10 Cases of TECHNOLOGY TRANSFER

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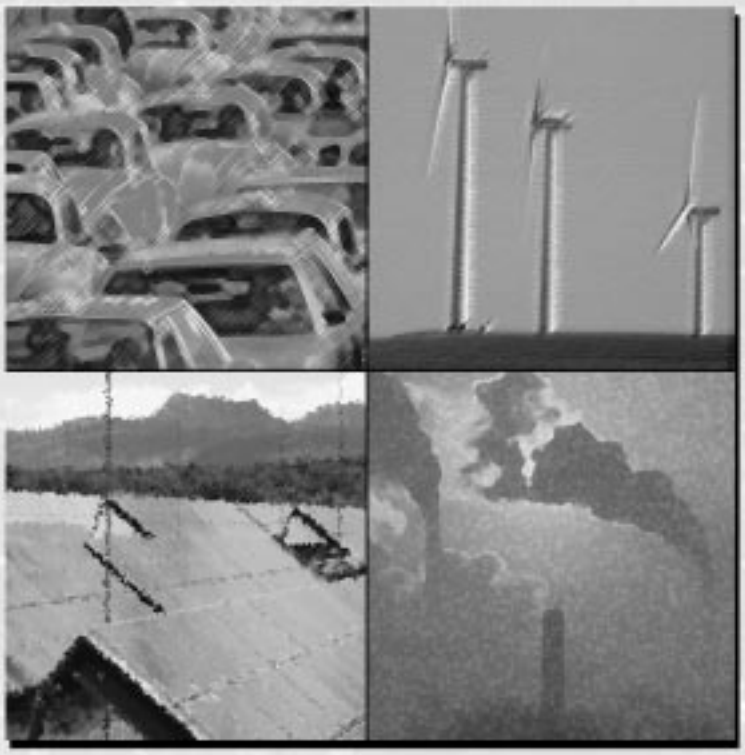

HIGHLIGHTS FROM GEF'S CLIMATE PORTFOLIO

"Developing countries are important theaters for innovation... What can be done at this time to steer their growth and development in directions that will make the best use of modern, cleaner technologies, 'leapfrogging' costly and polluting solutions adopted decades ago? This will require a special type of technology transfer."

— Professor José Goldemberg,
University of São Paulo, Brazil

Ten Cases of Technology Transfer

Global Environment Facility

June 2000

The Global Environment Facility (GEF) is the leading multilateral entity promoting energy efficiency and renewable energy technologies in developing countries and industrialized nations transitioning to market economies.

As the financial mechanism of the U.N. Framework Convention on Climate Change, GEF has allocated more than $1 billion to more than 240 climate change projects, matched by more than $5 billion in co-financing. Co-financing comes from governments, other donor agencies, regional development banks, the private sector (including non-governmental organizations), and the three GEF project implementing agencies: the United Nations Development Program, the United Nations Environment Program, and the World Bank.

"Shell entered the Sri Lanka market as a result of the World Bank/GEF project for off-grid solar power."

— representative of Shell International Renewables in Sri Lanka

Energy efficiency and renewable energy programs are designed to open doors for promising new technologies by removing barriers, cutting implementation costs, and reducing long-term technology costs. A new program addresses sustainable transport. Programs are designed to build sustainable markets, strengthen capacities, leverage financing from public and private sources, and facilitate technology transfer.

From 1991 to mid-2000 the GEF approved grants totaling $852 million for 82 energy efficiency and renewable-energy projects in 49 countries. Ten examples:

Wind Power in India

In India, World Bank/GEF support for wind power occurred in parallel with explosive market growth during the mid-1990s fuelled by favorable investment tax policies. By 1998, almost 1,000 MW of wind capacity had been installed in India and dozens of domestic wind turbine manufacturers had emerged, many with foreign partners. During the 1990s, a World Bank/GEF project directly financed 41 MW of wind turbine installations in India. The project strengthened the capabilities of the India Renewable Energy Development Agency (IREDA) to promote and finance private sector investments, and more than 270 MW of wind projects were financed through IREDA. The project also helped to raise awareness among investors and banking institutions of the viability of wind power technology. As a result of the project and the generally favorable market conditions, many financial institutions decided to offer financing for wind farms, which was a key project goal.

Wind Power in China

Under a World Bank/GEF wind and solar photovoltaic project, four new domestic wind power companies will construct 190 MW of wind farms and enter into commercial power-purchase agreements with utilities. These investments will

practically double the installed wind capacity in China and include the largest single wind farm to date, 100 MW in Inner Mongolia. Previously, most wind power investments in China have come from bilateral aid and have been less than 20 MW. Lower installed costs are expected, due to economies of scale from large wind farms and international competitive procurement. The project also includes a $90 million technology improvement component to assist domestic wind turbine and photovoltaic manufacturers to innovate, improve quality, and reduce costs — with both technical assistance grants and production investment loans.

Biomass Integrated Gasification / Gas Turbine (BIG / GT) in Brazil

Extensive research and studies on BIG/GT technology in the 1980s were funded by the Brazilian government, international private sector firms (including General Electric), and international assistance. Following these efforts, a UNDP/GEF project laid the groundwork for commercialization of this technology through studies and R&D on biomass fuel supplies and power plant design. A proposed World Bank/GEF project aims to demonstrate commercial viability of a 30 MW pilot plant. This technology demonstration is intended to spur further research, development, and commercialization of the technology worldwide, including dissemination of information and lessons learned from the demonstration stage. For example, a unique gas turbine design to accommodate low-calorific gas from the biomass gasifier, developed through UNDP/GEF sponsored R&D, can become "off-the-shelf" technology available for other BIG/GT plants.

High Efficiency Boilers in China

A World Bank/GEF project provides technology transfer and technical assistance to nine competitively selected boiler manufacturers to allow them to develop high-efficiency boiler models. As part of the technology transfer, the project acquires advanced equipment from abroad to upgrade these firms' designs to new boiler models. The project also provides technical assistance to the nine boiler manufacturers to develop, produce, market, and finance the new models and to strengthen customer service programs. It also provides technical assistance and training for industrial enterprises to understand, procure, and operate higher-efficiency boilers, and for design and research institutes and government agencies to disseminate the technologies to other boiler manufacturers.

"We have been able to offer our customers three-year credit to purchase our solar PV systems because of an IFC/GEF loan, which has greatly increased the ability of poor households to afford the technology."

— General Manager of Grameen Shakti, Bangladesh

Rural Energy Services from Solar PV in Sri Lanka

A World Bank/GEF project is promoting the market for "solar home systems" for rural households in Sri Lanka. Local dealers assemble, sell,

and service systems, using a combination of domestic and imported components. Local technicians have been trained in the technology and consumer education conducted. Consumer credit is being provided through local microfinance organizations. Sales by 1999 exceeded 1000 systems, and were expected to greatly accelerate during 2000. In addition, two events in 1999 were indirectly influenced by the project: Shell International Renewables entered the solar PV market and a nationwide department store chain began to sell PV systems.

"The GEF helped make conversion of coal-fired boilers to use cleaner natural gas 'fashionable' in our country, and has helped catalyze hundreds of such conversions."

— Polish government official

Small Scale Village Hydropower in India

A UNDP/GEF project in India has identified 20 sites to demonstrate the benefits of small hydro installations and increase awareness of the cost-effectiveness of hydro-electricity. Capacity-building activities have trained more than 50 officials in small hydro power planning, design, construction, management, and maintenance. A local educational establishment now offers a postgraduate program on alternate hydro energy. Ten states have issued guidelines for engaging the private sector in the commercial installation of small hydro. Local ownership and management models are being tested at three of the demonstration sites.

Solar Water Heaters in Morocco

A UNDP/GEF project in Morocco aims to install 80,000 m2 of solar hot water collectors. Technical capabilities are being strengthened in many ways. The project will train government agencies and private firms to promote, evaluate, and install solar hot water systems. The project will also develop norms, standards, testing procedures and trained test personnel, certification and labeling, and associated enforcement mechanisms. The project will introduce assemblers and manufacturers to improved standards and specifications to facilitate compliance, train architects and engineers to apply the standards and procedures, and develop codes of practice for constructors, installers, and plumbers along with training to facilitate compliance. The project will also design and lobby for practical mechanisms that would allow permanent reductions in value added tax and import duties on solar water heaters.

Energy-efficient Lighting in Poland

During 1995-1997, in two separate promotions, Polish consumers bought 1.2 million CFLs through an IFC/GEF market development project; more than 40 different CFL models were represented. Five manufacturers, including the one domestic Polish manufacturer, participated in an innovative subsidy program with joint manufacturer and GEF contributions (although two manufacturers dominated it). Retail prices of CFLs decreased by approximately 30% in real terms after the project. A global manufacturer of CFLs and foreign companies from Germany, China, and Japan have all entered the Polish market as a result of the project. The project led to a large change in consumer awareness

about CFLs and the number of households with CFLs almost doubled, from 11.5% to 19.6% of all households.

Energy-efficient Building Technologies in West Africa

A UNDP/GEF project in Côte d'Ivoire and Senegal strengthens capabilities to design and construct more efficient buildings, drawing upon international experience and technologies for efficient buildings. The project helps finalize an existing energy efficiency code for air-conditioned buildings and helps implement the code; the project consults with affected parties, tests the application of the code to several building projects, trains construction operators to understand and apply the code, and introduces the code into building permit procedures. In addition to the energy efficiency code, the project drafts a thermal comfort code for buildings without air conditioning and assists with its implementation. One representative building from each country is being audited and retrofitted, with an emphasis on air conditioning and lighting.

Decentralized Wind Power in Mauritania

A UNDP/GEF project installed demonstration wind-electric systems for rural electrification in 19 villages with 900 households. Beyond direct installations, the project piloted sustainable service delivery models (with cooperatives), trained local technicians, promoted consumer awareness, and developed financing and institutional capability for further development of small wind-electric systems. A second phase, extending the experience to 100 villages, has started with financing from the French government.

What is Technology Transfer?

Definitions of technology transfer differ widely in common usage and even among scholars. In the narrowest sense, technology transfer means simply transfer of equipment from one place to another, whether purchased (direct sales) or donated (i.e., through development assistance). This definition is usually unsatisfactory. Most would agree that a more compelling definition is that technology transfer means that local capabilities to understand, develop, produce, and use technologies are enhanced. This definition includes, for example, manufacturing joint ventures, technology licensing, joint research programs, university programs, personnel exchanges and training, service personnel and infrastructure, consumer understanding, policymaker familiarity, and so on. Going even further, one could say that technology transfer means anything that facilitates the adoption, adaptation, diffusion, and dissemination of new technologies within a given country. Almost all GEF projects provide some forms of capacity strengthening, know-how, market facilitation, and other technology-related elements that fall under these definitions.

For Further Information

"Renewable energy markets and the Global Environment Facility," *Financial Times Renewable Energy Report* no. 12 (February 2000), pp.18-22.

Promoting Energy Efficiency and Renewable Energy: GEF Climate Change Projects and Impacts, Eric Martinot and Omar McDoom (Washington, DC: Global Environment Facility, 2000.) (Available at www.gefweb.org)

The Global Environment Facility is an independent multilateral financial mechanism that assists developing countries to protect the global environment in four areas: biodiversity, climate change, international waters, and ozone layer depletion. GEF has funded more than 650 projects in 140 countries, committing close to $3 billion in grants and raising an additional $8 billion in co-finance. These projects are implemented by the United Nations Development Program, the United Nations Environment Program, and the World Bank on behalf of the GEF.

For further information, see the Operational Report on GEF Programs (December 1999).

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