

India Renewable Resources Development (RRD) Project

Location: Nationwide
Type: Commercialization of renewable energy technologies
Size: 3,000 MW from renewable resources
Funding: Total: US\$216,000,000
 Private: (in-kind support): Amount not provided
 Public: US\$216,000,000
Objective: To increase private-sector involvement in renewable energy.
Duration: 1993–2001
Scale: Urban and rural

Summary

The renewable energy share of power generation capacity in India grew from 0.1 to 3% in eight years as the approach to renewable energy development shifted from largely state administration to a demand and market-driven commercialization approach with active private-sector involvement. Nearly 3,000 MW of wind, small hydro, biomass, and solar photovoltaic (PV) power systems were in operation by March 2001, compared with about 100 MW in 1992. The increase is attributable to a pricing policy that more closely represents the economic costs of energy supply, trade, and industrial policy reforms, and the entry of the private sector to augment power generation capacity.

In-Country Principles That Attracted Nondonor Financing

- Institution building and access to justice and enforcement of laws



The project attracted private-sector investment because of successful energy-sector restructuring that established a framework for private investment and ultimate privatization.

Fiscal incentives and policies that helped encourage private-sector participation included low-interest loans with soft repayment terms, a five-year tax holiday for independent power producers, 100% accelerated depreciation in the first year, reduced customs duties on renewable resources energy equipment, sales-tax exemptions (in select states), and facilities for banking, wheeling, and third-party power sales.

Financing

Total project investment was US\$216,000,000. The Indian Renewable Energy Development Agency Limited (IREDA), an autonomous financial institution within the Government of India's Ministry of Nonconventional Energy Sources (MNES), has financed about half of the capacity additions through direct and loan support. Private-sector equity (amounts not reported), MNES support, and loans from other lenders financed the balance. Public financing sources included the Swiss Development Corporation (SDC), the Danish International Development Agency, and the Global Environment Facility (GEF).

The Project

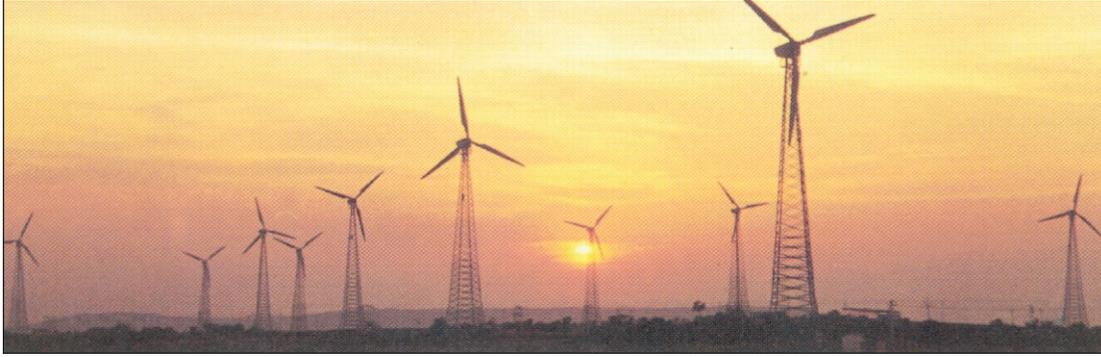
India's renewable energy resource use increased substantially through the expansion of the role of the private sector in technology commercialization.

Commercial, industrial, and residential sectors benefit because of increased access to reliable and reasonably priced electricity. Other benefits include land price increases, improved quality and availability of power in the vicinity of wind farms, and infrastructure development, such as improved roads.

The development of a commercial solar PV market has created a large, private-sector-led manufacturing base (60 firms in 2002 compared with 10 in 1992), a competitive marketplace where product costs are now among the lowest in the world, and increased participation by financial intermediaries.

Technical Data

Technologies include 5-Wp solar lanterns, 900-Wp PV irrigation pumps, 500- to 2,500-Wp solar power packs, 25-kWp village power systems, and a 200-kWp-grid tied system.



Performance Data

Small Hydro

Over 113 MW of small hydro capacity (33 projects) was commissioned and financed, compared with a target of 100 MW. Installed capacity has risen to more than 1,340 MW. Construction of 17 more small hydro systems (over 34 MW) has begun. An additional 155 MW has been financed in part with domestic market borrowings. The vast majority of new installations are owned and operated by private-sector companies.

Installations produce an aggregate annual energy output of 465,000,000 kWh at an average plant factor of 47%. Unit costs average US\$1,150 in real (year 2000) terms. Average estimated cost was US\$1,000/kW (year 2000 dollars) in comparison to US\$3,000/kW when installations were developed by the public sector. As the time from groundbreaking to commissioning has decreased from 20 to 54 months in 1997 to 11 to 20 months today, project cash flows have improved.

Wind Power

Installed capacity is now 1,340 MW as compared to 40 MW in 1992; more than 92% of capacity was implemented by the private sector. Unit costs are about US\$1,070/kW (year 2000). Rural employment amounting to 7,000 to 9,000 jobs in Tamil Nadu resulted from the 800-MW wind farms installed in the state.

Solar Photovoltaics

Seventy-eight projects with a combined capacity of 2,145 MWp generate 3,000,000 kWh annually; 40% of the 20 MWp produced in 2000 was exported. Average unit cost in real terms has declined from US\$22/Wp at appraisal to US\$11/Wp. There has been a five-fold income increase among farmers using PV pumps and a 50% increase in net income by some traders using solar rather than kerosene lighting. The income of some rural households is rising by 15 to 30% due to increased home industry output.

In addition to these performance measures, the carbon emissions avoided by RRD are estimated at about 3.6 million, 0.74 million, and 87,000 tons over the lifetime of the small hydro, wind, and PV projects financed under the project, respectively.

Participants and Roles

IREDA, under MNES, Government of India, implemented the project. The GEF, the SDC, and the Danish International Development Agency provided technical assistance.

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