

Viewpoint

April 2000

India Renewable Resources Development Project

This article briefly presents the highlights of the World Bank and Global Environment Facility-assisted Renewable Resources Development (RRD) project, implemented by the Indian Renewable Energy Development Agency (IREDA) during 1993-1999. A team of consultants from Winrock International India has conducted an impact assessment of the project through a series of case studies on three renewable energy technologies, which is the basis for this documentation.



The RRD project, the first of its kind for the World Bank in supporting renewable energy commercial market development, became operational in 1993, following the recommendation of an Energy Sector Management Assistance (ESMAP) review. Till then, the renewable energy program was run by governmental agencies using government procurements and subsidies to support local industry. The private sector's role was limited to supplying equipment, and design and installation services. The RRD project's basic objective was to help the renewable energy industry make a transition from a supply-driven approach to a market-based, demand-driven one in which the consumer would have a choice of product and effective after-sales service. The project goal was to support private sector implementation of 85

MW of wind farms, 100 MW of small hydro and 2.5 MW_p equivalent of PV systems.

The RRD project had a total budget of \$195 million including a technical assistance component from the Global Environment Facility (GEF) and bilaterals such as the Swiss Development Corporation (SDC) and the Danish International Development Agency (DANIDA).¹ The project was implemented through IREDA, an autonomous financial institution under the aegis of the Ministry of Non-conventional Energy Sources (MNES), Government of India. In 1992, MNES put in place a consolidated strategy of fiscal incentives and policies to encourage private sector participation, as part of the macro economic reform process.

¹The budget was later revised to \$160 million following a reduction in DANIDA's contribution. However, DANIDA continued to support the wind program directly by facilitating equipment supply from Danish manufacturers.

²IREDA offers loans at 12-14% interest for wind and small hydro power projects with a repayment period of 10 years. The interest rate for solar PV is 2.5%.

Fiscal and Policy Incentives by MNES

- Low-interest loans with soft repayment terms from IREDA²
- Five-year tax holiday for independent power producers
- Accelerated depreciation in the first year
- Reduction of customs duties on renewable energy equipment
- Sales tax exemptions (in select states)
- Assured power purchase rates by state utilities
- Facilities for banking, wheeling and third-party sale of power



The World Bank Group

South Asia Energy Sector Unit (SASEG) and Asia Alternative Energy Program (ASTAE)

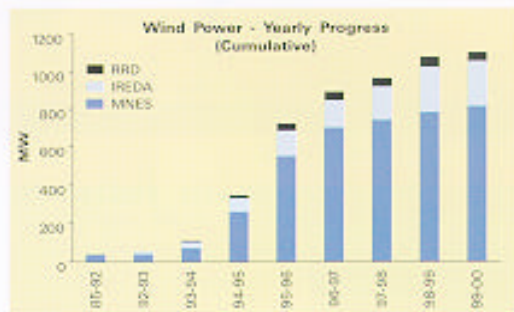


Wind Power Program

Emerging Wind Superpower

India has the capacity and technological know-how to exploit wind resources in a big way. A detailed resource mapping and assessment exercise supported by MNES, estimated the overall potential at 45,000 MW, more than double the earlier estimate of 20,000 MW.

Commercialization has largely been achieved in the wind energy sector. When RRD began, India had 40 MW of installed capacity, set up with international and MNES grant assistance. By March 2000, installed capacity touched 1,100 MW, making India the fifth largest wind power generating nation. Significantly, over 95% of this capacity was installed by the private sector with 85% for captive use. 14 projects with a total capacity of 49.9 MW were financed under RRD, while the total wind power portfolio of IREDA is close to 300 MW.



80% indigenization. Several of them benefited from joint ventures with leading manufacturers in Europe and the US, which resulted in significant technology transfer.

- Large turbines of up to 750 kW can be made in India, which has helped in better efficiency in harnessing wind.
- India now exports blades and soon can export turbines.
- Initially, several companies went in for wind farm development to avail of tax and depreciation benefits. With corporate tax rates reduced and minimum alternative tax imposed, the number of such companies has gone down over time. The emphasis is now on quality energy generation for captive use by energy-intensive industries.
- To encourage energy production, IREDA offers an interest rebate of 0.5% for capacity factor (CF) exceeding 18% and 1% for 29%. Till 1997-98, the average CF was 13%, which has improved in the last two years. For instance, TN Paper & Newsprint Ltd.'s wind farm is expected to attain a CF of about 25% in 1999-00.

Program Highlights

- The wind farms set up under RRD during 1993-95 helped reduce the perceived risks for investors, and resulted in improved practices in turnkey installation, O&M arrangements, modular, computerized operation, etc.
- The number of manufacturers has gone up from 3 (at the beginning of RRD) to 15, with

Attracting Entrepreneurs

Wheeling, banking and third-party sale facilities provided by state utilities, are critical for attracting private sector participation. Many first-generation entrepreneurs with high technical qualifications entered the small hydro sector due to these incentives. Andhra Pradesh and Karnataka states, where utilities have actively implemented the policies, lead in commercial small hydro development.

Small Hydro Program

India has a potential of over 10,000 MW in the small hydropower (SHP) sector of which only about 210 MW has been exploited so far by installing 267 projects. Of this, 43.55 MW was installed in 19 projects under RRD. Currently, 57 projects totaling 164 MW have been sanctioned by IREDA. This exceeds the original RRD target of 100 MW. Another 12 projects with 22.15 MW capacity are in the pipeline awaiting clearance from the World Bank on a second line of credit. Thus,





RRD has played a major role in accelerating commercialization in this sector.

Program Highlights

- India has an established manufacturing base in small hydro with nine active players holding 65% market share.
- Sanctioning-to-commissioning time for projects has come down significantly. Initially,

this ranged from 40 to 65 months, while at present this is 15 to 30 months. SKJ Power Ltd., a first-generation entrepreneur in Andhra Pradesh commissioned its 1.5 MW project in a record time of 15 months.

- A wide range of entrepreneurs, including energy service companies and small industries with captive requirements, has entered the sector. Some developers, such as Bhoruka Power, set up multiple projects following the success of their first project.
- Average capital cost for setting up small hydro projects has come down to \$800,000 to 1 million per MW for capacities above 1 MW, and \$1.2 million for capacities under 1 MW.
- So far IREDA/MNES have been handling projects of only up to 3 MW. Now projects of up to 25 MW capacity have been brought under their purview, which is likely to give a major boost to the sector.

Increased Income, Improved Lifestyle

Prior to installing a PV pump, Damodar Gour, a farmer in Chennaprovopally village of Andhra Pradesh was growing one rain-fed subsistence crop (paddy/maize) a year on 5 acres of land, and earned \$650. With a PV pump, he now grows two crops on 14 acres and earns up to \$2,625, more than four times in three years.

Solar Photovoltaic (PV) Program

India's PV program is among the largest in the world with over 675,000 systems (50 MW_p) installed, with domestic lighting and water pumping being prominent. India has a strong manufacturing base with a production capacity of 6.5 MW for cells (9 companies) and 9.5 MW for modules (22 companies). There are 45 companies that manufacture balance-of-systems. India now exports PV modules to countries in Asia and Europe.

RRD began with a target of 2.5 MW_p and a budget of \$42 million. Progress in the beginning was slow, with few projects in the first two years, on account of difficulties in reaching the dispersed rural customers; high initial costs; a poor marketing infrastructure; and the absence of entrepreneurs. IREDA conducted several entrepreneur training programs, PV design, installation and maintenance training courses, and business meets for PV companies and financial intermediaries. Consequently, the pace picked up significantly in the last two years and IREDA has sanctioned projects with a combined capacity of 4.2 MW_p. Of this, nearly 1 MW_p has

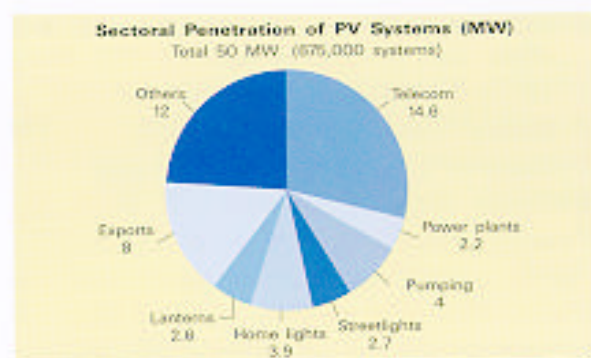


been installed through some 40,000 systems (home lights and lanterns account for 24% of capacity; pumping 6%; street lights 7%; powerpacks 49%; stand-alone power plants 5%; grid power 3%; others 6%). In order to accelerate disbursements and financial closures, IREDA is reviewing its procurement procedures and building internal management capacity.

RRD led to the development of innovative institutional models to promote PV in rural areas.

**Power of the Sun**

More than half the villagers in Mrityunjaynagar on Sagar Island (105 households) switched over from diesel to a solar power plant set up under RRD. From paying \$2 every month for a one light connection from the diesel plant, they now pay just \$2.5 for three lights and two power points. Women are happy with reliable lighting available, their children spend more time studying, and the men folk tend to stay at home to watch TV. Doctors can treat their patients better and the drug storekeeper need not grope in semi-darkness for medicines.



Examples of these models include:

Micro-credit Institutions: Wahandharak Nagari Sahakari Patsanstha Maryadit (WNSPM), a rural cooperative bank in Kolhapur, Maharashtra, offers solar lanterns as an incentive to people for opening recurring deposits with them. The system cost (without interest) is recovered from the recurring fees over a period of 10 years, at Rs 30 per month. Over 2,000 lanterns have been sold so far. WNSPM has developed a strong workforce to take care of maintenance.

Village Cooperatives: In Sagar Island of the Sunderbans in West Bengal, 5 PV power plants of 25 kW_p each (3 under RRD) are supplying electricity to about 500 families. A

cooperative society with representation from local organizations and consumers was set up to manage and maintain the plants, including collecting monthly charges. Apart from households, beneficiaries include grocery shops, tailoring shops, dispensaries, drug stores, etc. Earlier people used to pay about \$2 every month for a single light connection from a diesel plant, while the PV plant offers 3 light points and 2 power points (for TV, radio, etc.) for just \$2.5. Households, which were earlier using kerosene for lighting, save about \$1.25.

Financial Intermediaries: Nagarjuna Finance Limited (NFL) has tied up with Polyene Film Industries (PFI), a PV system integrator based in Hyderabad, Andhra Pradesh, to promote PV water pumping systems. NFL secured loans from IREDA while PFI takes care of installation, management and maintenance. A farmer can acquire a 860 W_p pump on a 10-year lease with a one-time payment of \$1,400. With PV pumps, farmers irrigate more land and switched from subsistence crops to cash crops for improved incomes. PFI has installed 86 pumps so far, and has plans to install 600 pumps in total with IREDA assistance.

Tangible economic, social and environmental benefits have been perceived by users.

IREDA – A Unique Institutional Model

Starting with a \$4 m base in 1987, IREDA, has, so far, sanctioned over 150 projects worth \$1,125 billion, and approved loans worth of \$609 million in the renewable energy sector. IREDA earned a profit of \$7 million in 1998-99. Further, it has attracted financial assistance from several donors, including KfW of Germany (\$120 m) and Asian Development Bank (\$100 m). \$135 m from World Bank, and \$85 m from OECD, Japan is in the pipeline.

Overall Impact of the RRD Project

- The RRD project provided the base for IREDA to establish itself as a model institution in the developing world with a successful track record.
- RRD has catalyzed market development by reducing perceived business risks, and helped demonstrate the marketability and competitiveness of renewable energy technologies by addressing various barriers in commercialization.
- Technical assistance activities under RRD have created considerable awareness and capacity among nearly 4,000 professionals in the country.
- The international competitive bidding process followed for large projects has made Indian manufacturers competitive and quality- and cost-conscious.
- The project sanction procedures under RRD have led to internal capacity building in IREDA. Also, the BDA scheme developed a number of experienced consultants who offer a range of services, apart from generating business for IREDA.
- Intense efforts by IREDA and MNES have encouraged several states to declare policies that promote commercial projects.