GEF Secretariat Terminal Evaluation Review

1. Project Data		Review date posted:	11/6/2002	
PROJ ID:	P010410 GEF ID#: 76		at endorsement Million $	at completion Million $
Project Name:	Renewable Resources Development Project (Alternate Energy)	GEF financing	$26.00	$26.00
Country:	India	Co-financing:	$254.00	$258.00
GEF Operational Program:	OP6: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs	Total Project Cost:	$280.00	$284.00
Implementing Agency	World Bank			
Partners involved:	Indian Renewable Energy Development Agency (IREDA), Government of the Netherlands (GoN), Swiss Development Cooperation (SDC), Danish International Development Agency (DANIDA), International Development Association (IDA)	Dates		
Prepared by:	Reviewed by:	Work Program date	12/1/1991	
Antonio Del Mónaco	Ramesh Ramankutty	CEO Endorsement	N/A	
		Effectiveness/ Prodoc Signature	4/6/1993	
		Closing Date	12/31/2001	

2. Project Objectives and Components as Proposed or any Changes during Implementation	
a. Global Environmental Objectives	To mitigate carbon emissions by strengthening IREDA's capacity to promote private investments in wind energy and solar photovoltaic (PV). The project had a hydro power component, however the GEF grant was to help reduce the project cost of PV and wind projects only, comparable to that of conventional alternatives.
b. Development Objectives	The Development Objectives are: (a) to strengthen IREDA's capacity to promote and finance entrepreneurial investments in alternate energy; (b) to create marketing and financing mechanisms for the sale and delivery of alternate energy systems based on cost-recovery principles; (c) to strengthen the institutional framework for encouraging entry of private sector investments in non-conventional power generation; and (d) to promote environmentally sound investments to reduce the energy sector's dependence on fossil fuels. These objectives remained unchanged throughout the project.
c. Expected Outcomes	There was no specific description of the expected outcomes.
d. Outputs/ components/ activities	The project had two major components financed in part by the GEF: (a) Technical assistance to strengthen IREDA's capacity to promote renewable energy technologies and provide technical support to private investors and other stakeholders engaged in renewable energy market development; and (b) Investments financed through IREDA including: wind farms with an aggregate capacity of 85 MW, a marketing and financing program to support the solar PV market, and the installation of 2.5 to 3.0 MWp of PV systems. These components did not change.
e. Comments on Project Cost, Financing and Dates	Project components were not revised. However, co-financing allocated to the project components changed and the project received several one-year extensions. Of the US$26 million in GEF funding, 52% was allocated for wind projects, 34% for solar PV projects, and 14% for technical assistance. For the PV systems, the first four years were spent on capacity building and working with prospective investors. The pace accelerated during the fifth year but the beginning of the Asian financial crisis caused a number of financial intermediaries earlier accredited by IREDA, to be unable to comply with the Reserve Bank of India's (RBI) new prudential norms to receive lines of credit.

3. Contribution towards the achievement of global environmental objectives:
The carbon emissions avoided as a direct result of the project are estimated to be 1.1 million and 94,000 tons over the lifetime of the financed wind and PV sub-projects, respectively.

4. Compliance with GEF review criteria	
a. Implementation Approach	The ICR did not discuss the Logical Framework. Some areas of project risks, ranging from technological, institutional to affordability issues, were identified at the outset and were addressed. However, the credit and collection risks associated with rural markets for solar PV applications were underestimated. This risk was partially mitigated through partnerships between energy service enterprises and self-help groups, farmers' cooperatives, NGOs and micro-finance institutions. Also the regulatory and policy risks associated with wind projects were also underestimated. The Bank recognized that implementation risks were highest for the PV component as it departed significantly from the business-as-usual approach of government tendering that existed in 1992. Capacity building was recognized as a key requirement to mitigate some of these risks and significant funds were mobilized for this purpose. Considerable resources were also allocated to strengthening IREDA's institutional capability. Agreement was reached on an Operational Policy Statement (OPS) which described IREDA's operating philosophy, objectives, programs and procedures and financial performance benchmarks. The co-financing partners, GoN, DANIDA and SDC, were closely involved in all aspects of project design and appraisal.

b. Country Eligibility, Ownership/Driveness, and Endorsement	The project objectives were in line with the Bank's Country Assistance Strategy which provides for encouraging private participation in the power sector, and promoting environmental benefits from renewable energy alternatives. The project also supported India's national environmental action plan which promotes renewable energy as a key element. Regarding country driveness, the policy framework and some fiscal incentives for grid-based windfarm programs were in place in participating states in Southern India, and investment pipelines were available at the beginning of the project. However, there was no pipeline for PV projects due to the lack of marketing, financing mechanisms, and information for end-users in the rural and peri-urban markets. Therefore the technical assistance program was designed to support market development activities for PV applications including training of technicians and entrepreneurs.
c. Stakeholder Participation/Public involvement	The project stakeholders were: Government of India, IREDA, GoN, SDC, DANIDA, IDA, GEF, the World Bank and the private investors and end users. With support from the project, IREDA launched awareness and promotional campaigns as well as series of regional business development meetings which helped disseminate information about the emerging investment opportunities in renewable energy. Renewable energy investments began to take off with funds provided through the project. The project implementation approach was based on consultations with the government, financial sector as well as private sector investors. IREDA's role in promoting policy and regulatory changes was through organization of business meetings in various states during which entrepreneurs were able to interface with policy makers. The decision to use IREDA as the implementation agency was taken after an assessment of the interest and capability of other financial institutions.
d. Sustainability	Investor's interest in renewable energy remains sufficiently strong as the demand for power continues to outstrip supply in many states. The continued interest of the business community is evidenced by the investment pipeline in privately operated wind power plants that are being installed in the country. Sustainability of PV manufacturing industry is likely because of the increasing international and domestic (e.g., telecommunications, railway, and defense) demand. However, sustainability of rural PV market will continue to depend on availability of affordable financing from the government and donors. In fact, with the end of this project, grant or concessional financing for PV is available through the government. Regarding the financial sustainability of IREDA, the level of non-performing assets (NPA), although progressively reduced to 12.4%, needs to be closely monitored. The proposed RBI plan to issue stricter norms for loss provision and write-off may increase the NPA in the portfolios. Accordingly, IREDA has taken actions to clean-up its portfolio following the recommendations in the Portfolio Audit and Diagnostic Study completed in mid-2001. They have increased their one-time recoveries, conducted more rigorous appraisals, allowed more flexibility to their loan officers in negotiating settlements, have appointed regional collection agents, and established tighter exposure limits.
e. Replication	The ICR contained no replicability workplans per se, however replication seems to be happening due to the market transformation process derived from the project. For example, commercialization has advanced rapidly in the wind power sector with over 90% of the installed capacity of 1,507 MW implemented by the private sector, compared to 40 MW of state-owned only facilities in 1992. IREDA's strong catalytic influence is evident as other financiers began to support wind farm investments after observing IREDA's experiences. Commercial market development has advanced in solar photovoltaic as well, as evidenced by: (i) the large private sector-led manufacturing base; (ii) a competitive market place where product costs are now among the lowest in the world; (iii) established retail sales and service networks; and (iv) emerging participation of financial intermediaries. India is now the fifth largest PV producer in the world with annual outputs of 20 MWp in 2000 with an installed capacity of 82 MWp.
f. Financial Planning	The actual project cost was $284 million compared to $280 million at appraisal and resulted in 207 MW of capacity additions compared to 188 MW expected at appraisal. The IDA Credit ($115 million) and GEF Grant ($26 million) were both fully utilized. The economic slowdown caused by the Asian financial crisis in 1997 hurt IREDA's financial performance, as many of IREDA's borrowers' core businesses suffered. IREDA had a negative real return on net worth in 1998 and Non Performing Assets (NPAs) raised to 21.6% in 1997-98. The wind farm investment target was reduced to 30.5 MW in 1997 when DANIDA withdrew its $50 million equivalent in parallel co-financing after disbursing $3.94 million. The SDC co-funding was also reduced to $2.3 million from $4 million in FY1999-00. These shortfalls were made up by additional funding of $0.4 million from GoN to strengthen the technical assistance program, IREDA ($40.7 million vs. $17 million at appraisal), promoter/consumer contributions ($87.7 million vs. 68 million at appraisal), and other loans ($12.5 million). Actual costs for the windfarm component was $87.7 million compared to $125.3 million estimated at appraisal. The lower cost was largely due to equipment cost reductions resulting from the use of a larger portion of locally manufactured components. The lower cost of the PV component was attributed to improved cost efficiencies, reduction in import duties and PV components price reductions. However, the aggregate capacity of PV systems actually financed under the project was 2.145 MWp vs. the 2.5 to 3 MWp estimated at appraisal.
g. Cost Effectiveness	Taking into account the GEF grant (by reducing investment costs by the amount of the grant) the project has an economic IRR of 14% for the wind farms as opposed to the original estimate of 12%. Without the GEF grant, the economic IRR would have been 9%. These values are still below the 20% IRR expected for GEF projects. The PV project had mixed results with EIRR greater than 20% for most components when GEF funding was available. The results suggest that donor cofunding may be necessary for some of these PV and wind projects to continue making them attractive for private investors seeking an EIRR of at least 20%. However, the use of GEF funds for the Home Systems and Lanterns was not necessary since the IRRs are high enough to attract private investments without subsidies. Therefore, the GEF funds could have been allocated for other projects since the cost effectiveness is low for these two PV projects. There were no explanations in the ICR about the great variations between the IRR of the PV projects with and without the GEF grant. The results are summarized below:

	Actual Economic IRR for the PV projects	**Without GEF grant**	**With GEF grant**
	Solar PV Lanterns	19%	33%
	Solar PV Home System	30%	108%
	Solar PV Power Packs	-23%	21%
	Solar PV Village Power	-3%	14%
	Solar PV Water Pumping	6%	43%
	The cost of carbon emissions avoided with GEF funding (i.e. only wind and PV investments) is $19/ton of carbon which is higher than the GEF recommended $10/ton. However, this is a project supported under the Operational Programs with an emphasis on market transformation and not on cost/ton of CO2. Regarding market transformation, there seems to be progress on wind power and PV but more work remains to be done to expand the markets.		
h. Monitoring & Evaluation	There were baseline indicators and values for these performance indicators at the project's completion which served to measure the progress obtained through the project. There were two to three supervision missions per year which included field visits and consultations with beneficiaries and business communities. The supervision teams consisted of financial/economic, technical, social/environmental, and procurement specialists, as needed. Independent technical specialists involved in windpower and solar PV projects elsewhere, participated in some missions and provided independent review of the programs. Following the mid-term review, IREDA established a Monitoring and Evaluation Cell. The Cell has been primarily responsible for ensuring completion of the financial investments and project performance. IREDA plans to expand the Cell's responsibilities to include assessment of development impacts of its projects. Key indicators are energy performance, unit costs and time to completion, global benefits, rural income and welfare improvement, and industry development compared to the baseline and completion estimates. The financial performance of IREDA will be tracked through its annual audited financial statements.		

5. Significant Outcomes/Impacts achieved by the Project

(a) The project enhanced IREDA's capacity to undertake its dual mandate of promoting and financing renewable energy technology. For example, IREDA has committed financing for nearly 1,500 projects developed by the private sector and NGOs accounting for 1,720 MW. By FY 2002, IREDA's annual loan disbursement level reached $134 million compared to less than $4 million posted in 1993. To increase its outreach and client support, IREDA established a cadre of business development associates in selected business centers of the country and is now piloting five regional representative offices. IREDA has now attracted other international support in excess of $350 million.

(b) IREDA's role in financing renewable energy investments has encouraged other lenders to support the sector. For example, currently renewable energy project financing is available from a larger number of national and local banks, non-bank financial institutions, cooperatives, foundations/trusts and government-owned financial institutions compared to nil in 1993. IREDA has financed about 30% of wind projects and solar PV schemes outside of the more commercial PV applications in state-run sectors.

Successful marketing and service delivery business models that IREDA has helped create include renewable energy service companies; retail companies selling renewable energy products and services to consumers, to private power developers, and to the State Electricity Boards. IREDA has also helped in the creation of cooperatives and micro/rural financing entities which have been a key to making the PV systems accessible to rural/poor consumers.

(c) The project helped promote a critical shift in the Government's approach to renewable energy development from one that was largely state-administered to a more demand and market-driven approach with active involvement from the private sector. Policymakers became aware of renewable energy business as a means to help meet growing local power supply needs . Accordingly, in addition to the four states that initially participated in the project, others started to set up enabling policy frameworks in support of renewable energy investments. These encouraged the private sector to invest in renewable energy infrastructure and service delivery systems, expand modern energy services to under-served rural communities, and support local and global environmental improvement. Over 3400 MW of wind, small hydro, biomass, solar photovoltaic and other renewable energy power systems were in operation by December 2001, compared to about 100 MW in 1992, with the vast majority of these investments developed by the private sector/NGOs.

(d) The project helped catalyze an unprecedented growth in the renewable energy investments and industry such that the share of renewable energy in India's power generation capacity grew from a mere 0.13 % in 1992 to nearly 3.4 % by 2001.

6. Significant Shortcomings (including non-compliance with GEF policies and procedures)

Renewable energy regulatory environment: At the time of appraisal neither the government nor the Bank had a clear vision of how sector reforms would be carried out during the life of the project. Hence, in the last two years, as reforms started to take off in some states, the Project was buffeted by unanticipated and sometimes ad hoc state regulatory changes.

Conflicting market policies: MNES subsidy programs sometimes conflicted with the market-oriented approach of IREDA-financed programs. For example, the MNES subsidy for solar lanterns directly competed with the more commercial approaches being fostered by IREDA.

Financial sustainability of IREDA: The government and IREDA did not sign a revised Subsidiary Loan Agreement (SLA), whereby instead of a fixed on-lending rate from the government to IREDA, IDA's concessional terms would have been extended to IREDA with the latter bearing the foreign exchange risk. This hurt IREDA's financial position in the face of lower lending rates in the market and after the GEF grant for PV was exhausted. By the year 2000, IREDA was paying IDA around 14% interest, and then lending those funds at 2.5 to 5% for PV. However, the SLA signed for the Second Renewable Energy Project did provide for passing on the IDA concessional terms to IREDA.

Sustainability of wind and energy projects: There is a risk of dissipation of the infrastructure built to serve rural PV market and of losing PV market development momentum if adequate affordable financing is not available. There is still considerable concern among the private sector investor community about the uncertainty in the regulations and tariffs of grid-connected projects. This uncertainty reduces investment interests and therefore should have been identified and addressed earlier in the project design.

Monitoring and evaluation: more attention should have been paid to monitoring of project outcomes and post-installation performance.

7. Ratings

	ICR	OED Evaluation summary (ES)/PPAR	GEF comments on the project	
Outcome	Satisfactory	Satisfactory	The project effectively mitigated carbon emissions by strengthening IREDA's capacity to promote private investments in wind energy and solar photovoltaic (PV), therefore the Global Environmental Objective was accomplished.	
Institutional Development	Substantial	Substantial (ES)/ Modest (PPAR)	The development objectives were largely achieved as well except for objective "c" which was partially achieved.	
Sustainability	Likely	Likely	The project had a sound implementation approach, however more work was needed on the regulatory component, as well as monitoring and evaluation.	
IA Performance	Satisfactory	Satisfactory	The Bank played a key role in the success of the project but failed to effectively identify and address some key regulatory aspects earlier in the project design.	
GEF Grant Recipient Performance	Highly Satisfactory	Highly Satisfactory (ES)/ Satisfactory (PPAR)	IREDA seemed to have largely achieved its objectives and adapt to difficult changing conditions.	
Monitoring and Evaluation		N/I	S	
Quality of the Evaluation Report		S	S	

8. Lessons for on-going and future GEF projects:

Renewable energy regulatory environment: Renewable energy programs should go hand in hand with programs to create the necessary regulatory reforms to create a favorable environment for investments in the sector. Furthermore, the renewable energy program should be consistent with and embedded into national power sector reforms and restructuring plans. These reforms should address tariffs, power sales into the grid from independent power producers, subsidies for renewable technologies when needed, and other factors necessary to create a predictable environment for investments in the sector. Policies to encourage maximizing energy output rather than installed capacity should be in place to prevent market distortions.

PV information outreach campaign: IREDA's proactive outreach to potential investors through its Best Practices publications, business meetings and the Business Development Associates (BDA) proved to be essential to business development, particularly for the PV market development as the PV promoters were relatively smaller and less experienced.

Development of renewable energy markets: Introducing competition among financial institutions will be important for commercial development of the renewable energy sector at the scale envisaged. In addition, multiple product/service delivery agents as well as technology improvements are necessary for success. A specialized financial institution, such as IREDA, was essential to begin the commercialization of new technologies, but broader participation by the financial sector is essential for the market to expand. A longer time frame should be planned ahead to accommodate innovative projects (e.g. PV in rural areas) which require more time for capacity building and working with prospective investors.

Potential for private investments in Wind and PV projects: The results suggest that donor cofunding may be necessary for some of these PV and wind projects to continue making them attractive for private investors seeking an EIRR of at least 20%. However, the use of GEF funds for the Home Systems and Lanterns was not necessary since the IRRs are high enough to attract private investments without GEF subsidies. Therefore, the GEF funds could have been allocated for other projects since the cost effectiveness is low for these two PV projects.

Monitoring and evaluation: There is a need to systematically monitor development outcomes and impacts. Given the positive impact of renewable energy schemes to rural communities and users, the establishment of baseline information and monitoring will facilitate the evaluation of the benefits of rural energy programs such as poverty reduction.

Financing mechanisms for rural PV systems: Affordable financing for rural consumers is essential to sell PV products in rural areas. Given the high up front cost of PV, grants may be necessary to reduce this cost. Financing also helps to increase market penetration as more consumers in an area can afford the products. It is also essential that financing is available locally - the rural market for lanterns, solar lighting kits expanded only when savings cooperatives, micro-finance institutions and rural banks that are closer to the customers, began to finance such products.

Bank procurement procedures: Implementing agencies should receive a training on World Bank procurement procedures to reduce delays in project implementation. In addition, procurement procedures should be flexible to accommodate the needs and goals of the project.

9. Post Completion Evaluation/Impact Evaluation (Yes or No)

Yes. This project used some innovative approaches to rural PV financing as well as private sector renewable energy development that would be interesting to further study for replication in other regions.

10. Comments on the quality of Completion Report

The ICR was a candid recount of the project and provided good information. However, it omitted a discussion of the logical framework. There were sections that were repetitive and the writing style was complex and confusing at times due to contradictions. There were no explanations in the ICR about the great variations between the IRR of the PV projects with and without the GEF grant.

13.5	52%
9	34%
3.6	14%
26.1	1