank of Baroda and the Bank of India, have launched new lending schemes for energy efficiency.

[1] A fixed exchange rate of Rs.44.83 per US $ was used to calculate US $ contributions made by borrower/project sponsors across the project timeline.

Enhanced Policy Environment and Institutional Support for Energy Efficiency The Energy Conservation Act, 2001 was a critical milestone for energy efficiency in India. The Bureau of Energy Efficiency (BEE) was established as a statutory body under the Ministry of Power to plan, implement and monitor the various programs under the Act, including standards and labeling programs, certification and accreditation for energy managers/auditors, energy efficiency policy research, awareness and development and implementation of energy efficient building codes, among other activities.

Increased availability and utilization of energy efficiency interventions: Successful lending for EE sub-projects by IREDA demonstrated the financial viability of such investments, leading to increased acceptance and financing by both the concerned industries and by the commercial banking sector. For example, waste heat recovery systems were few in India prior to the implementation of the investments under the project. However, this option is now widely accepted as viable throughout the industry. Annex 11 presents a good example of how financially sick enterprises units can be revived with effective deployment of energy efficiency measures. Many activities supported under the GEF TAP provided support for the increased use of EE in numerous sectors through market awareness and demonstration activities

GEO: Enhance and sustain improved end-use energy efficiencies with consequent reduction in carbon emissions

The activities supported under the GEF TAP were able to successfully provide institutional development support to IREDA to create and expand the new line of business of energy efficiency lending, increase broader awareness and capacity for EE, and increase market development for increased energy efficiency investments, by both IREDA and the commercial banking sector.

While the initial project included a specific focus on ESCO development, this mechanism has not achieved widespread success in the Indian context. ESCOs in India face a number constraints including inability to prepare bankable projects, limited legal and contractual capabilities, poor contract enforcing environment, poor balance sheets and limited experience and expertise in structuring projects with adequate payment structures. Nevertheless, the ESCO activities under this project have provided valuable initial experience, and will support future BEE programs in this area.

The total estimated energy and CO_2 savings which will be achieved assuming successful commissioning of the projects under implementation is 6.70 million tons of CO_2 reduction.

c. Efficiency (Net Present Value/Economic Rate of Return, cost effectiveness, e.g., unit rate norms, least cost, and comparisons; and Financial Rate of Return):

SHP Sub-projects

Financial Analysis: At appraisal, the FIRRs of 14 sub-projects in the project pipeline were calculated to be in the range of 22.0 to 40.1 percent. On project completion, FIRRs for 24 of the sub-projects funded under Bank line of credit (for which actual generation data could be obtained) were found to range between 15 and 51 percent. The FIRRs for the same sub-projects at the time of loan sanction were calculated to be in the range of 15 to 56 percent. Project unit costs for eighty percent of the projects ranged from US$ 960/kW to US$ 1526/kW but there were projects with costs as low as US$607/kW and as high as $1857/kW as well. The wide variation in unit project costs is on account of the locations and types of SHP projects implemented and to a small extent on exchange rate discrepancies.

Economic Analysis: At appraisal, the EIRRs of 14 sub-projects in the project pipeline were calculated to be in the range of 20.5 to 51.3 percent. On project completion, EIRRs for 23 of the sub-projects funded under Bank line of credit (for which actual generation data could be obtained) were found to range between 27 - 224 percent in all cases higher than the hurdle rate. The EIRRs for the same sub-projects at the time of loan sanction were calculated to be in the range of 21 to 47 percent.

EE Sub-projects

Financial Analysis: At appraisal, the FIRRs of 16 sub-projects in the indicative pipeline were calculated to be in the range of 26 to 158 percent. On project completion, FIRRs for 5 of the sub-projects funded under Bank line of credit (for which actual generation data could be obtained) were found to range between 11 and 91 percent. The FIRRs for the same sub-projects at the time of loan sanction were calculated to be in the range of 26 to 51 percent.

Economic Analysis: The Economic rates of returns (EIRRs) were calculated for a sample of projects and found to range between 53 and 238 percent. Although a one on one comparison with appraisal estimates was not possible due to the rapidly changing portfolio, this compares well with the appraisal estimates of a range of 26-155 percent for a different sample of projects.

d. Justification of Overall Outcome and GEO Outcome Rating (combining relevance, achievement of PDOs/GEO, and efficiency):

The project was and remains highly relevant to GoI priorities, and was successful in achievement of the development objectives. The project has had a positive impact in increasing private sector financing of renewable and energy efficiency projects.

Rating: Satisfactory

e. Overarching Themes, Other Outcomes and Impacts (if any, where not previously covered or to amplify discussion above):

Emergence of a wider market for financing RE and EE projects IREDA's pioneering role in financing private sector renewable energy and energy efficiency projects has been instrumental in stimulating the interest of other commercial financial institutions to enter this sector. Numerous commercial banks are now active in financing renewable energy and energy efficiency projects through existing financial products, and five have launched new specific schemes to finance energy efficiency investments in SMEs.

IREDA's internal procedures in issuing new loan products are often less flexible than those utilized by the domestic financial market participants, although IREDA has been able to increase the variety and competitiveness of its loan products and has streamlined its procedures. However, as a publicly owned nonbanking financial institution, it will be extremely challenging for IREDA to match the offerings and flexibility of the commercial financial markets. IREDA must therefore focus on areas where it has comparative advantages.

Poverty Impacts, Gender Aspects, and Social Development

***Employment*:** Almost all of the hydro sub projects employ workers from neighboring villages. Because these sub projects are located in remote areas where fewer avenues for regular employment exist, they offer the local people one an attractive employment opportunity. These projects can offer unskilled labor wages of up to Rs. 3,000 per month, Rs. 4,000 per month in case of semi-skilled and up to Rs. 5,000 per month for highly skilled workers. The SHP portfolio provided direct employment to approximately 700 people.

Tree Plantations: Most SHP projects located in the hills require some cutting of trees during construction. Although the SHP developers pay compensation to the Forest Department, many also plant additional saplings as part of project construction. Afforestation not only improves the aesthetics of the project site, it also reduces the frequency of land slides. Once developer has planted more than 3500 trees over the past 3 years and has plans to add another 1000 by the end of 2008.

***Education*:** Provision of support for education as a local contribution to the community is quite common for SHP developers. This can include support to local village schools through infrastructure provision, supplies for poor children (books and uniforms), or other contributions such as direct contributions or sponsorship of events.

Roads: Since most of the SHP sites are located in remote areas, there was a need to construct roads to transport materials and equipment to the project sites. This has benefitted the local communities by increasing accessibility. Forty four sub projects contributed to the development of almost 90 km of roads and bridges, further improved accessibility to neighboring villages. This has had a positive developmental impact, as some of these villages, especially in the hilly areas of Himachal Pradesh, were completely inaccessible before.

Institutional Change/Strengthening (particularly with reference to impacts on longer-term capacity and institutional development):

The World Bank loans have assisted IREDA in establishing itself as a leading Indian institution providing financing for renewable energy and energy efficiency projects. In particular the Technical Assistance Plan has enabled IREDA to strengthen its capacity in knowledge management and improved IT systems, energy efficiency knowledge, procurement and safeguards, and evolution of a corporate strategic vision through the strategic change consultancy. A credit risk rating system was also designed and implemented under the TAP to allow for improved risk based evaluation of proposed projects.

IREDA now has a much stronger governance framework with post of Managing Director elevated to Chairman and Managing Director, appointment of Director (Technical) and three Independent Directors, and the strengthening of audit committee.

Most of the recommendations of the strategic change consultancy are being implemented by IREDA. These include increased business focus on consortium financing, medium hydropower projects, waste-heat recovery projects. While IREDA was not able to source low cost funds from the domestic market, new sources of financing have been identified from bilateral and multilateral sources. As a result of these initiatives as well as addressing some of the key gaps in its operations, IREDA has been able to improve its overall financial and operational performance. Its disbursements have shown about 35 percent growth for the last two years and Non-Performing Assets have been reducing, leading to better profitability.

Other Unintended Outcomes and Impacts (positive and negative):

Local Area Benefits of SHP Sub-projects: Almost all of these sub projects are located in remote areas and have a positive impact on the local economy through net cash inflow into the region whereby the local population gets more livelihood opportunities and the local businesses are called onto deliver more services for construction, and logistical support and material for regular O&M.

f. Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops (optional for Core ICR, required for ILI):

Not Applicable.

d) Assessment of Risk to Development and GEO Outcome

Rating for Risk to Development Outcome: Low

Rating for Risk to GEO Outcome: Low

The overall risk to the development outcome and the global environment outcome is rated low on the basis that the project sub-projects components have been successfully commissioned.

e) Assessment of Bank and Borrower Performance (relating to design, implementation and outcome issues)

a. Bank Performance

Bank Performance in Ensuring Quality at Entry (i.e., performance through lending phase):

Rating: Satisfactory

The project was, and remains strategically relevant to Government priorities including reduction of infrastructure bottlenecks and the development of renewable energy and energy efficiency in the country. Quality at entry was satisfactory and the implementation arrangements building on lessons learned from the Renewable Resources Development Project were appropriate and consistent with the Bank's fiduciary role. There were minor shortcomings associated with the approval of the second project while the first was still effective, which led to low initial disbursement under the second line.

Quality of Supervision (including of fiduciary and safeguards policies):

Rating: Satisfactory

The Bank team played an active and effective role in the supervision of this project during the course of implementation, and proactively provided support to address implementation problems as they arose, including disbursements concerns, changes in IREDA management structure, and support for IREDA Strategy & Action Plan study which helped define IREDA's future role, financing strategy and improved organization structure /business processes. At least eleven supervision missions were undertaken by the Bank. Corrective actions were taken when needed to ensure achievement of the PDOs, including partial cancellation of the IBRD loan, realignment of the GEF technical assistance component to meet changing needs and refining project monitoring indicators. A number of field visits were undertaken to ensure compliance with safeguards, and to verify physical progress and achievements. The Bank's input to the Strategy and Action Plan was highly valued by IREDA, and has led to institutional improvement and robust prospects for continued IREDA lending to RE and EE beyond the project close date.

Justification of Rating for Overall Bank Performance:

Rating: Satisfactory

For the above cited reasons, the overall rating of the Bank performance is rated Satisfactory

b. Borrower Performance

Government Performance:

Rating: Moderately Satisfactory

The performance of the government counterpart Ministry of New and Renewable Energy (MNRE) was moderately satisfactory. The power sector in India underwent dramatic change during the project implementation period with the passage of the Electricity Act and the establishment of SERCs. Prior to the passage of the Act, the Ministry had issued recommended guidance on state-level power purchase prices for grid-connected renewable energy, guidance which expired in 2004. No additional central guidance was given to the individual SERCs who were reexamining their policies on grid connected renewables. As a

result, developers were subject to significant new regulatory risks as new PPAs were not approved and several states began reexamined existing PPAs. This negatively impacted the project as developers who had sanctioned or signed loans from IREDA delayed their project construction schedules until their PPAs were approved. Numerous projects were delayed or dropped due to this change in the enabling environment. The project was also affected by the two plus year delay in filling the vacant position of Managing Director of IREDA which negatively affected the decision making capacity and strategic vision for the organization.

On the positive side, the Bureau of Energy Efficiency (BEE) was established by Ministry of Power after the project had been effective, and while it was not a formally a project counterpart in project design, it did provide effective coordination and collaboration with relevant EE activities supported by the GEF TAP.

During the last two years of implementation, the MNRE provided significantly improved levels of support to IREDA and to the World Bank project. The governance arrangements at IREDA have been strengthened under the direction on MNRE, the strategy and action plan for IREDA has been accepted by the ministry and IREDA has been extended support on various steps towards implementing its plan.

Implementing Agency or Agencies Performance:

Rating: Satisfactory

IREDA consistently demonstrated a strong commitment to fulfilling the project development objectives and provided adequate internal staff and resources to ensure implementation success despite the difficult enabling environment changes which were outside of its direct control. It complied with all Bank loan covenants and discharged its fiduciary duties in a satisfactory manner. The quality of supervision support by IREDA technical officers was high, and their intensive efforts in following up with the individual promoters was a key factor for ultimate project success. IREDA was able to alter its policies and lending norms to adapt to changing market conditions, although this was done at a pace that could not match the changes in the local financial markets, and several sanctioned projects ultimately were taken up by local FIs which could offer more competitive projects. IREDA has adopted many of the recommendations from the Strategic Change Consultancy, which has improved its prospects for the future. The major shortcoming of IREDA during project implementation was the slow pace of reimbursement processing and the slow pace of procurement per WB guidelines for activities funded by the GEF TAP, although this showed some improvement by the time of project close.

- *Justification of Rating for Overall Borrower Performance:*

Rating: Moderately Satisfactory

Per the World Bank ICR Ratings guidelines, the overall borrower performance is rated as moderately satisfactory.

f) Lessons Learned (both project-specific and of wide general application)

Overall Lessons: Need for Transition Strategy of Supported Institutions if Project Goal includes increased commercial finance

Lesson 1: Transition Strategy Upfront consideration must be given to a transition strategy for World Bank projects supporting RE/EE lending thorough a specialized financial institution to address the future commercial bank competition that will inevitably arise from successful project implementation. Future challenges often include both direct financial challenges as the commercial market is often able to provide lower cost funding at more flexible terms, capacity challenges including how to retain public sector staff once the private sector enters the market, and institutional challenges, as new directions are needed once original objectives have been met.

Lesson 2: Technical assistance to commercial financial institutions is an important element of building institutional capacity to mainstream knowledge regarding clean energy market development: In order to adequately scale up lending for renewable energy and energy efficiency, the local banking sector must be an active participant. TA support can increase knowledge of the technical, policy and regulatory aspects of this market to allow improved understanding of sector risks when providing debt financing for such projects. Therefore, awareness and capacity building of commercial financial institutions for clean energy market development projects should be incorporated into initial project designs, even when primary lending activity is channeled through a single intermediary.

Lessons on Renewable Energy (SHP) Development:

Lesson 3: A predictable policy and regulatory environment is a critical precondition for private sector led RE development: Having a supportive policy environment, including transparent, predictable feed-in tariffs and policy decision making, is critical for private sector led development of small-medium hydropower projects. Other favorable policies which could further support the development of the RE sector if adopted include facilitation of developer access to land, and adoption of transparent and timely technical and environmental clearance processes by local regulators.

Lesson 4: Economic Valuation of Renewable Energy vis-à-vis Conventional Energy can provide significant policy and regulatory insights. Establishment of a suitable policy and regulatory environment for renewable energy can be hampered due to the lack of adequate tools and skills in assessing the full economic value of renewable energy power provided to the grid. In addition to the direct power benefits, renewable energy can also produce other benefits such as local and global environmental benefits, improvements in energy security, fuel risk mitigation through diversification, technology development, and modularity that need to be fully understood in the Indian context. Projects which provide financing for RE projects would be well served by providing complementary analytic support to regulators to strengthen policy making and the resulting enabling environments.

Lesson 5: Development of adequate power evacuation infrastructure is essential. One of the most crucial issues and/or potential barriers in the scaling up development of large and small hydro plants is the interconnection between the plant and the nearest grid point to maximize the power usage. Providing grid extension up to the SHP plants based on an integrated basin development approach is one solution which should be considered when encouraging hydropower development.

Lesson 6: Inherent risks in SHP sub-projects need suitable mitigation measures SHP sub-projects can be extremely vulnerable to unforeseen variations in hydrology, especially in the first few years of commissioning. Adequate risk coverage/insurance products could be built in the business model to mitigate such risks for both the developers and lenders.

Lesson 7: SHP entrepreneurs are eager to expand in scale as well as geographically and can do so if given sufficient support Significant entrepreneurial capacity for SHP sub-projects has been developed during the two World Bank renewable energy projects in India. The twenty three SHP developers supported under the second project have gradually increased both their number of plants in operation and the average size of their newly constructed plants. This increased private sector capacity has produced many indirect benefits, and can be further harnessed for future efforts in the country. Demand remains strong only for grid-connected run-of-river and dam-toe business models and there is limited private sector in other models.

Lesson 8: Scaling-up manufacturing and turnkey EPC contracting capacity is crucial This was noted as a bottleneck for small hydro development in India and developers have started importing equipment as the delivery time offered by Indian manufacturers is excessive. In India in the hydro sector, there are very few integrated EPC contractors. Contracts are usually split between civil construction and plant and machinery installation, which makes negotiation of EPC contracts relatively complex. Therefore there is a need to

address functional, technical and price related aspects across contracts. Otherwise, developers may face the risk of time and cost overruns and lower profitability.

Lesson 9: Developing Capable Institutions is a time-intensive process and once developed they should be leveraged to achieve greater impact Bank support to IREDA in course of this and the previous project has helped develop IREDA into one of the strongest renewable energy development institution in the country and in the region. The Bank's support in strengthening fiduciary and safeguard functions, governance arrangements and strategic vision for the institution, especially towards the later half of this project, have further strengthened IREDA. The GoI can now leverage the institutional capacities and sector development vision offered by IREDA to further the renewable energy development and climate change mitigation objectives in the country.

Lessons on Energy Efficiency and Demand Side Management:

Lesson 10: Financial Intermediation projects which fund EE should allow for development of different business models Different energy efficiency business models should be tried out to allow maximum flexibility in achieving desired outcomes given the constant shifts in market conditions. In India, end-user implemented approaches have been more successful when compared to ESCO and DSM type projects. The flexibility in project design enabled numerous types of EE eligible products to be financed under the LoC, which also let IREDA focus its efforts on more promising market segments, such as waste heat recovery and cogeneration, while shifting time and internal resources from sectors where business was less likely to materialize.

Lesson 11: Smaller EE projects face different market barriers and may be best reached through alternative instruments: Large companies with access to information, technical consultants and finance find it less difficult to implement EE projects either with IREDA financing or through other sources when compared to the SME sector. SMEs face several additional market constraints and barriers. The lack of local branch offices of IREDA made communication with smaller SME units difficult under the project, and relationships were often complicated by the presence of existing SME lending relationships with local banks. Future efforts designed to finance EE at SMEs should work through local financing institutions which may be better placed to expand EE lending to this sector.

g) Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies:

Evaluation of the project by IREDA (as reflected in the completion report prepared by them) is consistent with that of the Bank. The ICR prepared by IREDA is included in Annex-7. Comments were also received from IREDA on minor edits in the draft ICR. These comments have been appropriately incorporated in the final ICR.

(b) Cofinanciers:

(c) ***Other partners and stakeholders*** *(e.g. NGOs/private sector/civil society):*

ANNEXES

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Component	Category	Appraisal Estimate for Cost, including Contingencies (US$ M)	Actual/Latest Estimate (for 206 MW[1]) (US$ M)[2]	Percent of Appraisal
a. Small Hydro Investments:	Physical			
Run-of-River (100MW)		155	106	68.39
Canal falls/Dam-toes (65MW)		75	63.3	84.40
Thermal cooling water tail-ends (20MW); plant upgrading & rehabilitation (10MW); stand-alone microhydros (5MW)		33	2.7	8.18
Sub-Total		**263**	**210.14**	**79.90**
b. Energy-Efficiency (EE) Investments: by industrial, commercial, utilities, ESCOs, equipment vendors[3]	Physical	**30**	**42.23**	**140.77**
c. Technical Assistance				
Pre-investment activities: EE investment pipeline; business development & procurement models	Implementa-tion support	2	2	100
Strengthening of IREDA's in-house capacity in project appraisal, monitoring and promotion of EE	Capacity & institution building	3	1	33
Policy development for private sector investments in ESCOs and DSM	Policy support	1	1	100
Program outreach and training	Capacity building	1	1	100
Sub-Total		**7**	**5**[4]	**97.00**
Total Project Cost		**300**	**257.37**	**85.79**

[1] Actual costs for 95.65 MW SHP already commissioned, and latest estimates for 62.60 MW under implementation; also includes costs of estimated capacity of EE sub-projects supported by the LoC of 47.41 MW.

[2] A fixed exchange rate of Rs.44.83 per US $ has been used to calculate US $ contributions made by borrower/project sponsors across the project timeline. World Bank contributions, however, are based on actual US$ disbursements made throughout the project, in real terms.

[3] Estimate for EE is higher than originally projected because the EE portfolio included more projects than originally envisaged, and commercial banks took up some projects for which initial disbursements were made.

[4] During the period of implementation of this project, other donors financed a large number of activities (in particular USAID), reducing the identified requirements. Notable is the USAID's Energy Conservation and Commercialization Project that provided US$ 25 million in assistance during 2000-08.

(b) Financing

Source of Funds	Appraisal Estimate (US$ M)	Actual/Latest Estimate (US$ M) [1]	Percent of Appraisal
Borrower	**165**	**145**	**88**
International Bank for Reconstruction and Development (IBRD)	**80**	**54**	**68**
International Development Association (IDA) for small hydro investments	30	36.44	121
International Development Association (IDA) for EE investments	20	16.93	85
International Development Association (IDA) Total	**50**	**53.37**	**107**
Global Environment Fund (GEF)	**5**	**5.00**	**100**
Total	**300**	**257.37**	**85.79**

[1] A fixed exchange rate of Rs.44.83 per US $ has been used to calculate US $ contributions made by borrower across the project timeline. World Bank contributions, however, are based on actual US$ disbursements made throughout the project life cycle in real terms.

Annex 2. Outputs by Component

The project objectives were satisfactorily achieved, although the project required two one-year extensions and a partial cancellation of IBRD funds. While the outputs under the different project components were fully satisfactory, the implementation of the project was affected by extraneous factors which resulted in the cancellation of part of the proceeds. The allocations for small hydropower sub-projects and energy efficiency sub-projects were notional in the project design as where the allocations for the different SHP business models

Table 2.1: Component-wise Loan / Grant Utilization

Component	Estimated Utilization (US$ M)	Actual Utilization (US$ M)[1]	Remarks
Component A – Small Hydropower Investments	263	210.14	Although the LoC was open to different types of small hydropower investments, the market demand was run-of-river canal and dam-toe sub-projects.
(i) Canal-based and dam-toe schemes	75	63.3	
(ii) Run-of-river schemes	155	106	
(iii) Rehabilitation schemes (iv) Sub-projects using tail-end of thermal power plant cooling water systems (v) Stand-alone micro hydropower schemes	33	2.7	
Component 2 – Energy-Efficiency Investments	30	42.23	This is higher than planned as co-financing by commercial banks was larger than expected.
Component 3 – Technical Assistance	7	5	During the period of implementation of this project, other donors financed a large number of activities (notably USAID's ECO project that financed US$ 25 million during 2000-2008, reducing the identified requirements[2].
Total	**300**	**257.37**	

Component A: Small Hydro Investments: This component was aimed at supporting various types of small hydro schemes, including: (i) canal-based and dam-toe schemes; (ii) run-of-river schemes; (iii) rehabilitation or upgrading of old plants; (iv) sub-projects using tail-ends of cooling water systems of thermal power plants; and (v) stand-alone micro hydro sub-projects of up to 100kW each. It was expected that over 80 percent of the sub-projects would fall into categories (i) and (ii). The project was successful in

[1] A fixed exchange rate of Rs.44.83 per US $ has been used to calculate US $ contributions made by borrower across the project timeline. World Bank contributions, however, are based on actual US$ disbursements made throughout the project life cycle in real terms

[2] http://www.usaid.gov/in/our_work/activities/Enrg_Env/eco.htm; Personal Communications, Mr. Srinivasan Padmanaban, Advisor, USAID

achieving the commissioning of 95.65 MW of projects with 50.55 MW of canal-based and dam-toe sub-projects and 42.90 MW of run-of-river sub-projects as well as one 2.2 MW project that utilized cooling system of thermal power plants. No micro-hydro sub-projects and rehabilitation sub-projects were financed due to lack of proposals from entrepreneurs for such projects. Experience from other Bank operations (Sri Lanka Energy Services Delivery Project) indicates that stand-alone micro-hydro projects in particular require significant subsidy support to become viable. Details of sub-projects of each type and their performance are provided in Table 2.2:

Table 2.2: Type-wise Distribution of Small Hydro Sub-Projects

	Loans Sanctioned	Loans Availed	Sub-Projects Executed	Sub-Projects Commissioned
Number of Schemes				
(i) Canal-based schemes Dam-toe schemes	24 2	22 2	21 2	18 2
(ii) Run-of-river schemes	29	20	20	13
(iii) Rehabilitation schemes	0	0	0	0
(iv) Sub-projects using tail-end of thermal power plant cooling water systems	1	1	1	1
(v) Stand-alone micro hydropower schemes	0	0	0	0
Total number of schemes	56	45	44	34
Capacity				
Total capacity (MW)	240.25	158.45	158.25	95.65

*Source: Appraisal note of sub-projects prepared by IREDA and actual data collected from developers.

Forty-five sub-projects were supported out of which 34 sub-projects have been commissioned with a total installed capacity of 95.65 MW.

Contribution of Small Hydropower Development during the Tenth Plan: The project made a significant contribution to the Tenth Plan target of 550MW capacity addition of SHP development. Out of the total capacity of 536.7 MW installed during the Tenth Plan, the Bank's LoC directly supported about 96 MW of commissioned projects. Projects which dropped out of the Bank's LoC but were still completed during this period contributed another 38 MW of SHP capacity. Hence, the Bank's LoC directly and indirectly supported approximately 25 percent of the capacity addition in the SHP sector during this period.

While costs of certain sub-projects were higher than specified at appraisal, the economic rate of return (EIRR) ranged between 27 percent and 224 percent. The unit project costs showed a wide variation. Eighty percent of the projects ranged from US$ 960/kW to US$ 1526/kW but there were projects with costs as low as US$607/kW and as high as $1857/kW as well. The wide variation in unit project costs is on account of the locations and varying types of SHP projects implemented and to a small extent on exchange rate discrepancies.

The final evaluation report on the Second Renewable Energy LoC, conducted by PwC on behalf of the borrower, shows that the performance of the projects is uneven and on average below the appraisal estimates. Projects were supposed to generate 426.2 MUs annually at an aggregate CUF of 54.4 percent. However, based on available generation figures for 32 sub-projects, 402.38 MUs are projected to be actually generated every year in FY08 and beyond. Table 2.3 highlights the current generation status:

Table 2.3 – Actual vs. Projected Generation for 32 SHP Sub-Projects

Actual vs. Project generation	Average CUF (%)	Total Generation (MUs)
Projected for all sub-projects	54.4	426.2
Actual across all sub-projects	46.3	402.38
Projected (RoR sub-projects only)	58.8	195.4
Actual (RoR sub-projects only)	41.4	142.75
Projected (canal sub-projects only)	54.2	159.4
Actual (canal sub-projects only)	46.9	164.18
Projected (dam-toe sub-projects only)	45.1	71.5
Actual (dam-toe sub-projects only)		95.45

*Source: PWC: Appraisal notes of sub-projects prepared by IREDA and actual data collected from developers.

Component B: Energy-Efficiency Investments: Seventeen EE projects included in IREDA's energy efficiency portfolio at the time of project closure are in various stages of implementation. These are financed by the Bank's LoC and IREDA's own resources, representing over US$ 36 million disbursed for EE investment at the time of project closure. The total amount of investment for IREDA's entire EE loan portfolio, including sponsor's equity contributions, is over US$ 74 million. These projects represent 90 MW of new capacity/avoided peak demand.

The share of the Bank's disbursement directly financed under the second LoC is US$16.93 through 12 sub-projects. All but one sub-project financed directly by the Bank have been commissioned. The last project, Shri Venkateswara Sponge and Power is under implementation, and initial disbursements were made under the second LoC.

The twelve EEC projects directly financed under the second LoC will save approximately 249 million kWh of energy per year.

The total estimated CO_2 savings which will be achieved, assuming successful commissioning of the projects under implementation, is 9.43 million tons[1] over the life of the investments.

IREDA consultants prepared an analysis of the cost over-run of the EEC projects which indicates that the cost over-runs were within 10 percent.

Component C: Technical Assistance: The GEF-financed TA supported numerous activities to promote EE and DSM investments. Initially, the TAP focused on: (i) capacity and institution building support at IREDA; (ii) implementation support for EE lending activities; (iii) policy support; and (iv) market awareness. The program of activities was closely monitored during implementation, and was revised numerous times to better match activities with needs.

These four main areas were divided into 12 discreet tasks supported by the TAP, and included the following specific activities:

1 Advisory Services for ESCO Mechanism: This activity included: (i) analytical work on the Indian experience with the ESCO mechanism in the public sector, to support BEE-ESCO programs: and (ii) pilot handholding to support the design and procurement of ESCO-delivered efficiency services in eight hospitals and government buildings. As of project close date of March 31, 2008, all baseline audit work was completed and Request for Proposal (RFP) documents were issued, but none of the ESCO contracts have been successfully awarded.

[1] This is based on the assumption of a project lifetime of 20 years.

2 Project Monitoring and Verification: IREDA was provided support in the development of: (i) monitoring and verification (M&V) protocols for efficiency projects; (ii) preparation of a project monitoring and evaluation (M&E) manual; (iii) concurrent auditing and monitoring of IREDA- financed projects; and (iv) post commissioning and evaluation of EE projects.

3 Policy Support Initiative: Analytical work was undertaken to support: (i) BEE's development of EE codes and standards for certain equipment; (ii) Preparation of a directory of consultants and energy auditors; and (iii) production of investors' manuals for EE.

4 Knowledge Management Plan: The activity focused on improving IREDA's institutional capacity and portfolio management capability by providing assistance for upgrading hardware and software, to strengthen IREDA's internal operational performance in EE and RE lending.

5 Energy Efficiency Capacity Building Initiative: This activity included training and capacity building of IREDA and various stakeholders (industry, government and the financial sector) on EE. Training programs were also conducted on environmental and social impact assessment issues.

Support was also provided for the strategic change consultancy under this activity. The strategic change consultancy influenced the current business plan of IREDA and included three main pieces: (i) the "*Strategy and Action Plan;"* (ii) the "*Resource Mobilization Plan"* and (iii) *"Reviewing Systems and Procedures of IREDA for its Lending Operations and Developing a Suitable Action Plan for Organizational Restructuring."* The final piece on reviewing systems and procedures was not completed by project close, and remaining work on this piece was supported by IREDA's internal resources

6 Project Development Sub-Projects: This activity provided an additional grant incentive for select new lending products.

7 Procurement Advisory Services: This task provided specialist services to IREDA to support procurement of goods, works and consultancy services in a timely manner as per the World Bank guidelines.

8 Performance Evaluation of the World Bank LoC: Independent evaluations were undertaken for both the mid-term and final review of the project.

9 Project Partnership Program: This activity provided funding for IREDA's business development associates to generate new projects and to maintain EE information centers. It also provided ground-level support for the ESCO's activities included in activity 1.

10 Market Awareness and Outreach: This activity included numerous tasks designed to increase awareness of EE and to increase demand for EE lending. Numerous unique marketing products were created, and disseminated through media outreach and targeted marketing through conferences and business meetings.

11 Creative Market Development Initiative: SME cluster-based activities were undertaken in the textile, hotel, cement and paper sectors to increase lending for EE. Eleven projects were implemented, although only one ultimately took a loan from IREDA.

12 Support to Commercial Banks: This activity supported analytical work to increase Indian bank lending for EE, market support for bank sub-projects for EE for SMES, and a small grant program to partially cover energy audit costs undertaken through SBI Project Uptech for EE.

Table 2.4: Outputs of Technical Assistance Component

Name of the TA Activity	Indicator	Output
1. Advisory services for ESCO	• Number ESCO projects supported • Number implemented	8 nil
2. Project monitoring and verification	• Number of projects monitored/evaluated	4
3. Policy support initiative	• Number of policy/knowledge products produced	5
4. Knowledge management plan	• Number of systems improved	23
5. Energy efficiency capacity building initiative	• Number of persons trained (including IREDA)	3690 (external) + 200 (IREDA) = 3890
6. Project development scheme	• Loan amounts supported by grant scheme	Rs. 3914 lakhs
7. Procurement advisory services	• Number of procurement tasks supported by consultants' work	12 (SHP & EEC projects) & 9 (IT projects)
8. Performance evaluation	No indicator	-
9. Project partnership program	No indicator	-
10. Market awareness and outreach initiative	• Number of unique marketing products produced (i.e. advertisements., posters, films, brochures, etc) • Number distributed (total) • Number of persons reached (estimation)	Adv. – 15 types Posters – 10 types Films – 12 (U/P) Brochures – 5 Ads/posters – 25,000 Adv/brochures – NA
11. Creative market development initiative	• Number of audits supported • Number of projects implemented • Total value of investment and annual energy savings from implemented projects	24 12 Rs.746.6 lakhs (estimated) Rs. 650.88 lakhs
12. Support to commercial banks	• Number of energy audits supported by SBI scheme • Number of SME projects implemented from focused cluster marketing	45 projects Nil

Annex 3. Economic and Financial Analysis (including assumptions in the analysis)

I. Small Hydropower Schemes

Financial Analysis

At appraisal, the FIRRs of 14 sub-projects in the project pipeline were calculated to be in the range of 22.0 percent to 40.1 percent. On project completion, FIRRs for 24 of the sub-projects funded under the Bank's LoC (for which actual generation data could be obtained) were found to range between 15 percent and 51 percent. The FIRRs for the same sub-projects at the time of loan sanction were calculated to be in the range of 15 percent to 56 percent. Scheme-wise details of FIRRs are provided in Table 3.1.

Table 3.1: Comparison of FIRRs of Sub-Projects at Sanction and Completion

Project Code	Project Name	Project Type	Capacity (MW)	Projected FIRR at Sanction	FIRR based on Actual Generation	Cost Escalation	Change in Capacity Utilization Factor
1308	Punjab Hydro Power Ltd.	Canal	1.3	43%	51%	0.0%	-36.6
1310	Punjab Hydro Power Ltd.	Canal	1.5	48%	47%	3.4%	-22.87
1309	Punjab Hydro Power Ltd.	Canal	1.4	43%	38%	5.6%	-6.2
1318	Balaji Energy Pvt. Ltd.	Dam Toe	10	36.37%	38%	5.8%	-19
1642	Kotla Hydro Power Ltd.	Canal	1	29.62%	35%	-	-21.2
1641	Kotla Hydro Power Ltd.	Canal	1	39%	34%	0.2%	-21.1
1504	NCL Energy Ltd.	Dam Toe	8	29%	33%	-6.0%	-10.5
1643	Kotla Hydro Power Ltd.	Canal	1.75	34%	32%	16.6%	-17.5
1145	Cheveron Hydel Pvt. Ltd.	RoR	1	39%	31%	10.1%	3.97
1349	Kallam Spinning Mills Ltd.	Canal	0.8	23%	30%	12.8%	-20.01
1660	Dhauladhar Hydro Systems	RoR	0.15	15%	29%	9.0%	-14.1
1316	KKK Hydro Power Pvt. Ltd.	RoR	3	27.6%	29%	13.5%	3.3
1400	Ascent Hydro Projects Ltd.	Canal	2.2	46%	28%	7.0%	4.97
1560	KM Power Pvt. Ltd.	Canal	3.3	34%	27%	-8.2%	0.9
1515	Bhorukha Power Corporation Ltd.	Canal	1	28%	25%	0.0%	-15.1
1424	Hateswari Om Power Enterprises	RoR	1	21%	24%	0.0%	8.9
1363	Astha Projects (India) Pvt. Ltd.	RoR	5	26%	24%	0.0%	22.8
1379	KM Power Pvt. Ltd.	Canal	3.3	48%	22%	5.6%	-1.72
1380	KM Power Pvt. Ltd.	Canal	4	45%	22%	0.0%	7.95
1054	Kalson Power Tech (P) Ltd.	Canal	3	18%	18%	21.5%	-0.8
1317	Maruti PowerGen Pvt. Ltd.	Canal	3	41%	17%	0.0%	21.84
1493	Dharamshala Hydro Power Ltd.	RoR	4.5	56%	16%	-6.5%	53.8
1030	Hanuman Ganga Mini Hydel	RoR	3	30%	15%	29.3%	42.1
912	Nippon Power Ltd.	RoR	3	37%	15%	61.1%	37.56

Key Assumptions / Data:

(a) Actual project data on costs (including escalations) have been obtained from IREDA. For all projects, project construction period has been taken as 1-3 years. The debt-equity ratio has been assumed to be 70:30.

(b) Sale price used in the calculation is as per the appraisal note. However the sale price may have changed over the years. For instance, for Himachal Pradesh, the PPA price earlier was Rs. 2.5 per kWh, which has been revised to Rs. 2.87 per kWh.

(c) It is assumed that O&M cost of any plant is approximately 2.5 percent of the total project cost for year-1 and further escalated by 5 percent annually for all projects. Actual O&M costs were not available for each of the sub-projects.
(d) Subsidy figures used in the FIRR calculation have been provided by IREDA. The subsidy amount is entirely accounted for in the cash flow of the first year itself.

Reasons for Deviation from PAD Estimates

The financial analysis of the portfolio indicates that for majority of the projects, the actual FIRRs are below the estimates prepared at the feasibility stage. The difference between FIRRs at appraisal, detailed project reports (DPRs) and project completion is on account of the following reasons:

- Pipeline of sub-projects was changed during the period between appraisal (July 1997) and approval (June 2007) owing to a delay in the Bank's approval on account of international sanctions against India at that time. Therefore, this is not strictly a one-on-one comparison.
- The prevailing government policy at the time of appraisal provided a 10 percent annual increase in tariffs for generation from RE schemes, and high FIRRs were therefore only to be expected. With the introduction of the new Electricity Act, 2003 and lapse of the earlier government policy, the mandate for determination of tariffs for RE projects was given to state electricity regulators (SERs). As a result, there were significant changes in tariff determination approaches across states, which impacted several sub-projects funded under the Bank's LoC.
- Implementation of the sub-projects also faced cost and time overruns due to factors such as natural calamities, inflation in commodity prices, unforeseen civil works, delay in statutory clearances, and poor performance of contractors (see Text Box-3.2).
- The capacity utilization factor (CUF) of the projects have also varied due to decreased flows, silting and low grid availability (see Text Box-3.1).

However, revised estimates of FIRR are greater than cost of capital in all cases, and therefore all these SHP sub-projects are financially sustainable.

Text Box- 3.1

Factors affecting Capacity Utilization of SHP Schemes

- ***Variations in Rainfall and Inconsistent Hydrology:*** SHP sub-projects are affected by variations in flow of water caused by changes in rainfall patterns. For example, the Lodhama hydro project in West Bengal experienced 20 percent lower discharge in the lean season.
- ***Silting of Rivers:*** In addition to a large amount of silting inherent to the Himalayan rivers, generation from some SHP sub-projects is also affected by silting from upstream mining and construction activities. For example, the Maujhi-I scheme has been affected by silting from slate mining on slopes above the power plant site.
- ***Breakdown of Transmission Infrastructure and Grid Failures:*** Another key factor affecting the capacity utilization has been the failure of the electricity system in project areas causing plants to stop operations. For example, the Hanuman Ganga scheme lost a substantial amount of generation due to persistent grid failures. As against a projected CUF of 78.7 percent, the scheme achieved only 63.2 percent in 2006-07 and 57.5 percent in 2007-08. Similarly, transmission breakdown in case of the Lodhama Hydro Electric Station affected generation.

Text Box-3.2

Factors leading to Time and Cost Overrun of SHP Schemes

Of the 33 sub-projects commissioned under the project (for which actual data was available), 15 have a cost escalation of 5 percent or less. The other 17 sub-projects have escalation in the range of 15 percent of the original cost estimates. In general, cost escalation of about 15 percent is seen as acceptable for SHP sub-projects keeping in view high implementation risks, long construction period and increase in cost of raw materials. About two-thirds of all projects were implemented within six months of projected commissioning. Broadly the reasons for time and cost escalations in case of SHP sub-projects are as follows:

- ***Delay in Statutory Clearances:*** Delay in obtaining the required environmental, land and other statutory clearances result in implementation delays for projects such as Neora SHP and Birsignhpur SHP scheme.
- ***Impact of Natural Calamities:*** Natural calamities such as floods and landslides have also impacted project implementation, causing time overruns. For example, the Bonal Mini SHP was delayed by almost 44 months largely because of recurring floods in the area. Similarly, power house construction in case of Jiwa SHP was affected by cloud bursts.
- ***Delay in Implementation of Evacuation System:*** In some projects located far from the grid, implementation was impacted due to delays in the construction of the transmission system.
- ***Unforseen Civil Work:*** In some projects, unexpected additional civil work needs delayed project implementation. For example, rock structures and the presence of hard rock caused delay in the Balaji energy SHP project.
- ***Price Inflation for Raw Materials like Cement and Steel:*** Projects also faced increase in costs due to increase in prices of raw materials such as cement and steel.
- ***Non-performance of Contractors:*** Developers also cited poor performance of contractors as a reason for cost and time overrun of projects.

In some cases, cost escalations are on account of changed specifications of the scheme, leading to increased generation capacity.

Economic Analysis

At appraisal, the EIRRs of 14 sub-projects in the project pipeline were calculated to be in the range of 20.5 percent to 51.3 percent. On project completion, EIRRs for 23 of the sub-projects funded under the Bank's LoC (for which actual generation data could be obtained) were found to range between 27 percent and 224 percent, in all cases higher than the hurdle rate. The EIRRs for the same sub-projects at the time of loan sanction were calculated to be in the range of 21 percent to 47 percent. Scheme-wise details of EIRRs are provided in Table 3.2**.**

Table 3.2: Comparison of EIRRs of Sub-Projects at Sanction and Completion

Project Code	Project Name	Project Type	Capacity (MW)	Projected EIRR at Sanction	EIRR Based on Actual Generation
1318	Balaji Energy Pvt. Ltd.	Dam-Toe	10	36%	224%
1504	NCL Energy Ltd.	Dam-Toe	8	24%	104%
1400	Ascent Hydro Projects Ltd.	Canal	2.2	32%	98%
1145	Cheveron Hydel Pvt. Ltd.	RoR	1	26%	97%
1316	KKK Hydro Power Pvt. Ltd.	RoR	3	28%	84%
1424	Hateswari Om Power Enterprises	RoR	1	29%	81%

1349	Kallam Spinning Mills Ltd.	Canal	0.8	25%	79%
1309	Punjab Hydro Power Ltd.	Canal	1.4	31%	79%
1363	Astha Projects (India) Pvt. Ltd.	RoR	5	28%	78%
1308	Punjab Hydro Power Ltd.	Canal	1.3	33%	77%
1310	Punjab Hydro Power Ltd.	Canal	1.5	35%	76%
1660	Dhauladhar Hydro Systems	RoR	0.15	25%	75%
1642	Kotla Hydro Power Ltd.	Canal	1	25%	73%
1641	Kotla Hydro Power Ltd.	Canal	1	29%	65%
1643	Kotla Hydro Power Ltd.	Canal	1.75	28%	63%
1379	KM Power Pvt. Ltd.	Canal	3.3	29%	62%
1380	KM Power Pvt. Ltd.	Canal	4	27%	60%
1560	KM Power Pvt. Ltd.	Canal	3.3	32%	59%
1493	Dharamshala Hydro Power Ltd.	RoR	4.5	47%	53%
1317	Maruti PowerGen Pvt. Ltd.	Canal	3	27%	44%
1030	Hanuman Ganga Mini Hydel	RoR	3	27%	39%
912	Nippon Power Ltd.	RoR	3	24%	37%
1515	Bhorukha Power Corporation Ltd.	Canal	1	28%	27%

Key Assumptions

In addition to the relevant assumptions already mentioned in the financial analysis, the following assumptions have been used for economic analysis of SHP schemes:

(a) Cost of diesel-based generation has been estimated at Rs.10 per kWh. This is also consistent with the revised maximum unscheduled interchange (UI) rate of Rs. 10.00 per kWh provided by the Central Electricity Regulatory Commission (CERC). The prevailing capacity and energy deficit scenario in India is likely to continue in the medium term and therefore the cost of diesel-based generation is a suitable measure of economic benefit of the project.

(b) Economic costs of sub-projects were derived by adjusting the financial costs for taxes by applying the standard conversion factor of 0.9.

Reasons for Deviation from PAD Estimates

- As mentioned in the financial analysis section, the sub-projects at completion are different from sub-projects in the pipeline at appraisal.
- Several of the sub-projects have been affected by cost and time overruns, including the impact of commodity inflation.
- However, the most significant reason for increase in economic return from almost all sub-projects despite cost and time overruns and lower than expected capacity utilization in several cases, is the increase in cost of diesel-based generation. At appraisal, the cost of diesel-based generation was estimated at Rs.3.38 per kWh, whereas at completion this has been estimated at Rs. 10 per kWh (global petroleum prices have increased even further since this analysis).

II. ENERGY EFFICIENCY

Financial Analysis

At appraisal, the FIRRs of 16 sub-projects in the indicative pipeline were calculated to be in the range of 26 percent to 158 percent. On project completion, FIRRs for five of the sub-projects funded under the Bank's LoC (for which actual generation data could be obtained) were found to range between 11 percent and 91 percent. The FIRRs for the same sub-projects at the time of loan sanction were calculated to be in the range of 26 percent to 51 percent.

Actual FIRRs could be calculated and compared with appraisal estimates only for a sample of sub-projects (five in number) owing to difficulties in obtaining data. Table 3.3 illustrates the comparison of FIRRs for these 5 sub-projects. For calculating the actual FIRR, the following assumptions were used:

(a) Actual project cost (including cost escalations) have been used in the FIRR calculation.
(b) It is assumed that increase in O&M cost of any plant which has implemented EEC project involving installation of EE equipment is almost negligible.

Table 3.3: Comparison of FIRRs for Sub-Projects at Sanction and Completion

Project Name	Projected FIRR at Sanction (%)	Projected FIRR at Completion (%)	Cost escalation (Rs. million)
GMR Technologies & Technologies Ltd.	45	91	10
NCL Industries Ltd.	51	46	32
Mahendra Sponge & Power (P) Ltd.	46	22	20
Arunachalam Sugar Mills Ltd.	26	12	25
Anand Tissues Ltd.	39	11	0

The FIRR in case of GMR is very high as the actual energy savings are 3.62 million kWh/annum against the projected 2.46 million kWh/annum. However, FIRR in case of Anand Tissues Ltd. is negative because the actual energy savings are just 0.65 million kWh/annum against the projected value of 2.197 million kWh/annum, although there is some uncertainty related to this figure which was not independently verified.

Economic Analysis

The EIRRs were calculated for a sample of projects and found to range between 53 percent and 238 percent. Table 3.4 illustrates the calculation of actual EIRR. Although a one-on-one comparison with appraisal estimates was not possible due to the rapidly changing portfolio, this compares well with the appraisal estimates of a range of 26 percent to155 percent for a different sample of projects.

Table 3.4: Comparison of EIRRs for Sub-Projects at Sanction and Completion

Project Name	Projected EIRR	Actual EIRR
GMR Technologies & Technologies Ltd.	NA	283%
NCL Industries Ltd.	NA	238%
Mahendra Sponge & Power (P) Ltd.	NA	154%
Anand Tissues Ltd.	NA	102%
Arunachalam Sugar Mills Ltd.	NA	53%

Key assumptions:

h) Cost of diesel-based generation has been estimated at Rs.10 per kWh.
i) Taxes were taken at 11 percent which includes MAT, VAT etc.
j) Economic costs of sub-projects were derived by adjusting the financial costs for taxes by applying the standard conversion factor of 0.9.
k) In case of coal saving, heat rate of 2,500 Kcal/ kWh was assumed

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Specialization	Unit	Responsibility/ Specialty
Lending (from Task Team in PAD Data Sheet)			
M. Manzo	Team Leader	SASEG	
V. Ziff	Program Assistant	SASEG	
I. Sevilla			
A. Ceyhan	Power Engineer	SASEG	
K. Hattori		SASEG	
S. Padmanabhan	Sr. Energy Efficiency Specialist	ASTAE	
Y. Ziv	Environmental Engineer	ASTEN	
A.Dani	Social development	ASTEN	
W. Smith	Economist	Consultant	

Names	Specialization	Unit	Responsibility/ Specialty
Supervision (from Task Team Members in all archived ISRs)			
M. Manzo	Task Leader & Senior Operations Officer	SASDE	
Supriya Sen	Task Leader & Senior Financial Analyst	SASDE	
Andrea Ryan Rizvi	Task Leader	SASDE	
P. Dhingra	Task Leader & Sr. Power Engineer	SASDE	
Mikul Bhatia	Task Leader & Energy Specialist	SASDE	
A. Cabraal	Sr. Energy Specialist	SASDE	
Judith Plummer	Sr. Financial Specialist	SASDE	
R. Taylor	Lead Energy Specialist	SASDE	
E. Groom	Sr. Regulatory Specialist		
Jeremy Levin	Sr. Technical Specialist	SASDI	
Priya Barua	Research Analyst	SASDE	
Priya Chopra	Program Assistant	SASDE	
Neelima Kapur	Program Assistant	SASDE	

Chandrasekhar Govindarajalu	Sr. Energy Specialist	MNSSD	
S. Ahmed	Sr. Legal Counsel		
R. Narula	Financial Management Specialist	SARFM	
M. Gopalakrishnan	Financial Management Specialist	SARFM	
Manoj Jain	Sr. Financial Management Specialist	SARFM	
N. Verma	Financial Specialist – Financial Institutions	SARFM	
S. Krishnan	Procurement Engineer	SARPS	
S.K. Bahl	Sr. Procurement Specialist	SARPS	
A. Tait	Consultant		
S. Sankaravadivelu	Procurement Specialist	SARPS	
S. Srivastava	Environmental Specialist	SASDI	
Gaurav Joshi	Environment Specialist	SASDI	
W. Warren	Social Development Specialist	SASDI	
S. Thangaraj	Social Development Specialist	SASDI	
S. Narayanan	Sr. Social Development Specialist	SASDI	
R. Lopez Rivera	Hydropower Engineer		

(b) Staff Time and Cost (from SAP)

(The system pulls data available for all fields)

Stage of Project Cycle	**Staff Time and Cost (Bank Budget Only)**	
	No. of Staff Weeks	**US$ Thousands (including travel and consultant costs)**
Lending		
FY1998		50,913.66
FY 1999		21,848.98
FY 2000	9.65	17,044.59
FY 2001	-	-
FY 2002	-	-
FY 2003	-	-

FY 2004	-	-
TOTAL:	**9.65**	**89,907.23**
Supervision/ICR		
FY2005	40.77	116,128.59
FY2006	43.15	93,357.92
FY 2007	27.06	28,778.18
FY 2008	30.98	34,477.86
FY 2009 (Till 16.8.08)	5.61	11,160.35
TOTAL	**147.57**	**293,902.90**

Annex 5. Beneficiary Survey Results (if any)

Not Applicable

Annex 6. Stakeholder Workshop Report and Results (if any)

Not Applicable

Annex 7. Borrower's ICR

In the year 2000, IREDA has received this Line of Credit for the implementation of "India: Second Renewable Energy Project" of World Bank (WB) targeted to promote Small Hydro and Energy Efficiency / Conservation investments in the country. The detailed objectives of the project as conceived are detailed below:

1. Increase power supply through development of environmentally sustainable small hydro schemes.

2. Promote Energy Efficiency and demand-side management (SDM) investments.

3. Remove market barriers to delivery of Energy Efficiency services and products.

    - Strengthening IREDA's capacity to appraise and supervise energy efficiency investment projects through the provision of consultancy services and training.

    - Improving the marketing of the energy efficiency and DSM investments under the project through the provision of consultancy services to prepare business development modules, model bid documents and informative packages.

    - Promoting private sector participation in the end-use efficiency including development of appropriate policy incentives through the provision of consultancy services to various state energy development entities, and training for public and private sector on energy conservation and DSM.

The Line of Credit included an IDA component US$ 50 Million, IBRD Component of US$ 80.00 Million and GEF component of US$ 5.00 Million whereas IREDA has to bring counterpart funding of US$ 2.00 Million, only for GEF. The IDA and IBRD components are poised for project funding while the GEF and IREDA's Counterpart are assigned to support the Technical Assistance / Capacity Building objectives to remove market barriers to delivery of Energy Efficiency Services and products.

The loan agreement was executed on 11th August 2000 and made effective from 31st January 2001. The closing date of LoC was fixed for 31st March '2006.

During the course of implementation a number of policy issues etc., beyond the control of IREDA and the sub-project promoters, had come up, affecting timely implementation/ progress of the project. Therefore, the matter was taken up by IREDA with the WB through GoI which was considered and accordingly, on 24.06.2005 World Bank approved extension of the closing date of the LoC up to 31.03.2007 with a reduction of US$ 18 million from IBRD allocations. Subsequently, a second extension in closing date up to 31.03.2008 was also considered by WB on 20.11.2006 with an additional reduction of US$ 8 million in the IBRD component in the trail.

Implementation of Small Hydro Projects

World Bank through the second LoC has supported 45 SHP sub projects; out of which 12 projects are under IBRD and 33 under IDA Line of Credit. 35 sub projects have been commissioned with installed capacity of 100.15 MW by July, 2008. The remaining 9 projects aggregating to 57.90 MW are expected to be commissioned by March, 2009. The total installed capacity of all projects when commissioned, will be 158.25 MW. 1 project of 0.4 MW capacity stands abandoned.

Implementation of Energy Efficiency Projects

World Bank through the second LoC has financially supported 12 sub projects in EEC sector. Out of this 11 have been commissioned and one is expected to be commissioned in December, 2008. Majority of the projects are for installation of energy conservation equipment except two projects which are for setting up of captive power plant.

The industrial plants in sponge Iron, cement, steel and sugar sectors were able to purchase and demonstrate new technologies with excellent energy efficiency norms. The success stories developed under WB LoC has paved the way for advanced energy efficient technologies in many of the Indian industrial plants e.g. the cement plants, the energy efficiency norms are comparable to the best energy efficient plants in the world. Further, some of the steel plants and sugar plants are already undergoing process of modernization and adopting more energy efficient practices. BEE's recent study of the pulp and paper sectors has indicated that these sectors have also responded positively and implemented technology upgradation plans. Use of fluidised bed boiler, variable frequency drives, energy efficient pumps, fans, compressors and cooling towers are widely employed in Indian industries. Interactions with industry experts indicate that over the years, there has been a significant reduction in investment costs of these equipment given their increased demand and scale of manufacturing.

Implementation of Technical Assistance Activities

Overall 12 TAP activities were implemented. Several activities have been designed and completed under the Line of credit to overcome various market barriers in implementation of Energy Conservation Act, 2001.

The funded projects were aimed to showcase techno-economic viability of EE investments by IREDA to other financial institutions and Commercial banks through developing their capacity to design bankable EEC project packages and also build the capacity of associated stakeholders.

Technical Assistance support was provided in standardization of project appraisal formats; developing pre and post project monitoring and verification protocols for sugar, cement and steel sectors and marketing of EE loan schemes. Capacity building programs for commercial banks and ESCO companies were undertaken to enhance technical and financial capacity for developing EE loan schemes and marketing techniques.

The activities like preparation of investor manual, EE information manual and development of codes and standards for performance evaluation of industrial equipment aimed at identifying the potential areas in energy intensive sectors that need to be targeted for energy efficiency. They also contributed in developing the strategic plan for implementation of Energy Conservation Act, 2001.

Technical Assistance was also provided to ESCO's in developing projects in Government buildings, hospital buildings, and industrial clusters. Some of the activities undertaken under TAP focussed on development of consultant directory, database on EE product equipment, list of ESCO companies and EE equipment manufacturers.

IREDA also utilised the knowledge gained under TAP activities to develop their portfolio in EEC financing. IREDA has financed 11 projects in industries like cement, pulp and paper, sugar, steel in this LoC. Additionally, IREDA has also financed one project in hotel industry outside the LoC, base work for which was undertaken in TAP.

EEC projects financed under LoC with reduced interest rates encouraged the industrial sector like cement, pulp and paper, textile and Hotels to improve their existing technology and profitability with achievement in reduction in overall specific energy consumption and emissions.

4.1.1 Bottlenecks for Small Hydro Development

Hydro power projects are location specific, varying significantly in costs and feasibility depending upon topography, hydrology, geology and accessibility related factors. The cost of SHP projects (per MW) ranged from around Rs. 40 million to Rs. 100 million. The main reasons for this are that the investment costs of hydro can vary significantly due to terrain and access difficulties as most of these projects are located in remote hilly areas. Besides the transmission of power to load centres, away from the source, necessitates investment in construction of transmission networks on difficult terrain.

In India in the hydro sector, there are very few integrated EPC contractors. Contracts are mostly split between civil construction and plant and machinery installation, which makes negotiation of EPC contracts relatively complex. Therefore there is a need to address functional, technical and price related aspects across contracts; else developers may face the risk of time and cost overruns and lower profitability.

SHP developers have highlighted lack of adequate land and freedom to develop the land and the infrastructure as a key bottleneck. In hilly states, delays in obtaining land/forest clearances have substantially delayed project implementation. This is a major problem being faced by a number of SHP developers as once local residents know that a SHP plant is coming up in an area, they either refuse to sell the land or ask for exorbitant prices.

One of the most crucial issues/ barriers in the scaling up of hydro plant (large and small) is interconnection between the plant and the nearest grid point to maximize the power usage from these sources. In a number of cases it has been seen that SHP plants are situated in locations far away from the transmission network. Therefore providing grid extension up to the SHP plants introduces an additional financial burden either on the licensee or the developer and in cases where funds for development of this infrastructure are limited; it severely hampers the process of hydro development in the region and state.

Hydro is a relatively expensive renewable energy technology due to its high upfront costs from detailed engineering requirements, remote locations, synergising civil and electromechanical works and also the high risks of Force Majeure events which sometimes further drive up the costs making these projects all the more unattractive for private developers.

Differing policies across states lead to concentration of projects in States which have the most investor friendly policies. At the same time different States have different policies for the awarding projects, variations in feed in tariffs and capital costs allowed which again promote non uniform hydro power development and consequent excess capacity in some States and supply constraint in others.

Lack of adequate financing also discourages developers especially the first generation entrepreneurs in the development of Small Hydro Projects. Financial Institutions, such as public/ private banks are still by and large unconvinced of the success of Small Hydro Projects.

Financial institutions are unlikely to finance small first time developers who cannot put up enough collateral.

With an approximate cost of about Rs. 50 million a Megawatt, developing a 5 MW plant would entail an expenditure of anywhere between Rs. 200 - 250 million of which a minimum equity an entrepreneur would have to put up would be Rs. 50 million. Most banks request developers to either furnish guarantees or provide adequate collateral as a financial institution which very few developers are able to comply.

Despite detailed S&I, project development in the Himalayan Region is prone to geological surprises during construction. This can at times cause delay and add to the estimated project cost. It is necessary to ensure that commercial agreements, such as the Project Implementation Agreement, signed with the State Government recognize such surprises and provide for consequent extension of Commercial Operation Date in case such surprises emerge during the construction period.

Technical- Economic Clearances (TEC) on an average adds between one to two years to the development time of the project.

4.1.2 Barriers to EE in India

The projects financed under this World Bank Line of credit targeted to address the three primary stakeholders in EE and ESCO business, namely the end-use industry, energy auditors, and the banks and financial institutions. Banks and state-level financial institutions usually finance the SMEs and municipal corporations. While awareness about EE opportunities is gradually increasing among SMEs, municipal corporations and commercial building from last five years, there has been no concrete effort to expand EE project financing. The issues on EE from the perspective of each of the stakeholders are discussed in brief in the following section:

Large companies with access to information, technical consultants and finance have found it less difficulty in implementing the EE projects as compared to the SME sector, who have not undertaken energy efficiency initiatives on account of several issues and constraints. These include:

- Lack of data on energy consumption, including measurement and verification (M&V) available with SMEs;
- Lack of trust on technical capabilities of external energy auditors (we know our plants better attitude);
- Lack of either guarantee from the consultants for minimum savings or absence of demonstration of savings in other similar types of plants in vicinity;

- Non-availability of turnkey solutions from concept to commissioning from one single source;

- Non-availability of simple financing schemes for implementing EE projects on normal terms, preferably from the same bank from which it has availed working capital requirement;

- Last but not least, the burden of upfront transaction cost of carrying out energy audits.

Impact of World Bank 2nd Line of Credit

Small Hydro Power

Most of the Small Hydro developers are either first generation entrepreneurs in energy sector or small and medium enterprises. However the impact their investment and work has had on society especially the local communities and the local environment is noteworthy.

One of the biggest impacts and learning's from the second LoC has been the understanding of the key role this programme has played in making clean energy sources like small hydro commercially attractive and viable.

- The second LoC provided an opportunity for developers and entrepreneurs interested in setting up SHPs to come forward, plan and execute these projects with funding from IREDA when no other financial institution was ready to provide funding to these projects.

- The second LoC provided access to funds for first time entrepreneurs. As they successfully executed projects, other FIs gained confidence and gave them the funds to scale up and invest further.

19 states namely, Andhra Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal have announced policy for setting up commercial SHP projects through private sector participation. The facilities available in the states include wheeling of power produced, banking, buy-back of power, facility for third party sale etc.

The conducive policy in many states particularly due to Renewable Energy Purchase Obligation (RPO) and successful project implementation of projects from 2nd LoC from World Bank, have generated many projects. There are now ample number of Small Hydro projects in pipeline in IREDA which also includes one project of 100 MW capacity which will require consortium financing.

Energy Efficiency & Conservation

Most of the EEC sub projects developers went for installation of energy efficiency equipment in the existing plants and as such these measures do not have any direct impact on the local community.

Under the Energy Conservation Act, 2001, 9 energy intensive industrial sectors are defined as Designated Consumers i.e. thermal power stations, fertilizer, cement, iron and steel, chlor-alkali, aluminium, railways, textile and pulp & paper. Specific energy consumption (SEC) norms for each designated consumer were emphasized to be adhered after five years. It is observed that there is a wide band of energy efficiencies in

different units, some units would be able to comply and some will be unable to achieve the target of SEC. Issue of Energy Savings Certificates to those Designated Consumers who exceed their target SEC reduction may be a mechanism whereby certified excess saving may be traded amongst companies to meet their standards compliance requirement, or banked for the next cycle of energy savings requirements.

The progress of energy efficiency has not achieved the required pace in India due to barriers of:

- Lack of awareness
- Higher upfront cost of energy-efficient technologies
- Lack of access to innovative financial instruments and
- Asymmetry in sharing of costs and benefits from the technology

Success of most of the projects funded under LoC has proved that the financing EEC sub projects is a viable option and not a risky proposition. Financing of EEC sub projects was a new experience for IREDA at the start of this LoC but now IREDA is strongly placed to finance similar projects. Foreclosure of the loans by some of the projects funded under this LoC has shown that the implementation of EEC projects is even more profitable than what they had expected during proposal stage.

On supply side energy efficiency has a lot of potential in optimisation of performance of power plants. To promote energy efficiency / conservation in energy consumption and to promote optimum performance of the power plants with a view to improve environment and climate protection by involving agencies that has responsibilities of outputs and activities as per their field of expertise.

Energy Efficiency in buildings offers an enormous potential for reducing energy consumption. Whether in existing housing stock or in newly constructed units, energy efficiency constitutes a savings potential that is still far from being fully utilised.

Conclusion

2nd line of credit wherein 45 small hydro projects were funded has enabled IREDA to take up financing of small and medium hydro projects with a better prospective of barriers in development and to factor in risks and its mitigation associated with development of SHP.

Further, this has also helped IREDA build up relationship with SHP entrepreneurs and who are now taking up small and medium Hydro projects in various states enabling IREDA to increase its outreach to various states and promoters.

Similarly for Energy Efficiency projects inclusion of enhanced energy efficiency as one of the eight National Missions recently announced by the Government have brought the sector on forefront. A number of schemes and programmes have been initiated and it anticipated that these would result in a saving of 10000 MW by the end of 11th Five Year Plan in 2012.

The World Bank Line of credit for energy efficiency and particularly capacity building of various stakeholders through TAP activities have resulted the importance of enhanced energy efficiency. During the period of Line of Credit, IREDA had a very active interaction with all the stakeholders including other commercial banks and Bureau of Energy Efficiency. Power plants efficiency improvement, Energy Efficiency in industry and end use, development of programmatic CDM and Energy Efficiency in public and private buildings are the focus areas emerging in the near future.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not Applicable

Annex 9. List of Supporting Documents

1. Project Concept Note
2. Project Appraisal Document, April 1998
3. Financing Energy Efficiency: Lessons From Brazil, China, India and Beyond. Robert Taylor, Chandrasekar Govindarajalu, Jeremy Levin, Anke Meyer and William Ward, World Bank, 2008
4. Mid-Term Review Report (Econoler), July 2003
5. Final Evaluation Report-" Status Report on India- Second Renewable Energy Project", PricewaterhouseCoopers, India, March 2008
6. Aide Memoires for Implementation Support Missions from May 2000
7. Implementation Completion Report (ICR) for India: Renewable Resources Development Project, Project ID: P010410, June 2002
8. Implementation Status Reports (ISR) from December 2000
9. Country Assistance Strategy (CAS) for India, December 1997
10. India Energy Efficiency Project. SMPR report, Global Environmental Facility, 2003
11. National Action Plan on Climate Change, Government of India, June 2008
12. BEE Action Plan, 2008
13. Energy Conservation and Commercialization (ECO) http://www.usaid.gov/in/our_work/activities/Enrg_Env/eco.htm
14. Personal Communications, Srinivasan Padmanabhan, Advisor, USAID

Annex 10. Institutional Development of IREDA

During the course of two World Bank engagements with IREDA, several initiatives have been taken to strengthen the institutional capacity of the organization and establish it as the premier renewable energy financing agency in India as well as in the South Asia region. Some of the key initiatives taken over the last few of years, and the improved corporate performance achieved as a result are discussed below.

Improved Corporate Governance Arrangements

IREDA has taken a number of initiatives to strengthen corporate governance. After more than two and a half years of vacancy, the position of MD has been filled, and elevated to Chairman and MD. This has enhanced the autonomy in decision making and allowed the organization greater flexibility as a financial institution in responding to the market. Vacant positions on the IREDA Board have been filled and three independent Directors have been appointed to the Board in 2008. The independent directors are distinguished people, including the former Chairman of the Central Ground Water Board (Ministry of Water Resources), a distinguished professor from the Indian Institute of Technology (IITK) / Indian Institute of Management (IIMB) who is also the founder director of the Indian Institute of Information Technology (IIIT), and the former Member (Finance) of the Department of Telecom.

IREDA has placed a strong emphasis on greater transparency and accountability and has put measures in place to achieve this. It has appointed an audit committee to review internal systems, financial performance and management, and risk management policy. An external consultant has been hired to review systems and procedures of IREDA's lending operations and to develop a suitable action plan for organizational restructuring through the strategic change consultancy exercise under the Bank's LoC.

Improved Corporate Financial Performance

IREDA's financial performance, which had deteriorated significantly during 2003-05 due to the change in enabling environment, compounded by natural events (droughts in Andhra Pradesh – see Text Box 10.1) and the company's inability to swiftly respond to changing interest rate regime in the country), has been improving consistently over the last three years.

Loans Portfolio: IREDA's loan portfolio has been greatly expanding over the last several years. Disbursements in FY07 increased by more than 36 percent over FY06 to about Rs. 410 crore. This increased by a further 34 percent in FY08. Increase in disbursements is partially attributable to initiatives taken following the strategic change consultancy exercise. These initiatives include funding of medium hydropower plants (larger than 25 MW), consortium funding with commercial banks, and increased financing for wind sector projects.

Profitability: IREDA's profitability improved from Rs.46 million in FY02 to Rs. 470 million in FY08. One of the key factors that have affected its profitability in the recent years is the provisioning for poor asset quality.

Asset Quality: A fall in recovery rate and a high level of NPAs (an increase of 7 percent over the previous year) was observed in IREDA's loan portfolio in 2006. Twenty-five of IREDA's SHP projects in Andhra

Text Box 10.1: Impact of Andhra Pradesh Drought on Small Hydro Power projects

Andhra Pradesh faced drought like conditions for three years from 2001-04. As a result, small hydro sub-projects faced decrease in water flow and were unable to generate adequate revenues to service their debt. Of the 25 sub-projects that were impacted, 6 were funded under the second renewable energy project. IREDA developed a loan restructuring package to assist promoters. The main features of the package included extension of repayment period, interest waiver till start of principle repayment and a reduction in interest to 10% subject payment of premium. All the affected sub-projects are performing satisfactorily after restructuring.

Pradesh were affected by drought for a consecutive three-year period, which resulted in a high accumulated funded interest liability, making it difficult for developers to make full and timely payments on a sustained basis. In addition, a change in accounting standards, which required NPAs to be recognized with a lag of 90 days instead of the previous 180 days also contributed to higher NPAs. To address this concern IREDA initiated actions for recovery from NPAs through various instruments including: (i) one-time settlement (OTS); (ii) Reschedulment; and (iii) SARFAESI Act, which resulted in recovery of written-off loans of Rs.14 crore and Rs.12 crore each in FY06 and FY07 respectively, thus enhancing IREDA's revenues and profitability. As of FY08, IREDA's net NPAs stood at 11.25%.[1]

Support from GOI in raising more capital: IREDA's ability to fund a larger RE project is limited by the size of its net worth. GOI has increased the authorized share capital of the company from Rs.400 crore to Rs.1000 crore to allow IREDA to raise more equity from government sources as well as from the market. MNRE has advised IREDA to explore opportunities for broad basing its equity base.

Strategic Outlook of IREDA

The World Bank project assisted IREDA in undertaking a set of three strategic consultancy studies which aimed at developing a strategic vision and addressing some of the key challenges faced by it. The three studies were:

1. Strategy and Action Plan for Adapting to the Changing Business Environment
2. Resource Mobilization Plan
3. Reviewing Systems and Procedures of IREDA for its Lending Operations and Developing a Suitable Action Plan for Organizational Restructuring

The key recommendations of the first two studies (the third study is currently in progress) as well as the steps being taken towards implementing them is provided in Table 10.1:

[1] This is based on provisional numbers for FY07-08, subject to approval by IREDA's Board of Directors.

Table 10.1: Key Recommendations and Actions Taken from First Two Strategic Change Consultancy Studies

Ser	Strategic Consultancy Recommendations	Actions Taken by IREDA
1	**Financing of medium and large hydropower projects** (above 25 MW) under consortium financing arrangements. **Financing other Large Renewable Energy projects** under consortium financing arrangements with other banks and financial institutions.	• IREDA is discussing the **funding of a large hydropower project** under co-financing arrangement with IL&FS. • IREDA is funding a **Rs.3,620 million wind power project** for Tata Power • IREDA is planning to explore the funding of **more wind power IPP projects** with some developers • IREDA is planning to finance **co-generation projects with sugar cooperatives** under a consortium financing approach
2	**Form a consortium with banks and financial institutions** for project financing to increase market reach and market share.	• IREDA has signed a **MoU with PTC** India Ltd. and PTC India Financial Services. Together the three entities would provide full financial and commercial solutions to RE developers including financing, investment and power off-take. • IREDA has signed an **MoU with the Power Finance Corporation** (PFC) to facilitate consortium financing of RE and EE projects (especially medium and large hydropower projects) • IREDA is co-operating with Tata Power on **85.4 MW wind project** along with private sector operations arm of the ADB. • IREDA has signed **partnership agreement with IDFC** to explore joint implementation of RE programs.
3	**Arrange funding from bilateral and multilateral sources** for reduced cost of funds	• IREDA is availing **funding from the European Investment Bank (EIB) of Euro 150 million** for overall RE investments. • IREDA is tying-up **KfW funding for Euro 50 million** for all RE with a specific emphasis on IPP wind energy projects. • IREDA is arranging an additional **Euro 19 million from KfW** towards exploring projects that would help in removal of barriers to bio-mass based generation. • IREDA is in early discussions with **ADB for US$ 150 million** funding for solar thermal and solar photo-voltaic projects.
4	**Streamline delivery processes** for customer retention. For example, easier appraisal process for repeat customers – cutting down on avoidable steps and offering competitive and flexible lending terms. Regular feedback and interaction.	• **Study on reviewing systems and procedures**, and organizational restructuring is currently underway. • **Credit Risk Rating System** developed by CARE for rating IREDA customers and offering risk-based terms of lending has been implemented. A credit risk rating cell has also been established.

Annex 11
Sample Energy-Efficiency and Renewable Energy Investments[1]

A few sample projects are highlighted below to provide a flavor of the investments that were undertaken under this operation. The samples include: (i) one EE project in waste-heat recovery (WHR), which is likely to become a key niche business area for IREDA moving forward; (ii) one innovative canal-based hydro project that was built utilizing the head available within the water circulating system at a thermal power plant; and (iii) one run-of-river (ROR) sub-project that showcases exemplary social and environmentally sensitive development.

Mahendra Sponge & Power (Pvt) Ltd. – Energy-Efficiency Project

Mahendra Sponge & Power (P) Ltd. (MSPPL) was incorporated as a private limited company on July 23, 2002 to manufacture sponge iron, steel and power. The company has a capacity to manufacture 200 TPD with two kilns of 100 TPD each. The first kiln was commissioned on November 26, 2003, while the second kiln was commissioned on October 23, 2004. MSPPL declared profits during the first year of operation.

The company proposed to set up a 8 MW WHR-based power plant, from the waste heat released from the two kilns, to meet the entire power requirement of its sponge iron plant and the power requirements of its group units (within the same complex) that manufacture MS ingots and TOR Steel. MSPPL approached IREDA to part finance a Rs. 275 million proposed investment in a power plant based on waste heat from sponge iron kilns and an additional atmospheric fluidized bed combustion (AFBC) boiler. A DPR was submitted with an application for a loan of Rs. 192.5 million. The loan was subsequently approved by IREDA and was shared equally between IREDA and the Second Renewable Energy Project funding that is, Rs. 96.25 million each. The project implementation was smooth except for a delay of four months due to the late shipment of the AFBC boiler from the supplier, Citar Vessels. Though originally planned to be commissioned in October, 2006 it could only be commissioned in February, 2007. There was a cost overrun of Rs. 20 million due to additional expenses on civil and erection works but all the additional expenses were provided from the internal accruals of the company.

Figures 1 & 2: Waste Heat Recovery Boiler and Kiln

[1] These Case studies were prepared based on the site visits and final evaluation report prepared by consultants PricewaterhouseCoopers, India

MSPPL completed the installation of the power plant in February 2007 and started commercial production in March 2007. The plant is also recording the data with regard to the auxiliary power consumption which is around 14-15 percent of the generated power. The major portion of the power produced is used for captive generation for the sponge iron plant and the two induction furnaces of 8 T capacity each. For the rest of the power, MSPPL has signed a PPA with the Chhattisgarh State Electricity Board, which is to the tune of 3 MW (average PLF 80 percent).

This project has set the benchmarks and standards for pursuing WHR boiler-based power plants for other sponge iron units. MSPPL was the first plant in an industry cluster in Siltara, Raipur which installed captive power plant using waste heat from the sponge iron kilns. The success of MSPPL in running this plant has influenced four additional sponge iron plants to install captive power plants. As such, MSPPL has become the trendsetter in that area and more WHR power plants are expected in the remaining 18-19 sponge iron plants in the cluster.

Birsinghpur - Small Hydro Project

The Birsinghpur project is located in the Umaria District, about 180 km northeast of Jabalpur in the eastern part of Madhya Pradesh. The project is located within the premises of Sanjay Gandhi Thermal Power Station (SGTPS) which is owned and operated by the Madhya Pradesh Power Generating Company Ltd. (MPPGCL), formerly Madhya Pradesh State Electricity Board (MPSEB). SGTPS is located on the Johilla River and has four operating units of 210 MW each. SGTPS operates on the lake cooling system in which, the water is conveyed in a canal to the circulating water pump house. The water is then circulated through the cooling condensers of the steam generating units by the circulating water pumps. After cooling the steam in the condensers, the water is discharged to the seal pit. The water then flows back to the reservoir by gravity through the return canal. About 30,000 cubic metres per hour (m3/hr) of water is required for cooling the condensers. Three pumps, each having a discharge capacity of 10,000m^3/hr at 25 metres head are employed to draw water from the lake.


Figures 3& 4: Seal Pit and Bypass Gate of the Plant

The difference in elevation between the water level in the seal pit and the water level in the return canal provides the head for the Birsinghpur mini-hydro project. The quantity of water discharged from the seal pit provides the flow. The available head and flow for the project activity are relatively constant, with the head being about 8.7 M and the available flow for each unit of about 8.3 cubic meters/sec for a total flow of about 33 m^3/sec. The feed-in tariff for the project was set at Rs. 2.25 per unit as per the MNRE policy that was applicable when the project was commissioned. A 30-year PPA was signed with MPSEB, however, sale to third parties was also allowed under the PPA and at present 100 percent of generation from the mini-hydro project is sold to Indore and Ratlam-based third parties at a mutually decided rate (between Rs. 3.85 and Rs. 4 per unit). As the thermal plant is operational year round, except for disruptions due to R&M or technical problems, the hydro project is also operational throughout the year. As a result, the project has

achieved a CUF of 95 percent, which is higher than the projected CUF in the DPR of 86.6 percent. While this hydro project was innovative, it has high replication potential at other thermal power plants across the country.

Dehar - Small Hydro Project

The Dehar SHP is a 5 MW plant at Bithal village of the Sihunte Tehsil in Chamba District of Himachal Pradesh. Although the project was executed on time there was an escalation in civil cost as some structures had to be rebuilt due to landslides. As a result, the projected cost (as per the loan agreement) of Rs. 248.5 million escalated to Rs 256.10 million. The project was primarily funded by IREDA but a loan of Rs. 19 million was also taken from another financial institution (UCO Bank).

The developers of this project have implemented a number of exemplary social and environmental initiatives as part of the project. Some of these initiatives are outlined below.

Livelihood Opportunities: To enhance community relations and provide livelihood for people living in the surrounding villages, the project developers have decided to provide a job to at least one person from each household in Bithal village. This has had a very positive impact on the image of the project and local villagers speak highly of the work undertaken by the project developers.

The project has also taken up the initiative of providing 10 kg of rice per month to 100 households below the poverty line located in the surrounding area. These households were selected based on consultations with the local panchayat.

The project also provides livelihood opportunities for others from Himachal Pradesh. Barring one supervisor (a diploma holder) from Andhra Pradesh, all personnel working at the plant were from Himachal Pradesh, including districts that are far away from the project site.

Connectivity and Community Development: The project developer had constructed a three-kilometre long dirt road for the project that now provides very good connectivity for the Bithal village to the nearest road head at Tikri. The project developer has also constructed a small temple near the project site for the villagers and a small Dharamshala (with four rooms and associated infrastructure) at the Chumali Mata Mandir, the local deity's shrine. In addition, the developer has also constructed a playground for the local school.

Figure 5 – Road built with temple in background

Minimizing environmental impact and construction costs: The project developer has constructed a ropeway of approximately 0.5 km which was used for transportation of all construction material to the channel and fore bay tank to reduce the number of trees that needed to be felled during construction. In addition, the project undertook afforestation on 6.0 hectares of degraded land at Jaiaru N-DPF-I as compensation for the trees that were cut during construction and also paid Rs. 0.2.million for soil conservation as mandated by law.

Maintenance of the Irrigation and Public Health Department (IPH) water and irrigation supply weir: The project developer undertook the maintenance of an IPH's (Irrigation and Public Health Department) weir located adjacent to the site (weir is located below the projects fore bay tank). This weir invariably gets damaged during the rains every year and the project has an understanding with the IPH and the local people that the repair work for the weir is the responsibility of the project. Annually, the project developer spends up to Rs 0.3 million on repair work. The weir services a kul (a water channel) which is almost 7 km long and is the longest in Asia.

In addition to the above initiatives this small hydro project was also the first hydel project in India to sell CERs. The project sold 23,000 CERs during the first 17 months of project implementation to KfW.