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GLOBAL ENVIRONMENT FACILITY

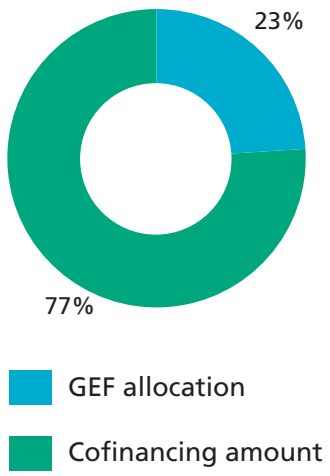
ABOUT THE GLOBAL ENVIRONMENT FACILITY (GEF)

The GEF unites 176 member governments—in partnership with international institutions, non-governmental organizations (NGOs), and the private sector—to address global environmental issues while supporting national sustainable development initiatives. It is the catalyst that drives actions to improve the global environment.

The GEF mobilizes international cooperation, helping to move the world toward sustainable development. It links local and global environmental challenges. In just 13 years, it has evolved into an effective and transparent entity with a solid track record of getting results. Today, the GEF is the largest funder of projects to improve the global environment. The GEF has allocated $4.5 billion, supplemented by more than $14.5 billion in cofinancing, for more than 1,400 projects in 140 developing countries and countries with economies in transition.

At the heart of the GEF's work are its three Implementing Agencies—the U.N. Development Programme (UNDP), the U.N. Environment Programme (UNEP), and the World Bank—which share the credit for the GEF's measurable on-the-ground achievements. The GEF's Executing Agencies also contribute to the GEF's impact: the U.N. Food and Agriculture Organization (FAO), the U.N. Industrial Development Organization (UNIDO), the African Development Bank (AfDB), the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the Inter-American Development Bank (IDB), and the International Fund for Agricultural Development (IFAD).

THE LEVERAGING EFFECT OF GEF SUPPORT



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THE CHINA–GEF PARTNERSHIP TO INCREASE USE OF RENEWABLE ENERGY

Around the world, the transition to renewable energy systems has begun. From private investors to governments to multilateral assistance agencies, renewable energy is receiving increasing investment shares and attention. China's experience provides a good example.

Chinese leaders recognized early on that accelerating the transition to efficient and renewable energy would bring enormous economic, social, and environmental benefits. They realized that the transition was inevitable, not because fossil fuel supplies would run out, but because the relative costs and risks of using them would continue to increase. In contrast, wind, sun, and water are free. Free, that is, except for the ways and means of efficiently converting them to energy.

The potential for renewable energy in developing countries is challenged by several factors, not the least of which are the up-front costs of installing equipment and the limited resources of the people who need it. Certainly, this is the case in China. Chinese leaders, well aware of the complexity of a transition to renewable energy, turned to the Global Environment Facility (GEF) for assistance.

Through the GEF, China is developing new energy programs and approaches that go beyond one-time, stand-alone projects. They seek to have a broader, more significant impact—nothing less than structural change at the national level. From the beginning, these strategies build in project components for large-scale and long-term replication, monitoring and evaluation, and stakeholder involvement in partnerships with the national government, the private sector, and other actors.

A leading example is China's Renewable Energy Scale-Up program. With $41.6 million in grants from the GEF, outside loans and grants totaling $129 million, and significant national investment, China is working to remove barriers to the introduction of cost-effective renewables; reduce the cost and improve the performance of small hydro, wind, and selected biomass technologies; and increase the market penetration of renewables enough to make a sizable cut—187 metric tons of carbon—in greenhouse gas emissions.

China's 10-year program sets ambitious targets for investment and government commitment to a supportive policy environment. Among other things, it envisions the implementation of a national policy framework to develop large-scale commercial markets in renewable energy. This framework requires that a share of electricity supply be met from renewable resources as part of a mandated market.

Chinese leaders expect the costs of renewable energy to decline and the economic and environmental benefits (both local and global) to accelerate. The program also supports improvements in the quality and performance of equipment and strengthens the capability of service industries to respond to increased market demand.

China's renewable energy portfolio includes a number of other GEF projects. For example, a $5.8 million GEF grant is supporting the first phase of a project to reduce the cost of fuel cell buses in Beijing and Shanghai. Buses are a major source of greenhouse gas emissions as well as localized air pollution in China. Fuel cell–powered vehicles offer the potential for pollution-free transportation. In collaboration with both the national and local governments, GEF is helping public transit companies obtain fuel cell buses for the two cities and operate them over a total distance of 1.6 million kilometers. The initiative includes significant private sector involvement and is designed to sustain the effort beyond the duration of the GEF project. Chinese officials and project designers anticipate that lessons learned from the project can be used to develop similar initiatives in other cities and countries.

Another GEF project is helping rural health clinics switch from coal-fired electricity to solar and photovoltaic (PV) systems, at a 30 percent lower cost. As the health delivery expenses are reduced, the clinics become more self-sufficient and can re-channel income toward improving health services. The target is to rehabilitate from 2,000 to 4,000 clinics per year in 10 provinces throughout the country. The passive solar health clinics are designed by local villagers, who also volunteer their labor for construction and maintenance.

The GEF is also sponsoring projects to help strengthen China's capacity to work with renewable energy, to undertake solar and wind energy assessments, and to expand methane recovery and use.

INCREASED USE OF RENEWABLE ENERGY IN CHINA

- About 50 million households are served by small hydro village-scale mini-grids.
- About 10 million households are served by solar hot water heaters.
- China's latest five-year plan calls for a five-fold increase in wind power, to 1,500 megawatts, by 2005. The plan also proposes requiring that 5 percent of all new power generation come from renewables, which could mean an additional 20,000 megawatts of power by 2010.

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SUDAN: PROMOTING SOLAR PHOTOVOLTAIC SYSTEMS

Sudan's main energy source is biomass, mostly in traditional uses. Electricity constitutes only 2 percent of the country's energy consumption. The national electricity grid reaches a half million households, less than 10 percent of the population; major and minor local grids serve another 5 percent. Consequently, the majority of Sudanese take care of their energy needs themselves. In addition to biomass, liquefied petroleum gas and charcoal are sources of household energy. Wealthier households often invest in diesel generators.

THE GEF SOLAR PHOTOVOLTAIC PROJECT

In 2000, the Global Environment Facility (GEF) launched a project to create a sustainable technical, institutional, and financial infrastructure to support the market penetration of solar photovoltaic (PV) systems. The project aims to meet the growing energy demand in semi-urban Sudan with PV, rather than diesel, systems. The project seeks to build capacity and awareness and to help the Sudanese government develop policies and regulations that will create an environment favorable to the use of this clean technology.

When the project began operations, PV technology, despite its potential, was little known in Sudan and was rarely used to satisfy the country's energy needs. It was mainly used in telecommunication applications and by airports, railways, and the military. The government had already undertaken some PV promotion activities with the help of donors and wanted to do more. It recognized that a range of training and outreach activities, combined with the strengthening of public institutions and, most importantly, some assistance in formulating and implementing a PV policy, was required to achieve a higher PV market penetration.

The project got a strong start when it was taken up by the Ministry of Energy, which could count on the expertise of a team of dedicated professionals. The project soon established a strong network of partnerships among the central and state governments, the Sudan Environment Conservation Society, the Energy Committee of the National Assembly, and the Energy Research Institute.

POLICIES THAT ENABLE THE MARKET

Today, the Sudanese government is actively supporting PV policies. The solar PV project has contributed to enhanced awareness of the social and economic potential of PV power and has boosted activities by the National Energy Committee of the National Assembly to enact a Solar Energy Act. In the annual 2004 national development budget, the parliament passed a resolution

exempting PV system components from import duties and the value added tax. The government has further decided to invest in a joint venture with China for a module assembly line. It is expected that the combined effects of tax reduction and local assembly will reduce PV costs by 30–40 percent.

PROVIDING SOCIAL SERVICES POWERED BY THE SUN

In the absence of a significant private household market, the main market action for PV is in the social sector. The Sudanese government and the states have invested in PV backup systems for schools, health clinics, and community centers. The model schools have already seen improved exam results, which they attribute to greater opportunity for studying with the availability of electric light. Some schools have invested in computers now that they have reliable power.

The cost of introducing PV systems in the major social centers of 1,000 villages was incorporated into the government's most recent annual development budget. But for the later stages, the cost of systems in the social centers is expected to be covered through installment payments by the users.

FINANCING

Financing continues to be the single most important and complicated issue for a larger PV market in Sudan. Before the project, most PV sales were cash-based; vendors and banks were unwilling to provide financing to consumers or sell on credit because of the inherent financial risk and the high transaction cost of small loans. To reduce the credit risk, the project has piloted, with the Sudanese Social Development and Savings Bank (SSDSB), a guarantee mechanism, which became operational in 2003. At the end of 2003, about 80 percent of the capital provided was used to leverage credit for solar systems, mostly for household uses. The payback rate was in the range of 87–92 percent of the monthly transactions. Because of the success of this program, the Sudanese Agricultural Bank agreed in 2004 to provide credit in five additional towns, where SSDSB does not have branches.

NEXT STOP: THE ELECTRIC WATER PUMP

For PV-powered irrigation, the accrual of direct economic benefits is expected to make replication even easier. For thousands of small farms along the Nile, using PV pumps would be more economical than buying expensive fuel for unreliable diesel pumps. The government plans to demonstrate the advantages of PV pumps and spread the information through the State Focal Points.

THE FUTURE

The PV market players in Sudan are optimistic and expect increasing sales in coming years. The government and private businesses are hoping for falling PV costs resulting from proposed PV policies and from manufacturing by local firms. They anticipate increased demand from social institutions and private households as they become fully aware of PV's benefits. If that happens, the project, which has been extended until the end of 2004, will have truly contributed to removing barriers to a larger PV market.

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THE GEF AND RENEWABLE ENERGY

The Global Environment Facility (GEF) is the largest source of funds for renewable energy in the developing world. As the financial mechanism for the United Nations Framework Convention on Climate Change, the GEF has provided about $900 million for more than 110 projects in 50 countries. This support has leveraged almost $6 billion in additional cofinancing.

The importance of renewable energy for sustainable development is beyond dispute. Clean energy technologies are vital to alleviating poverty, expanding rural development, and maintaining environmental quality. The productive use of renewable energy in rural areas helps to raise incomes and improve health. Pumping water for irrigation, power for drying crops, energy for cottage industries, and lighting in schools and hospitals are all important applications of renewable energy for rural areas that have no chance for connection to a power grid in the foreseeable future.

The opportunities for renewable energy are staggering. About one-fourth of the world's population lacks access to electricity, mainly in South Asia and Sub-Saharan Africa. In Sub-Saharan Africa, many women carry 20 kilos of fuel wood an average of 5 kilometers every day and then burn this wood in an inefficient cookstove. These stoves pose grave health hazards. Globally, about 2.5 million women and children die prematurely every year from breathing the smoke from inefficient cookstoves.

The GEF helps shift energy investments in developing nations in more sustainable directions. It works to remove barriers and to bring down the cost of promising new technologies, while minimizing subsidies for equipment and consumers. The GEF is constantly seeking partners and new ideas for opportunities that will allow continued investment without further external support. The GEF is innovative and catalytic; a key feature of its work is linking national development priorities and global environmental objectives.

Through its projects, the GEF deals with problems hampering the transformation of markets for renewable energy: lack of supportive policy frameworks, inadequate financing for installations or supporting businesses, lack of technical capacity, and lack of awareness and trust in the technologies by users and utility companies. The GEF's renewable energy projects involve private firms as manufacturers and dealers, local project developers, financial intermediaries, recipients of technical assistance, technology suppliers and contractors, and project executors. Here are some typical examples:

- Solar home systems for rural off-grid markets
- Mini-grids based on micro-hydro, photovoltaic, wind, or biomass
- Biomass and biogas for captive applications (agro-processing industry)
- Wind farm demonstrations
- Favorable policy environments for wind farms (such as power purchase agreements)
- Geothermal power plants
- Biomass-based district heating
- Innovative financing mechanism for renewable energies.

Several examples illustrate the diverse strategies the GEF deploys. In rural Sri Lanka, a GEF rural renewable energy project has helped tens of thousands of people switch from kerosene or lead-acid batteries to solar energy and micro-hydro systems to power their lives. To implement the project, a local nongovernmental organization offers loans to the purchasers of household solar systems, pays the supplier, and has the responsibility of collections. In addition to solar energy, the project is promoting small village-level hydro schemes. To date, the project has set up 84 village hydro installations, which electrify more than 4,000 houses, with more in the pipeline. The project has been so successful that the GEF has launched a follow-up project, which is exploring the potential for biomass and wind technologies for village mini-grids, along with emphasizing new approaches to income generation and social services.

Another example is the Strategic Partnership for Geothermal Energy Development in Eastern Europe. It is designed to promote the use of geothermal energy in the region by mitigating financial and resource-related risks, by providing financial support for some investment projects, and by providing capacity-building and technical assistance. Partners are the participating countries in the region, the GEF, the World Bank, the United Nations Environment Programme, and various international financial institutions. The core innovation of this partnership is a partial risk guarantee window to mitigate against the geological risks of exploratory drilling—which often is a prohibitively large investment and a barrier to the wider market penetration of geothermal energy production.

Another strategy underlying GEF renewable energy projects is helping commercialize new technologies that are particularly beneficial to developing countries. In Tunisia, a solar water heater project has led to an unprecedented market acceleration for this cost-effective application. In this project, the GEF supported government efforts to encourage the substitution of renewable solar energy for fossil fuels in public and private institutions so as to mitigate global warming by reducing carbon dioxide emissions. GEF support has helped triple solar water heater installations.

In Mexico, the GEF is supporting the commercial development of a solar thermal power plant. The project aims to demonstrate the commercial feasibility of the solar trough technology as a major source of power. The GEF is engaging the relevant companies in a dialogue about risk sharing and the next steps toward achieving fully commercial development. The GEF is supporting similar plants in Morocco, the Arab Republic of Egypt, and India.

The solar thermal power plant project ties in with the GEF's other renewable energy work in Mexico. To reduce greenhouse gas emissions while responding to increasing energy demand and energy diversification imperatives, Mexico is exploring a long-term strategy to accelerate the commercialization of renewable energy technologies, particularly at the grid-connected level. The government of Mexico is seeking to directly stimulate renewable energy through a GEF-supported financial mechanism that will deliver incentive (tariff) support to jump-start the market. It will facilitate the investments through regulatory changes and policy commitments at the national level. The program will develop a continuous stream of investments with a declining level of concessional support over time, and it will integrate these investments with policy and market recognition of the energy capacity and environmental and diversification value of renewable energy sources at the tariff level. Coupled with significant commercial financing, the expected level of tariff support implies an approximate 10-to-1 leveraging of GEF funds.

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SUPPORTING NEW RENEWABLE ENERGY TECHNOLOGIES

As the chief provider of funding for renewable energy projects in developing countries, the Global Environment Facility (GEF) is having a significant effect on accelerating the development of such energy. A major focus of the GEF's renewable energy portfolio is reducing long-term technology costs through demonstration and commercialization. Since its inception, the GEF has supported the dissemination of new technologies for renewable energy. The GEF strategy rests on the assumption that investments and follow-up can reduce the costs of renewable energy technologies and enable them to become competitive with conventional fossil-fuel-based technologies.

BIOMASS INTEGRATED GASIFICATION

With 170 million energy users across 8.5 million square kilometers and a strong technical and scientific base, Brazil is well-positioned to pioneer renewable energy technologies in partnership with the GEF.

A biomass energy technology project, one of the first endeavors of the GEF, began with the goal of demonstrating the commercial viability of a high technology process for cogeneration of heat and power: biomass integrated gasification/gas turbine technology. In Brazil, this technology can convert sugarcane biomass residues into electricity much more efficiently than can traditional technologies. The power can then be used within the sugar plant and also fed into the grid.

During the 1990s, the venture resolved a wide range of important economic, financial and engineering issues. Now a public–private consortium is working towards building a plant in southeast Brazil at a sugarcane processing factory. Because the Brazilian sugar industry is so large, this technology offers the potential for a large reduction in greenhouse gas emissions. In addition, sugar producers can decrease their operating costs by using the industrial waste more efficiently.

CONCENTRATING SOLAR POWER

In 1996, the GEF's Scientific and Technical Advisory Panel recommended high-temperature solar-thermal power technology as one of the renewable energy technologies with the potential for significant cost reduction and high use in countries with sunny climates. Concentrating solar power is the most cost-effective way to convert solar radiation into electricity. Such efficiency was proven operationally in California in the mid-1980s; research and development programs continue in Europe and the United States.

The Mathania Solar Thermal Power Plant project in India was the first to enter the GEF work program in 1996 as part of a larger strategy for introducing this technology. The GEF is financing the incremental costs of construction and operation of a grid-connected, 140-megawatt (MW) solar-thermal fossil-fuel hybrid power plant in Rajasthan. The plant incorporates a parabolic trough solar-thermal field of about 35–40 MW and will demonstrate the operational viability of solar-trough technology. The GEF is developing similar projects in Mexico, the Arab Republic of Egypt, and Morocco.

MARKET AGGREGATION

Because many of the new technologies and applications are plagued by similar problems, such as the small number of stakeholders involved and a high degree of risk and uncertainty, the GEF is exploring innovative ways to support those new technologies. For example, the EMPower project, initiated by the GEF, is a novel partnership between the renewable energy supply industry and the users and utility companies that constitute the demand for the technologies. The global project will offer a forum for discussing and aggregating future demand and supply. Having global demand and supply interests communicate their respective plans in a common forum is expected to reduce transaction costs, speed up project development, reduce investment risks, and eventually lead to lower prices.

The technologies on which this initiative will focus are both concentrated solar power and large-scale solar photovoltaic (PV) applications. EMPower will develop market aggregation tools and initiate a market forum for solar electric technologies.

LARGE GRID-CONNECTED SOLAR PHOTOVOLTAIC PROJECTS

A successful example of an innovative PV project can be found in the Philippines. CEPALCO, the third-largest electric distribution utility company in the country, considered increasing its generation of fossil fuels to meet growing demand. Instead, a $4 million GEF grant has helped structure a ground-breaking PV project that will enhance the capacity of CEPALCO's existing hydro facility. PV panels with a total capacity of 1 MW will be operated in conjunction with the pump-storage facility in Bubanawan. The hydro project will serve as an effective storage facility for the power produced in off-peak hours by the PV system, so that the hybrid will become fully dispatchable. The project is unique in several ways:

- It will be the largest grid-connected PV installation in the developing world.
- It will demonstrate the conjunctive use of hydro and PV resources, effectively increasing the capacity of the hydro unit and making PV power dispatchable and reliable.
- It will have an innovative project finance structure, wherein the loan can convert to a grant.

BUILDING INTEGRATED PHOTOVOLTAIC APPLICATIONS

The GEF is promoting national innovations for advanced renewable energy. In Malaysia, a GEF-supported project is investigating different strategies for Building Integrated PV (BIPV) applications. With PV technology integrated into their design and construction, an office building, hotel, residence, or other building could produce its own electricity as well as sell any excess energy back to the grid.

The Malaysia project aims to promote local manufacturing of BIPV systems, support the development of enabling policies to encourage the use of BIPV technology, and promote different applications of BIPV systems throughout the country. To produce those systems, the project is bringing together a variety of stakeholders, including representatives from industry and government.

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FINANCING FOR RENEWABLE ENERGY

The main barriers to the widespread use of renewable energy are the high up-front costs, particularly for installing equipment, plus the limited resources of the people—most often the rural poor—who need the technology. To some degree, strengthening capacity building, promoting enabling environments, developing policy frameworks, and improving demands for renewable energy technologies can help mitigate steep transaction costs and underdeveloped markets. But even if those barriers are removed, the up-front investment costs of renewable energy projects will still be higher than those of conventional technologies.

The Global Environment Facility (GEF) is the largest provider of funding for projects to support the use of small-scale, off-grid renewables, such as solar home systems, and make them more affordable. The GEF has more than 30 such projects in 20 countries.

The GEF and its Implementing Agencies have tested different strategies to expand the use and improve the affordability of renewables. One approach, which was particularly suited to social services and small businesses, emphasized productive uses such as targeting renewable energy for income generation and social services that have direct economic benefits. Thus, this approach can contribute to local development and provide livelihoods to pay for improved energy services.

Another strategy that makes it easier to finance small- or larger-scale applications involves reforms of power sector policy frameworks. Those frameworks offer opportunities to reduce the risks

perceived by investors, for example, for grid-connected renewables, such as wind and small hydro.

Yet another GEF strategy tests the use of innovative approaches to increase access to local sources of financing. Over the past 10 years, the GEF has been an equity owner of company shares, has loaned money on commercial and subcommercial terms, has initiated microfinance schemes, has provided contingent financing for project preparation and investment, has mitigated renewables-specific project risks, and has ventured into the area of credit guarantees.

THE GEF AND SMALL BUSINESSES

Most renewable energy companies are small, underdeveloped, and not yet profitable. Particularly in rural areas—where millions of people are spending large amounts for lower quality fuels, but cannot afford the initial cost of renewable energies—the energy businesses need more effective business planning, better management skills, and greater access to finance and consumer credit.

In the mid-1990s, few renewable energy businesses in developing countries could function as role models for the build-up of local industries. To accelerate the financial viability of photovoltaic (PV) businesses in developing countries, especially for off-grid applications, the GEF designed the Photovoltaic Market Transformation Initiative (PVMTI), a financing facility with a variety of financial instruments. PVMTI seeks to fulfill its mandate by nurturing a few selected photovoltaic business models and providing them with an appropriate combination of technical assistance and loan financing, as well as providing guarantees and equity.

The GEF initially focused on India, Kenya, and Morocco. Investments in those markets are expected to provide sustainable business models that can ultimately be replicated in other countries. The PVMTI currently supports 12 businesses, representing a wide range of applications, including individual solar home systems and mini-grid type applications. In the six years since its implementation, the project has provided equity financing to sellers and users of PV systems, in addition to loans and credit guarantees.

CONTINGENT LOANS AND GRANTS

Many businesses are willing to invest in renewable energy projects if the public sector shares the risks. Therefore, the GEF offers contingent loans and grants to mitigate the risks of investments and financing, as well as the high costs of project development. A contingent loan has an interest rate and payment schedule similar to a traditional loan, but the loan would be forgiven if certain conditions are met. One example is the large solar PV and hydro hybrid grid-connected power plant of the Philippine utility, CEPALCO. In this case, a GEF-financed contingent loan is providing funds for the costs of the PV systems; most importantly, the debt will be forgiven upon satisfactory completion of the project.

SUPPORTING PROJECT DEVELOPMENT COSTS

Up-front costs for project development can constitute up to 5 percent or more of the total capital needed for a project. To help with those up-front costs, including project preparation, the GEF Caribbean Renewable Energy Technical Assistance Facility (CRETAF) collaborates with the Caribbean Renewable Energy Fund, which is a GEF-sponsored loan facility. CRETAF, which will supply early-stage loans for preparing project proposals, is designed to mitigate the financial risks associated with early-stage development activities. The loans are contingently reimbursable, with repayment linked to financial closure. Public- or private-sector enterprises, plus not-for-profit institutions, such as schools, research institutes, or nongovernmental organizations, are eligible for CRETAF support.

HELPING BANKS UNDERSTAND RENEWABLES

One GEF project that uses partial guarantee facilities is the Hungary Energy Efficiency Cofinancing Program

(HEECP). While the main objective is to increase energy efficiency investments, this program has also developed a product line in biomass facilities, particularly for district heating. To facilitate commercial lending, the HEECP targets technical assistance to banks. It works with them to structure business deals, educates them on the special opportunities and risks of biomass investments, and provides partial risk guarantees that can serve as collateral for investment loans.

During its eight years, the HEECP has helped raise commercial funding for more than 40 investments. But its greatest effect has been in improving the capacity of banks to properly assess the risks of unusual types of energy projects. This enhanced risk assessment capability has increased the willingness of the financial sector to lend in the energy area. Currently, a follow-up program is providing such services in six countries in Eastern Europe, and further extensions are planned.

HEDGING AGAINST RESOURCE RISKS

Beyond the technology-neutral approaches, financing for renewables can help mitigate the risks that are specific to renewable energy projects. For geothermal plant development, the highest risk occurs when the first well is drilled, even if there has been surface-based geophysical exploration. GEF projects in Africa, the Caribbean, and Eastern Europe are developing financial mechanisms to insure investors against the geological and technical risks during development of geothermal projects.

COUNTRYWIDE INVESTMENT LENDING PROGRAMS

In many countries, financing for renewables is not available because the capital markets do not have sufficient liquidity and depth. A number of GEF projects provide loans to investors and users of renewable energy. Often, this funding triggers larger market development. For example, the GEF has given support to the Indian Renewable Energy Development Agency Limited (IREDA). IREDA then used the money to provide credit lines specifically for wind and solar PV projects. The financing was accompanied by technical assistance and promotional activities. According to independent assessments, without devoted credit lines and the accompanying promotional activities—together with a set of tax breaks—no commercial credit lines to finance renewable energy would have been created in the private banking sector.

LENDING TO FINANCIAL INTERMEDIARIES

On a much smaller scale—and with much more targeted support—GEF's Small and Medium Enterprise (SME) program has helped finance one of the prime examples of microfinancing for renewable energy, the Grameen Shakti Bank in Bangladesh. Grameen Shakti is one of a group of companies under Grameen Bank. Its PV solar program represents by far the largest business line for the company.

Through that program, Grameen Shakti sells PV home energy systems to consumers in remote and underdeveloped areas, particularly those who have a low probability of receiving grid power within the next five years. A GEF investment loan allowed the company to continue expanding its business and to lend to more consumers.

For the GEF, working with lending financial intermediaries is of growing importance. The SME program has now been restructured as the Environmental Business Finance Program, which focuses exclusively on the work with financial intermediaries.

MICROFINANCING FOR CONSUMERS

Access to financing for small businesses is important, but in many developing countries, consumers also need access to credit to buy the hardware for their energy supplies. With the GEF's support, the Uganda Photovoltaic Pilot Project for Rural Electrification was implemented by the Ugandan Ministry of Energy and Mineral Development from 1998 to 2003. Its main objective was to establish the foundation for sustainable markets for PV technology in areas that

would not be reached by the national electricity grid in the foreseeable future.

The project sought to establish a financial mechanism that could provide consumers with the needed access to loans so they could afford a solar home energy system. To achieve this goal, a renewable energy village bank model with six rural microfinance institutions was developed. Each of the village banks was given a revolving fund, which was used for loans to consumers to purchase PV systems. The loans had reduced interest rates of 18 percent (compared to 48 percent), a repayment period of two years, and a flexible repayment schedule that took into account seasonal variations in consumers' incomes. In this way, more than 510 PV systems were installed in six locales in one and a half years; during the same period, the costs of the systems were reduced by 15 percent. Default rates on the loans at five of the six banks were under 5 percent.

LESSONS LEARNED

- There is a tremendous need for financing to create renewable energy projects.
- The policy environment is a crucial factor in the decisions of investors to make financial commitments to renewable energy projects.
- Support of private investment, together with backing from credit guarantee facilities and favorable market conditions, is key to sustainable market build-up.
- Financial intermediaries need help in understanding the ramifications of lending for new technologies and applications.
- Numerous options for technological and financial risk mitigation are already available, but more options need to be developed in the future.

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