**IEA PVPS**

International Energy Agency

Implementing Agreement on Photovoltaic Power Systems

**Task 9**

Deployment of Photovoltaic Technologies: Co-operation with Developing Countries

**Report IEA PVPS T9-08:2004**

# Sources of Financing for PV-Based Rural Electrification in Developing Countries

**May 2004**

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# FOREWORD

The International Energy Agency (IEA), founded in November 1974, is an autonomous body within the framework of the Organisation for Economic Co-operation and Development (OECD) which carries out a comprehensive programme of energy co-operation among its 23 member countries. The European Commission also participates in the work of the Agency.

The IEA Photovoltaic Power Systems Programme (IEA PVPS) is one of the collaborative R&D agreements established within the IEA. Since 1993, its participants have been conducting a variety of joint projects in the applications of photovoltaic conversion of solar energy into electricity.

The overall programme is headed by an Executive Committee composed of one representative from each participating country, while the management of individual research projects (Tasks) is the responsibility of Operating Agents. Currently activities are underway in five Tasks.

The 21 members of IEA PVPS are: Australia (AUS), Austria (AUT), Canada (CAN), Denmark (DNK), European Commission, Finland (FIN), France (FRA), Germany (DEU), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Mexico (MEX), The Netherlands (NLD), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), the United Kingdom (GBR), and the United States (USA).

The objective of Task 9, which started in late 1999, is to increase the overall rate of successful deployment of PV systems in developing countries through increased co-operation and information exchange with developing countries and the bilateral and multilateral donors.

Thirteen countries[1] participate in the work of Task 9, which is an international collaboration of experts appointed by national governments and also includes representatives of the World Bank and United Nations Development Programme. Developing country representatives are invited to participate.

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in co-operation with experts of the following countries: Canada, Denmark, Finland, France, Germany, Italy, Japan, Sweden, Switzerland, the United Kingdom and the United States of America. The views expressed in this paper represent a consensus of opinion amongst the Task 9 experts.

This document provides an introduction to PV project financing, including funding sources available, strategies and planning needed to secure the necessary financial resources for the deployment of PV technologies in developing and transitional economies. It is part of a series of guides and other documents being published by the International Energy Agency's Photovoltaic Power Systems (IEA PVPS) Task 9 Experts Group. Other guides in the series are:

- Institutional Framework and Financial Instruments for PV Deployment in Developing Countries;

[1] Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States of America.

- Summary of Models for the Implementation of Photovoltaic Solar Home Systems in Developing Countries;
- PV for Rural Electrification in Developing Countries – A Guide to Capacity Building Requirements;
- Financing Mechanisms for Solar Home Systems in Developing Countries: The Role of Financing in the Dissemination Process;
- The Role of Quality Management, Hardware Quality and Accredited Training in PV Programmes in Developing Countries;
- PV for Rural Electrification in Developing Countries - Programme Design, Planning and Implementation;
- 16 Case Studies on the Deployment of Photovoltaic Technologies in Developing Countries.

In addition to the above Task 9 guides and documents, the IEA's PVPS Task 3: Use of photovoltaic power systems in stand-alone and island applications, also contributes important information for PV projects. The following two Task 3 documents are recommended to PV programme planners:

- Survey of PV Programmes and Applications in Developing Countries in 1996. Report IEA PVPS T3-03:1999;
- Managing the Quality of Stand-alone Photovoltaic Systems: Recommended Practices. Report IEA PVPS T3-15:2003.

## SCOPE AND OBJECTIVES

This document is intended as a guide for PV programme developers in developing countries, including public entities (host governments, bilateral institutions), private institutions (private developers) and non-governmental organisations.

This guide details:

- risk analysis and the barriers to financing;
- sources of financing including advantages and disadvantages of each source;
- considerations and variables that influence financing decisions; and
- the process for securing financing.

This guide will explore the various types of financing sources available to development project planners at both national and project levels. In addition, this guide will define the key variables that influence which types of financing and what combinations of financing will best fit particular projects. Finally, this guide will help project developers prepare to approach various sources to secure financing.

Although the focus of this guide is on PV technologies, much of the discussion will apply to other rural, decentralised energy systems and even to development work in general.

## KEYWORDS

Keywords: bank, bilateral, budget, Clean Development Mechanism, cost, developing countries, development, equity, finance, financial, financing, fund, funding, grant, loan, multilateral, photovoltaic, PV, renewable energy, solar

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| CDM | Clean Development Mechanism |
| DAC | Development Assistance Committee of the OECD |
| DRE | Decentralised Rural Electrification |
| EC | European Commission |
| ESCO | Energy Service Company |
| FPEI | Foreign Portfolio Equity Investment |
| FDI | Foreign Direct Investment |
| GEF | Global Environmental Facility |
| GNP | Gross National Product |
| GRIP | Guaranteed Recovery of Investment Principal |
| IEA | International Energy Agency |
| IFC | International Finance Corporation |
| IREDA | Indian Renewable Energy Development Agency |
| kWh | Kilowatt hour |
| MIGA | Multilateral Investment Guarantee Agency |
| MDB | Multilateral Development Bank |
| NBFCs | Non-Bank Finance Companies |
| NGO | Non Governmental Organisation |
| O&M | Operation and Maintenance |
| OBA | Output Based Aid |
| ODA | Official Development Assistance |
| OECD | Organisation for Economic Cooperation and Development |
| PV | Photovoltaic |
| PVMTI | Photovoltaic Market Transformation Initiative |
| PVPS | Photovoltaic Power Systems |
| RPG | Recommended Practice Guide |
| SHS | Solar Home System |

| | |
|---|---|
| SMEs | Small and medium size enterprises |
| UNEP | United Nations Environment Programme |
| UNDP | United Nations Development Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| W | Watt |
| WB | The World Bank Group |
| Wp | Peak Watts or Watts peak |

# SUMMARY

PV deployment programmes in developing countries require the procurement of capital resources in order to plan the programme, purchase, transport and install the equipment, and provide training and maintenance for its use. Where does this money come from?

This guide will explore various sources of financing accessible to programme developers engaged in off-grid rural electrification. Although this guide focuses on PV deployment, the concepts presented in this guide will generally be applicable to other decentralised electrification efforts and even to rural development efforts as a whole.

Financing is the process of securing funds via loans, grants, equity investment, or other instruments. Financiers in general are concerned with making a return on their investment and will finance projects that meet their fiscal, geographical and ethical guidelines. They will assess the risks related to individual projects and may demand security or guarantees to ensure the desired return on investment.

Financing for PV programmes at the national level principally comes from international development banks in the form of Official Development Assistance (ODA) or concessionary finance. Government ministers can procure large loans – and in some cases grants – from multilateral development banks and bilateral agencies. Private foundations can provide grants or soft-loans. "Green" market mechanisms like Certified Emissions Reductions produced through the Clean Development Mechanism, can further augment project funding. Finally, guarantees from development banks can play an important role in facilitating financing.

While international financing sources play an important role in capitalising development projects, significant funds are also available through developing countries themselves. Many countries have created funds earmarked for development, or even for rural electrification, by levying tariffs on grid electrification or by taxing other energy sources. Commercial banks and investment firms both at the national and international level are also willing to provide financing to development projects when the projects are structured to meet their requirements for return on investment.

Programme developers need to consider a number of variables as they plan their financing packages, often including financing from a mix of sources to maximise flexibility. Each type of financing source may have different requirements for ROI (return on investment) and different levels of flexibility for dealing with the length, uncertainties, and risks of a given programme.

Research is vital to understand the requirements, preferences and application processes of each potential financing source and to identify the correct contact point at each source. The application process will almost always include a series of conversations and the exchange of application forms, references, and other paperwork. The financing process will also require the programme developer to calculate the total costs of the project with reasonable accuracy. The development of a business plan might be required, including market analysis and even stakeholder evaluations, especially for commercial applications. A business plan further assists programme developers to thoroughly prepare to “sell” their project to financiers. Finally, programme developers need to realize that the application time frame can vary widely from source to source, taking as long as a couple of years with the large multilateral development banks and as little as several months with commercial sources.

Programme developers will benefit not only from thorough planning of their projects, but also from the consideration of financing options and variables in the earliest stages of the programme planning.

# 1. INTRODUCTION

Rural electrification in developing countries is always expensive, requiring a high capital investment accompanied by in-depth programme planning, the purchase and transportation of the equipment and system supplies, and the procurement or development of expertise to install, operate, and maintain the systems. In addition to the up-front capital and planning costs, decentralised electrical systems, including solar home systems and other photovoltaic (PV) and renewable energy technologies are usually expensive relative to the average individual income in developing countries. Securing financing is an essential step in extending decentralised electricity in developing countries, whether through the installation of photovoltaic (PV) systems or through other means.

A variety of financing sources are available to national governments and programme developers both at the international and national levels. This guide will define the key factors that determine which types of financing and what combinations of financing will best fit particular projects. This guide will also help project developers prepare to approach various financing sources to secure funding.

## *1.1 Programme versus Project Definition*

By way of clarification, the use of the term “programme” in this guide is generally meant to signify a national effort to extend electricity services, and may involve a variety of technologies beyond PV[2]. A programme takes a broader view than a “project,” which in this guide is used to mean the effort to install PV technology in a specific locality following a specified timetable. A project might be a subset of a national programme, and conversely, a programme is likely to be composed of several projects.

Single projects that are *not* linked to national programmes run the risk of accomplishing no sustainable benefit. For this reason, discussion of financing in this guide will generally focus on “programme” financing, though most of the time, the terms “programme” and “project” could be used interchangeably as far as financing is concerned. Individual project developers who read this guide are encouraged to ensure that their project is linked to broader national programmes.

## *1.2 About “Financing”*

"Financing" refers to the borrowed capital, in monetary form, that allows the continuance of long-term projects. Financing is procured from financial markets or institutions ranging from multilateral and bilateral banks to commercial lenders, to investors and co-operative associations. Financing instruments include grants, loans, equity investment, guarantees, and less conventional exchange mechanisms such as emission reduction certificates created by the Kyoto Protocol’s Clean Development Mechanism (CDM). Definitions of these instruments are found in Appendix III of this guide.

Financing for development programmes takes place on two levels. First, the governments of developing countries can apply to international financial organisations dedicated to providing development funding. This kind of financing, called “international concessionary financing,” is available mainly in the form of loans (though grants are sometimes made), which the developing country will then distribute internally to a variety of development projects. Other international funding organisations include foundations, which are typically private, non-profit organisations dedicated to providing grants or soft loans for development within their specialisation. Some

[2] An example of this is the Programme d'Action Sénégalais d'Electrification Rurale (PASER) in Senegal, which is a nationwide multi-year programme aiming to electrify the rural regions of the country through three main technology options: grid extension, diesel generators and renewable energy (including PV).

foundations are dedicated to solar home system installation, while others have a more general approach embracing renewable energy or sustainable development.

The second financing level is the national or commercial level. Many national governments have established funds earmarked for development or electrification work. They build these funds through taxes on conventional energy sources or on grid electrification. Commercial banks can also be a source for loans when the programme or project meets their return-on-investment (ROI) guidelines. Small local banks can be particularly helpful in funding local development or facilitating end-user financing for local projects. Large international banks rival the international concessionary scene in size and can be an important source of financing for programmes or projects that meet their guidelines.

Individual projects, which might be managed by government ministers, non-governmental organisations (NGOs), co-operatives, or even private contractors, often have more access to financing at the national or commercial level than at the international concessionary level, though they can link to international concessionary financing through cooperation with national programmes.

### *1.3 How to Use this Guide*

Those individuals who create or lead programmes for the deployment of rural electrification technologies can refer to this guide to identify potential sources of financing and plan a financing mix to meet the needs of their particular programme or project.

Programme developers should first understand the different types of financing sources and the instruments (loans, grants, guarantees, etc.) they offer. As programme developers complete the planning process, they need to keep in mind the interaction of the programme variables (like length of programme, number of partners, location, political conditions, etc.) with financing options. Programme developers need to carefully assess the risk factors that are associated with the programme. Finally, programme developers should understand the basic process of applying for financing. Incorporating risk mitigation, security, and return-on-investment considerations into the programme planning process and anticipating interaction with various financing sources from the beginning of the programme will help developers achieve success.

Some initial advice in preparing to secure financing:

1) Financing sources should be considered early in the programme planning process. Be aware of potential sources and how the variables of the project will affect the financing requirements.

2) Make a first contact with potential sources of financing as early as possible.

3) The programme planning and development stage should include the consideration of risk mitigation and the development of answers to the questions that potential financiers are likely to ask.

4) Finally, understand that arranging programme financing takes time, effort, and money to begin with, and that loans for programme financing have additional costs in the form of interest and fees charged. Plan for the costs of financing in the overall costs of the project.

Each of the main categories of financing will be described in greater detail in this guide, including official development aid from international sources, national funding, and commercial funding. No one category of financing is necessarily more important than another: the individual constraints of each programme or project will determine from which sources financing can best be accrued. There is a tendency to rely heavily on financing from the large multilateral and

bilateral agencies, however this is not necessarily appropriate, as 80% of development financing actually comes from within developing countries themselves[3]. One study sponsored by the GEF and UNDP listed local governments as the first source of financing for renewable energy development projects. The national, provincial, district or county government can all be potential sources of financing and should be considered. In addition, the village or community government should provide some level of support (financial and/or infrastructural), and end-users should be engaged in paying for the project. The GEF report then listed local micro-enterprises, the local utility, private project developers, or other social organisations (NGOs, co-operatives) as potential financing sources, only listing international financiers or donors at the end of the list[4].

As programme developers begin to plan their financing mix, they should keep these options in mind, working with all levels of local and national government, enterprise, non-profits and NGOs, and even the local utility to create a financing mix that will allow flexibility and will work with the business plan to bring sustainable distributed electricity to villages in the developing world.

# 2. BASIC FINANCING CONCEPTS

Before looking at the different sources of development financing, programme developers should understand the basic rules of the financing process. Overall, financial institutions will be creating a package that includes the total finance amount and: a) the repayment terms, b) the interest rate, c) the repayment schedule, d) any guarantees or securities. Organisations that provide financing are concerned with three core conditions: the risk inherent in making a loan or providing funding, the security that will offset risks undertaken, and finally, the return expected on their investment.

## *2.1 Risk Assessment*

Risk is determined based on probable outcomes at the project level and at the national and international political and economic levels. There are a variety of situations that might bring a PV development project to the risk of default (failure of the borrower to provide the expected return). These risks include business risk, country risk, market risk, money, or interest rate risk, project risk, and foreign exchange risk[5]. For example, business risk includes the risks incurred in operating a business: raw material costs, sales volumes, and prices may fluctuate, affected by demand disruption, strikes, natural disasters, etc. Country risk includes the risk of regional economic recession, national economic mismanagement, and political unrest. Foreign exchange risk includes the possibility that exchange rates may fluctuate during the course of the loan. More or less risk will be inherent in a given project or programme depending on how the project or programme is designed, e.g. its dependence on imported equipment, its business model, time frame, location, etc.

Different categories of risk may be closely related, and a fluctuation or change in any one area can dramatically affect the financial outcome of a programme, hence the importance of awareness in the programme planning phase. Programme developers should assess risk by asking themselves: What will happen if any of these possibilities occur? How will it affect this programme? Are natural disasters a possibility in the programme area? What would happen if one occurred during the programme? Is the host economy stable? What would happen if political change occurred during the programme?

[3] *Finance for the Developing Countries*. Richard Kitchen, 1986.
[4] *China Village Power Project Development Guidebook*, August 2002.
[5] *Finance for the Developing Countries,* by Richard Kitchen, 1986.

The likelihood of a risk-event occurring is also a key variable in assessing its importance. It is possible, for example, to anticipate the rough probability of a hurricane or earthquake striking a given region within a programme's timeframe. It may be more difficult to anticipate market fluctuations or foreign exchange devaluations. This is principally achieved by examining similar programmes in similar countries that have already been completed. If no similar projects are available for comparison, financiers will consider the risk to be "uncertain." Many commercial financiers are unwilling to loan to projects with "uncertain" risk. If they do agree to make a loan, they may assess higher interest rates to cover themselves in what they perceive to be a higher risk situation, or they may demand guarantees from international development financiers.

## *2.2 Security and Risk Mitigation*

Risk can be mitigated in two ways: first, by planning the programme and arranging financing in such a way that risk is minimised, or second, by taking a security or guarantee[6]. In the first method, the programme factors that relate to risk might be adjusted. If a national economy is unstable over time, for example, programme planners might structure the programme so that it is completed within one economic cycle. Understanding the risks involved in a programme can lead planners to incorporate a time-frame, involve political players, or otherwise adjust the programme plan to prepare for eventualities that might disrupt the programme.

To a certain degree, arranging the variables of a programme to fit the strengths and weaknesses of the financing options is not always possible. A programme will take a given amount of time and involve a given number of risks no matter how carefully planned and managed. This is why the provision of financial securities and guarantees can be particularly important. A security generally mitigates risk by providing some kind of asset behind the loan. For example, a project might provide its current assets as security. Then, if the loan is not paid, the assets can be seized by the lender. In the case of PV projects, if no acceptable assets are present, a guarantee might be required instead of a security. Guarantees are a specific form of security which depend on the promise of a powerful and well-funded organisation to pick up the loan should default occur. For example, the Multilateral Investment Guarantee Association (MIGA) was formed by the World Bank specifically to provide guarantees to development work.

## *2.3 Returns*

Returns are the reason that commercial financial organisations exist. Returns are also key to the health of foundations and development banks, including multilateral and bilateral institutions. They are willing to lend or invest money, after assessing the risks, because they expect to make a profit - a return on investment (ROI) or a return on equity (ROE). The return is generally earned in the form of interest (in the case of loans) and dividends (in the case of equity investment). The higher the perceived risk of a programme or project, the higher the required return in order to attract investors to it. Therefore, in seeking project financing, project developers need to calculate in advance the risk that financial institutions will associate with their project, and then be prepared to mitigate that risk through security, guarantees, and an appropriate rate of return.

## *2.4 Barriers to Financing*

PV programme designers are likely to encounter some very specific barriers to arranging financing. First, securing financing from large multilateral and bilateral development banks can be a lengthy and complicated process. Access to the large development funders is also often restricted to national government representatives or to projects with national governments as partners. In addition, most development funders will have sets of guidelines and requirements

[6] *Finance for the Developing Countries*, by Richard Kitchen, 1986.

that must be met in order to receiving financing. These can include partnerships with other organisations, location in a specific region, or use of a specific technology. These requirements can change from year to year, meaning that programme planners must be flexible and stay informed of the requirements and processes set out by the development lenders.

Second, lenders tend to avoid projects if they believe the technology is unproven or that the market for PV has not been established. While multilateral and bilateral development banks and development foundations will be more tolerant of emerging technologies, commercial lending and investment organisations are especially likely to perceive PV development programmes as "high-risk" because of their unfamiliarity with the technology or lack of experience with development situations. This is exacerbated by the fact that financial institutions have difficulty finding well-informed advice about PV system financing[7].

Another barrier to project financing is the size of the financing package requested. Lenders are most interested in making large loans to well-established companies providing predictably profitable services. PV programme funding requirements are often relatively low, especially by the standards of commercial lending and investment organisations. A small loan requires just as much administrative effort as a large loan and therefore has proportionally higher costs per amount of return[8]. To respond this concern, programme developers need to be prepared to demonstrate the profitability as well as the non-financial merits of the project, in other words they need to be able to "sell" their project.

Finally, PV programme developers must compete for limited funds against a field of other important rural development projects[9]. Development financiers have political agendas and technological preferences around which PV programme developers will have to work. Subjective considerations are sometimes enumerated directly in the financial organisation's purpose statement, but sometimes they are harder to ascertain. Familiarity with potential funding sources and early conversations with them are the best ways to navigate these sometimes unpredictable barriers to obtaining financing.

# 3. AVAILABLE FINANCING: OVERVIEW OF SOURCES

Financing for decentralised energy development projects comes in three principal categories: international concessionary financing, national development financing, and commercial financing. Depending on whether the organisation seeking financing is a public entity (host governments or bilateral agencies) or a private institution (private developers, non-government organisations), it will have access to different financial sources. As noted above, many large development funding organisations limit access to national government representatives or to projects partnered with national governments.

## *3.1 International Concessionary Financing*

Funding to host governments is available through international sources like multilateral development banks (MDBs) maintained by international development organisations, through bilateral agencies, through private funds and foundations, and through green investment mechanisms. International concessionary financing is most often arranged in the form of loans, but some grants are also made. Loans from international development agencies might be made

[7] *Financing Solar Energy in India.* European Commission, 2000.
[8] *Financing Solar Energy in India.* European Commission, 2000.
[9] Sometimes PV projects can be integrated into multi-sector programmes, such as rural health and education programmes. When this can be done, the programme can appeal to a wider variety of financing organisations and can present a higher loan-level.

at commercial rates, or at subsidised or "soft" rates[10]. The large development banks also offer guarantees to mitigate the risk of the project and facilitate other forms of financing (such as loans from commercial sources). Funding through multilateral development banks and bilateral development banks is called Official Development Assistance (ODA).

### *3.2 National Development Financing*

The national governments of nearly every developing country have funds dedicated to development issues. In fact, 80% of total development investment comes from domestic finance accounts, with the other 20% coming from international and other financial sources[11]. At the national level, there are also non-governmental organisations and co-operatives, which while they may or may not have the ability to finance a programme can contribute to its framework and infrastructural aspects, reducing overall costs that need to be financed.

### *3.3 Commercial Financing*

Commercial financing is available through institutions at both the national and international levels. Commercial lenders are generally more reluctant to invest in unfamiliar technologies in risky development circumstances than are Official Development Assistance (ODA) sources. However, commercial sources control huge financial resources, and if a solid business plan and predictable rate of return can be presented, commercial sources can prove to be important funding sources.

Table 1 lists the basic sources from which PV programme developers might seek financing, and the financing instruments that each generally provides. Further information on these sources follows.

**Table 1: Matrix of Financing Instruments**

| | Market-based Loans | Soft Loans | Grants | Equity investments | Guarantees | Technical Assistance | Other |
|---|---|---|---|---|---|---|---|
| Multilateral Development Banks | X | X | Some | Some | X | X | |
| Bilateral Aid | X | X | Some | | | X | |
| Funds / Foundations | X | X | X | Some | | | |
| Green Investment | | | | X | | | X |
| National Development Funds | X | X | | | X | X | |
| Commercial Loans & Investment | X | | | X | | | |

[10] The World Bank website states: "Together these organisations (IBRD and IDA) provide low-interest loans, interest-free credit, and grants to developing countries."

[11] *Finance for the Developing Countries*. Richard Kitchen, 1986.

# 4. INTERNATIONAL CONCESSIONARY FINANCE

International concessionary finance (funding for development) falls into two broad categories: official development assistance (ODA) and alternative international financing. ODA is provided through the donations of developed countries and is earmarked specifically for assisting less-developed nations to improve their economies and standards of living. Large international co-operatives like the United Nations (UN) and the World Bank Group (WB) are major sources of ODA. In addition, most developed countries have internal funds through which they provide their own development financing, called bilateral aid.

Several general rules apply to ODA:

1) Multilateral and bilateral development banks principally provide funding in the form of loans, though some grant money is also available.

2) ODA will usually fund only a certain percentage of the total costs of a programme and will require the participation of the host government in financing the project as well.

3) Most ODA is accessible only to the national governments of developing countries and may not be directly accessible to individual project planners.

4) "Guarantees", while not outright financing, are important financial securities that can be arranged through some of the international development banks in order to mitigate the risks inherent in development financing (this can be especially important in securing funding from commercial sources).

Alternative international financing beyond ODA includes financing through foundations or private development funds. Foundations allocate financing that originates from private sources: an example is Royal Dutch/Shell Group's "Shell Foundation". Alternative international financing also includes "green" investment mechanisms, such as tradable certificates for $CO_2$ emissions. These are market-based efforts to externalise the environmental benefits of renewable energy and solar electrification. The various sources of international concessionary financing are explored in greater detail below.

## *4.1 Multilateral Development Banks*

International financial organisations founded by the cooperation of several developed countries specifically to fund development projects are called multilateral development banks (MDBs). Member nations pay into the common development fund in order to provide high levels of development financing. MDBs' major goals are to combat poverty, improve water and food supplies, improve access to electricity, provide education opportunities, develop infrastructure, develop job opportunities, and improve the standard of living. MDBs are likely to aim their financing at the development of infrastructure components such as providing training (capacity building), regional PV marketing, and small business development that will help the programme achieve "sustainability" - i.e. working PV systems providing electricity to the recipients for years to come.

MDB financing is principally made in the form of large loans to the national governments of developing countries[12]. The interest rates on these loans will often be at below-market levels with grace periods ranging from 3 to 10 years (during which no interest accrues). An example of an MDB is the Global Environment Facility (GEF). PV electrification is not a *direct* goal under GEF project areas, but can fit into the "Climate Change Mitigation" category. In addition to

[12] MDBs rarely accept proposals from private project developers, though the International Finance Corporation (IFC) of the World Bank is an exception to this and focuses on providing financing to private-sector developers.

meeting a specific environmental goal, projects must meet several clear guidelines to be considered for GEF funding, including: 1) reflecting national or regional priorities and demonstrating the support of the country or countries involved, and 2) improving the global environment or advancing the prospect of reducing risks to it. In addition, host countries need to have ratified any relevant international treaties (such as the UNFCCC) and must be eligible to borrow from the World Bank or receive technical assistance grants from UNDP.

The World Bank Group has three MDB subsidiaries. One, the International Bank for Reconstruction and Development (IBRD), provides loans to developing countries at more favourable terms than would be available from commercial lending organisations. For example, the loan terms for IBRD loans generally include 15-20 year repayment periods with 3-5 year grace periods during which no interest is charged. In 2002, IBRD provided loans totalling 11.5 USD billion in support of 96 projects in 40 countries[13]. Another component of the World Bank Group, the International Development Association (IDA), supports the reduction of poverty worldwide through loans, guarantees, and non-lending services, including analytical, policy, and advisory services. The International Finance Corporation (IFC) is a member of the World Bank Group that provides loans, equity finance and quasi-equity to private-sector projects in developing countries. It also offers financial risk management products and intermediary finance.

For large decentralised electricity projects or PV programmes that will take place over a year or more, even several years, MDB funding is valuable because of its subsidised interest rates, grace periods, and high financing levels. In addition, MDBs field a high percentage of the development funds currently available to national governments. They have the leverage and the experience to finance development programmes that commercial banks and other investment organisations may be reluctant to consider. For all of these reasons, MDB financing is a good main source for programmes run by national governments.

**MDB Financing Example: Global Environment Facility and Others**

The (Global Environmental Facility) (GEF) has partnered with the International Finance Corporation (IFC) to develop a PV-specific fund called the Photovoltaic Market Transformation Initiative (PVMTI). PVMTI offers technical assistance and initial capital to groups that will install PV systems in the target countries of India, Morocco, and Kenya. The IFC is conducting other, similar initiatives, and similar projects are implemented through the World Bank and UNDP and bilateral loans and grants.

*Source: The Photovoltaic Market Transformation Initiative, IEA PVPS Task 9 Case Study, September 2003*

In 1993, partially financed by UNDP, a GEF project started in Zimbabwe, under which a total of 9 000 SHS systems of 45 Wp were to be installed in five years. The intended results of the project were to prepare a rural electrification programme that allowed the participation of the households with lower incomes. The fee per PV system in the rural electrification programme was fixed according to the results of a village social-economic survey at 750 ZWD with monthly payments of 75 ZWD, (12 ZWD = 1 USD). The GEF project set up a scheme to facilitate the purchase of PV systems by potential users by the use of a revolving fund which allows purchase by 2 to 3 instalments per year at 15% interest, compared with the high market rate interest in Zimbabwe of 35-40%.

*Source: Deployment of PV in Zimbabwe, IEA PVPS Task 9 Case Study, September 2003*

However, MDB funding has some drawbacks as well. One key factor that government ministers and programme developers should take into account is the long bureaucratic process required to secure the funds in the first place. MDB applications typically have to be reviewed and approved by many different bodies within the organisation. The application process can require documentation totalling up to 100 pages in length, and the work to write or compile these massive documents is not usually covered by funding[14]. Furthermore, the time-frame for MDB applications can be anywhere between two to five years. Thus applicants must have the

[13] *Finance for the Developing Countries*. Richard Kitchen, 1986.

[14] One exception to this is the GEF, where application can be made for funding to cover project document preparation costs.

financial means to support a long project gestation period, which will include compilation of information, application writing, and exchanges with the MDB *prior* to receiving any funding.

A final factor for government ministers and programme developers to consider is that multi-year project funding through MDBs usually comes with a requirement for regular project reporting during the whole length of the project. This can be time consuming and can also divert much needed funds into report-writing activities. However, regular reporting can also be an advantage as the project is monitored throughout to make sure funds are being spent correctly and that the project is progressing on schedule. The reports also document valuable lessons-learned and provide a basis upon which to secure financing for future projects.

Regardless of the benefits and challenges of MDB funding, national governments seeking to carry out PV projects should expect to combine MDB financing with other resources, including their own national funds raised through taxes or energy tariffs, and co-operation with local financial organisations.

### *4.2 Regional MDBs*

In addition to international MDBs like the WB and the GEF, there are regional and national development banks. Regional MDBs receive funding from member countries, usually key developed countries in the region as well as participating developing countries. Regional MDBs include the European Bank for Reconstruction and Development (EBRD), African Development Bank (AfDB), Asian Development Bank (ADB), Inter-American Development Bank (IADB), and Islamic Development Bank (IDB). Several sub-regional development banks also exist, set up by cooperation between several countries in a region to finance their mutual development. The East Africa Development Bank (EADB), set up by Kenya, Tanzania, and Uganda, is an example[15]. Another is the Caribbean Development Bank, which began operations in 1970 with eighteen members and 25 million USD in capital subscriptions[16].

Private regional development banks also exist, for example the Atlantic Development Group for Latin America (ADELA). This is an international private joint venture (with about 230 shareholder banks or companies) that provides development funding to Latin American countries. The Private Investment Company of Asia (PICA) is another example of a private regional development bank. Financed by shareholders, PICA focuses on the development of private sector companies in developing countries in Asia.

**Regional MDB Financing Example: The Asian Development Bank**

In 1997 a loan was granted from the Asia Development Bank (ADB) to Bhutan to provide opportunities for cash-generating business, job creation, adequate education, and health services to rural people in Bhutan through electrification by hydropower and solar panels. The PV component of the project included PV electrification for schools, hospitals, and other local community facilities in remote rural areas.

*Source: www.adb.org/documents/profiles, Bhutan, Sustainable Rural Electrification, ref. BHU 29242-01*

An ADB-funded technical assistance project was begun in Mongolia in 2003 with the aim of providing technical assistance for renewable energy development in small towns and rural areas. The project will set up a pilot off-grid renewable energy hybrid system (PV-diesel) in a remote village (Soum Centre), providing capacity building to the stakeholders as well as a relevant policy framework to support renewable energy technology in Mongolia.

*Source: IT Power, UK, 2003*

[15] *Development Banking and Finance*. Victor Murinde, 1996 (p.211).
[16] *The Caribbean Development Bank*. Chandra Hardy, 1995.

The European Commission (EC) operates in much the same way as a regional MDB by collecting funds from member countries to be used for the reduction of poverty worldwide. Although PV programmes would not receive direct funding through the EC, three Directorates-General (DG) within the EC have missions to facilitate capacity building and training activities, which can be very important for the success of a PV project[17]. These include Transport and Energy (DGTren), Environment (DGEnvironment) and Development and Poverty Alleviation (DGDev).

The EC channels its development financing through the EuropeAid Co-operation Office, the mission of which is to implement the external aid instruments of the European Commission. EuropeAid is funded by the European Community budget and the European Development Fund and provides external aid through either contracts to provide services, supplies or works to beneficiary countries, or through grants to non-profit organisations. EuropeAid releases calls for proposals to which programme planners can apply for funding[18]. The European Investment Bank (EIB) then implements the financial component of agreements concluded under European development aid and co-operation policies[19].

**Financing from the European Commission**

In 1985, the European Commission (EC) provided a grant for 170 PV units (84 Wp) for a project in Tuvalu. In a second phase of the project, another 175 systems were installed from 1993 to 1994.

*Source: Solar Energy: Lessons from the Pacific Island Experience, World Bank Technical Paper 244, May 1994*

**Asia Pro Eco Programme**

Asia Pro Eco is a five-year European Union initiative launched in 2002 with an EC contribution of 31.5 million Euros (the total budget is 82.3 million Euros). The main objective of Asia Pro Eco is to facilitate the adoption of policies, technologies and practices that promote cleaner, more resource-efficient, sustainable solutions to environmental problems in Asia.

*Source: http://europa.eu.int/comm/europeaid/projects/asia-pro-eco/faq_en.htm*

### *4.3 Bilateral Agencies*

Most developed countries have a branch of government or a semi-governmental division that has as its specific mandate to provide funding for development following the current administration's agenda. For example, in the U.K. the Department for International Development (DFID) provides development aid; in the U.S., it is the U.S. Agency for International Development (USAID); in Japan it is Japan International Cooperation Agency (JICA), in Germany, the Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ) and the Gesellschaft für Technische Zusammenarbeit (GTZ) fulfil this purpose; and in Australia it is the Australian Agency for International Development (AusAID). This is not an exhaustive list: nearly every developed country carries some kind of bilateral development aid.

The goals of bilateral lending agencies are determined by the legislation and administrations within each country. Some bilateral agencies have closer links with certain developing countries or regions for historical reasons, for example, France's connection with West African nations and therefore development aid may sometimes be directed to specific geographic regions. Efforts by bilateral lending agencies are usually closely partnered with local organisations, including NGOs, stakeholder groups, and national financing departments. Besides providing direct funding, bilateral institutions have been active in providing training for PV system

[17] PV for Rural Electrification in Developing Countries – A Guide to Capacity Building Requirements, IEA PVPS Task 9, 2003.
[18] http://europa.eu.int/comm/europeaid/index_en.htm
[19] http://www.eib.eu.int/about/

installers, project staff for designing and administering PV programmes and PV equipment for demonstration projects.

In addition to providing funding through their own national funds, the major developed nations also coordinate their development financing through the Organisation for Economic Co-Operation and Development (OECD), which provides its member nations with a forum called the Development Assistance Committee (DAC). The goal of the DAC is to increase the effectiveness of the sustainable development work of OECD member nations. The DAC has produced the following guidelines for awarding development funding, applicable for most bilateral agencies:

- First, projects should be relevant to the priorities and policies of the target group, recipient, and donor.
- Second, projects should effectively achieve the objectives they were designed to achieve.
- Third, projects should be designed in such a way as to create clear benefits in proportion with the resources needed to carry out the project. This generally requires comparing alternative approaches to achieving the same outputs, to see whether the most efficient process has been adopted.
- Fourth, projects should evaluate both the intended and potential unintended consequences of the project and the sustainability of the project's benefits.

**Example of Bilateral Financing: KfW**

The Kreditanstalt für Wiederaufbau (KfW), the German bank for reconstruction, has extended a 60 million Euro loan to India's IREDA including a 15 million Euro allocation for PV. In addition, the State of Bavaria financed a 500-unit electrification project in the South African village of Folovhodwe.

*Source: "Financing PV Growth," Michael Eckhart et al; 2001*

In addition to coordinating development efforts through the DAC, the OECD Technical Assistance Committee (TAC) contributes to development projects by providing logistical and technical support.

Bilateral financing, like funding through MDBs, is generally open only to the national governments of developing countries. Its advantages are similar to MDB advantages: a large pool of financing resources is available to developing countries through bilateral donor funds, and financing through bilateral agencies often has more flexible terms than commercial loans. Bilateral agencies, like MDBs, are more open to innovative and/or unproven technology and the risks associated with development work, than are commercial financiers.

Bilateral financing also has a few disadvantages. First, because of its political dependence on the government of a single developed country, bilateral financing imposes more geographical restrictions on project eligibility than does MDB financing. Bilateral agencies may, for example, require that projects take place in specific developing countries or regions favoured by the current administration's policy. Or they may require that equipment suppliers or project managers be based in their own home country. These restrictions vary from agency to agency, which leads to a further difficulty for programme developers: that of finding a bilateral agency to which their project will be eligible not just from a "topic area" stand point, but also with regard to the particular geographical criteria of that agency. This kind of search can be time consuming if the searcher is not familiar with the nature of bilateral agencies.

Another potential shortfall of bilateral financing is that it tends to have short project time restrictions. While MDB financing favours longer-term projects (5 to 10 years), bilateral financing favours projects with time-spans of just 2 to 3 years. This limits the time to set up a long-term sustainable structure to carry on the project after its initially funded phase. Furthermore, once the project is finished, there may not be any further funds available. When follow-up funding is available, it may be restricted by guidelines that do not respond to the needs of the country

where the project was originally implemented. This situation can prove disruptive of capacity-building and micro-economic development enterprises. Fortunately, many bilateral aid agencies have recognized this limitation and are now encouraging project planners to propose solutions to it. The sustainability of a project beyond the end of the financing is becoming a major factor in the evaluation of project proposals.

In addition, bilateral agency financing shares two key characteristics with financing from multilateral sources. First, a considerable amount of paperwork and a long gestation period may be needed to secure bilateral funds. A gestation period of up to two years is not impossible, although each agency will have different procedures and time-scales. Second, bilateral aid usually carries regular reporting requirements, that have costs and benefits as described in the section on MDBs above.

### *4.4 Funds, Foundations and Charities*

Foundations, charities, and private funds set up to sponsor development projects often provide capital in the form of grants or soft loans. Funding from these sources is usually linked to a specific purpose and is given in the form of a "one-off" payment to provision the hardware or some single part of a larger programme. After the initial grant or soft loan, no further funding is usually offered, relegating foundation and charity funding to a limited role in the overall financial package. Low financing limits and short funding time-frames force project planners to supplement their foundation financing with funds from other sources.

An advantage of working with private agencies is that they have a quicker response time than MDBs and bilateral agencies, and working with them does not require as much paperwork. Foundations and charities do usually require regular update reports in much the same way MDB financing does. This can help ensure that the project keeps to its schedule and meets its objectives, but it does take time and resources away from the project itself.

An example of a foundation which could be a source of financing for PV development work is the United Nations Foundation (UNF), which has fund categories for climate change mitigation and environmental work, both of which can encompass PV projects. Another notable foundation is E&Co. E&Co was established in 1994 as an independent non-profit organisation with the strategy of providing enterprise development services and modest amounts of money (up to 250 000 USD in the form of loans and equity investments) to economically, socially and environmentally sustainable energy enterprises in developing countries.

**Foundation Example: E&Co**

In the Dominican Republic, an estimated 80% of the rural population cannot afford to purchase or short-term finance PV solar home systems. In 1994, Soluz Dominicana was established to provide a leasing/rental approach for these unserved people. E&Co allowed the expansion of the Soluz Dominicana project with a 75 000 USD equity investment (combined with a 75 000 USD loan).

*Source: E&Co Progress Report, 1998.*

There are a number of other funds that PV project planners can look to for funding assistance. Two examples are the GEF Small Grants Programme (implemented by the United Nations Development Programme) and the Shell Foundation.

An important final note is that although foundations often give money in the form of grants with no repayment requirement, this does not mean project planners should give PV equipment and installations away for free. End-user participation in the cost of PV ownership is essential to fostering a long-term appreciation for the equipment and its use and maintenance.

Development work is also sometimes offered donations of equipment or other resources. Programme developers should be very cautious in accepting donations, and should never use donations to justify the creation of a programme that does not have the support of local end-

users, but should always design their programmes to pay their own way and create a sustainable system of decentralised electrical systems.

**GEF Small Grants Programme (SGP)**

The GEF Small Grants Programme provided grants of 50 000 USD each to three local NGOs in the Dominican Republic to establish a micro-credit scheme for people in remote rural areas to equip their households, schools, health centres and irrigation schemes with solar energy. Twenty-five men and women trained in photovoltaic technology have started 14 new businesses and sold and installed 4300 systems, providing reliable and affordable electricity. These systems replace kerosene consumption, reduce greenhouse gas emissions and produce savings that have enabled people to repay the initial credit. Agricultural production has improved with the installation of solar-powered pumps for irrigation, and computers installed in schools have expanded learning opportunities for local children.

*Source: Hands-on Action for Sustainable Development, 1992-2002, The GEF Small Grants Programme, UNDP, UNOPS, GEF*

The IEA PVPS Task 9 Guides *Institutional and Financial Infrastructure Framework for PV Deployment in Developing Countries* and *Summary of Models for the Implementation of Solar Home Systems in Developing Countries* provide a more complete discussion of arranging financing terms and the involvement of end-users.

# 5. NATIONAL AND COMMERCIAL FINANCING

Beyond international concessionary finance (through official development assistance and through alternative funding mechanisms), programme developers and project planners can access funding at the national and commercial levels. National governments that have received ODA from large multilateral or bilateral development banks allocate these funds in turn directly to specific projects. In addition, most developing countries have created development funds of their own through taxes or tariffs. They apply these funds toward rural electrification projects within their own borders. Beyond traditional financing, national governments can also provide incentives to offset the cost of development projects, such as tax and customs exemptions on equipment, VAT exemption on bills, etc.

Commercial sources are sometimes also interested in financing electrification projects through loans and equity investment. Commercial sources include banks, both those located in the project host country and international banks, as well as investment co-operatives and international insurance agencies with an investment arm.

## *5.1 National Development Funds*

Besides funding from OECD member countries and bilateral agencies, many developing countries have created funds for rural electrification projects of their own. They may raise funds through special tariffs on existing electricity customers, by placing a surcharge on energy services, or by earmarking a specific portion of the national budget to the fund. Ecuador, Mozambique, Kenya, Madagascar, Senegal, Argentina, Mexico and Zimbabwe are just a few of the countries that operate national fund programmes for rural electrification. Such funds are an important source of financing support for PV projects: 80% of development financing is done on a domestic level[20]. Depending on the constraints of the national programme, project-level developers may be able to receive loans or grants through the national development banks to offset project costs.

[20] *Finance for The Developing Countries*. Richard Kitchen, 1986.

National development funds are essential sources of financing for development programmes because ODA often requires some kind of co-financing from the government of the host country where the project is to take place. In addition, a national political commitment to rural electrification makes projects more interesting to commercial financiers. However, like financing from bilateral agencies, national funds can become the victim of political change or economic fluctuation, and there is a danger of the funds being abruptly terminated. This could have a devastating effect on PV projects that rely too extensively on national funding sources[21]. In addition, national development banks may restrict loan terms, making it difficult for long-term projects to be carried out with continuity.

**National Resource Example: Morocco's PERG**

In August 1995, Morocco's Office National d'Electricité (ONE) launched a national programme called the Global Rural Electrification Programme (PERG). It is PERG's ambition to boost the rate of rural electrification from close to 20% in 1995 to 80% by 2006, which means bringing electricity to more than 1,500,000 households in a little over ten years. This massive electrification can be achieved only by grid connection in the vast majority of cases, however, part of the project implementation also considers SHS and PV mini-grids for isolated villages.

*Source: Summary of 16 Case Studies of PV Deployment in Developing Countries, IEA PVPS Task 9, September 2003*

## *5.2 Government Incentives*

Beyond national electrification funds, local government policies can also provide a significant reduction or refund to the cost of a PV project. Some governments provide end-users with tax rebates on the cost of PV equipment, for example, which reduces the overall cost of the project and facilitates end-user involvement. Some governments waive import duties or may have other policies in place which decrease or offset the cost of carrying out a PV project in that country.

Project planners should research the following potential fiscal policies in the project host country, factoring the existence or lack of these policies into the cost of the project.

*Subsidies* – Subsidies can take two main forms. First, local governments may refund a portion of the cost of a PV system to end-users or to project developers. Second, local governments may provide a direct grant to PV system companies to assist them to market, sell, and maintain PV systems.

**Multilateral Subsidy Funding in China**

The Chinese government, with WB help, provides direct grants to small PV companies to aid in marketing, sales and maintenance of 10 MWp of PV systems, an estimated 300 000 to 400 000 systems, in western China. Specifically, companies receive a grant of 1,50 USD per Wp of PV capacity for systems with a capacity of 10 Wp or greater.

**Tax Breaks in Senegal**

Senegal established a law in 1993 that certain PV equipment would be exempt from value added tax and import duty. This included a solar PV "lighting kit" (18 Wp maximum), solar lamps, solar PV "pumping kit" and PV modules.

*Source: Best Practice Manual, UNDP/ESMAP, 2001*

*Tax breaks* – Tax breaks can provide end-users with relief when purchasing PV equipment by removing taxes on the purchase, or can provide projects with relief in procuring supplies or equipment.

*Import Duty Relief* – When the local government waives import duties on the imported components of a PV system, this can represent a significant financial savings for a PV project.

Government fiscal policies such as subsidies and tax and duty relief can help get a project started, or can direct interest to countries and/or regions where PV would otherwise be difficult to implement. However, problems arise when, due to a change in government or economic conditions, these tax breaks, import duty waivers, or subsidies are suddenly withdrawn.

[21] *Best practice manual,* UNDP/ESMAP, October 2001.

On-going programmes without adequate provisions to mitigate the effect of government fiscal policy change might suddenly find their equipment costs increasing to an unmanageable level, or may find that end-users can no longer afford to buy the planned PV systems. Either situation can endanger the sustainability of the project if subsidies have created a "false market". Also, while subsidies might help establish a market where one could not exist before, their introduction into existing markets can damage them by creating unsustainable market demands.

**National Resource Example: India's IREDA**

The Indian government is extremely supportive of renewable energy projects through its Indian Renewable Energy Development Agency (IREDA). IREDA's stated mission is to be a pioneering and competitive institution for sustainable development, promoting and financing self-sustaining investment in renewable energy and energy efficiency. By 1995, IREDA had been involved in installing 825 kWp of PV power units, along with 954 PV community lights, TV and community facilities; 85 000 PV domestic lighting units; 32 872 PV street lights; and 1 373 PV water pumps. IREDA provides funding to support renewable energy projects at a maximum rate of 80% of the project cost or 90% of the equipment cost, offering a maximum ten-year repayment plan.

*Source: IREDA materials online, see http://solstice.crest.org/renewables/ireda/*

For more detail on finance institutions and financing for SHS please refer to the three IEA PVPS Task 9 RPGs on these subjects: *Financing Mechanisms for Solar Home Systems in Developing Countries*, *Institutional Framework and Financial Instruments for PV Deployment in Developing Countries*, and *Summary of Models for the Implementation of Solar Home Systems in Developing Countries*.

### *5.3 Commercial Loans*

While all financing sources will look for a sound business plan and low risk (hence a good possibility that the investment will be returned), this consideration is most true in the commercial sector. Commercial lenders will generally only invest in companies that have proven high growth and profit potential and/or that have arranged appropriate guarantees.

Commercial banks have several advantages over ODA and national funding. First, commercial sources are flexible and respond quickly to changes in the international or local economic environment. Commercial loans also follow a predictable application and approval process with which most programme developers and project managers will be familiar. While commercial lending institutions may make subjective decisions, they are less prone to political change and politically-motivated limitations on financing categories than MDBs and bilateral agencies. Finally, they are open to proposals from private project managers in contrast to ODA sources, which are generally only open to national host governments. Though they may be more risk-averse than government, multilateral, bilateral, and NGO agencies mandated to provide development funding, commercial sources are also generally more flexible and accessible than official development financing sources.

Programme developers need to be aware, however, that commercial loans generally have a much shorter pay-back term than loans from ODA sources. Terms of a year or more are long by commercial standards. Additional challenges are that PV projects deal with technical applications that banks or private investors probably do not understand well and involve rates of return that are difficult to assure. Consequently, commercial lenders who are willing to accept the uncertainties and make a loan often charge relatively high interest rates. The likelihood of securing commercial loans or investment is higher if the investing organisation has been involved in financing development projects before[22]. Finally, PV project financing levels are often low by commercial standards, discouraging some commercial banks from considering investment because their administrative cost ratio is high with small loans.

[22] "Private Capital Flows and Growth," *Finance and Development,* June 2001.

There are a variety of large international banks which have at times, depending on global market conditions, played an active role in financing development projects.

Then there are local commercial banks that may provide financing to development projects when persuaded by a strong business plan that the project is within their field of interest and will provide an appropriate return. Local commercial banks can also be important partners in facilitating end-user financing and credit, a key factor for success of a project when end-users have limited cash and the PV or other electrification technology represents a high percentage of their annual income.

Further information on facilitating end-user participation in the financing of a PV programme is provided in the IEA PVPS Task 9 guide, *Models for the Implementation of Solar Home Systems in Developing Countries*.

**Commercial Funding Example**

SELCO India (Pty) Ltd. is a solar PV installation and service company that has installed over 5 000 solar home systems in southern India. SELCO has accomplished this in part by building working relationships with a number of local banks such as Syndicate Bank. These commercial sources supplement financial support from non-bank finance companies (NBFCs) such as Manipal Finance. SELCO has provided cash deposits as partial guarantees to several of the lenders, encouraging them to become involved in PV financing, and has provided interest rate buy downs in other cases. The commercial loans are typically at 80% of the system cost, repaid over one to three years.

*Source: "Financing PV Growth," Michael Eckhart et al; 2001*

### *5.4 Semi-Commercial Loans*

In addition to the variety of commercial banks, there are a few private development banks that compete on the national level as well. These are sometimes referred to as non-bank finance companies (NBFC) in development parlance. Examples include the Korean Development Finance Corporation, Uganda Development Bank, and Industrial Credit and Investment Corporation of India[23]. These banks have a development mandate and are accustomed to working with new and developing technologies.

Semi-commercial loans are loans that are subsidised through ODA or private foundation contributions. These are available through co-operatives that straddle the line between bank and charity. For example, the Solar Development Group (SDG) is the result of a partnership between the World Bank and several U.S. charities to provide business development support and investment to organisations that provide other energy sources to off-grid rural areas in developing countries. To be eligible for SDG support, an entity should be a private company engaged in PV or in a complementary business with rural target customers. The business must be located in a developing country, and should have high growth and profit potential[24].

### *5.5 Foreign Investment*

Foreign Direct Investment (FDI) is the investment by business interests in one country in the capital requirements of a project in another country. FDI is not a common means of financing PV development programmes for the same reasons that commercial bank loans provide a lower proportion of development funding than does ODA. Investors will insist that development programmes have appropriate security against risks and that they provide a sufficient rate of return on investment.

However, FDI has some considerable advantages over other forms of development funding, encouraging programme developers to investigate means of engaging with foreign investors. FDI has an advantage over Official Development Assistance in that it can often provide longer term project financing than ODA, and it operates more as a business relationship than ODA

[23] *Development Banking and Finance*. Victor Murinde, 1996.
[24] http://www.solardevelopment.org/resources/index.htm

loans and grants. FDI comes with clear obligations and limitations (as does ODA), however the financing process is less bureaucratic than the ODA process tends to be. Instead of following an application process involving forms and specific requirements, arranging FDI is a business interaction dependent on negotiation, compromise, and contractual sales of share of interest in the programme.

FDI investment levels to developing countries have remained quite consistent over the years. Even during world financial crises like the Asian economic slump in the 1990s, FDI levels remained stable to Asian nations. This is in contrast to the pattern with other types of private capital flows[25]. In addition, FDI is a more flexible financing vehicle than debt because direct investments in a country are immediately re-priced in the event of a crisis[26]. Finally, FDI may be less subject to political variables like changes in the administration in power, which can have an important effect on national development funds.

# 6. VARIABLES INFLUENCING FINANCING DECISIONS

Each of the various types of financing described above will interact differently, given the terms of the financing, with programme risks and variables. Programme developers need to consider the interaction of financing characteristics (such as interest rates and currency fluctuations) with the variables of the project itself (such as time frame and the amount of expertise and equipment that may need to be imported).

The following are key variables that will influence financing arrangements:

1. Total programme cost including planning, implementation, hardware, follow-up, etc.
2. Interaction of institutional infrastructure (government policies, financial systems, laws, social patterns) with the programme.
3. Projected time-frame of the programme.
4. Degree to which end-users can participate in the programme.
5. Experimental versus proven nature of the technology.
6. Number of partners involved in the programme and degree to which national and local government supports it.

Depending on these variables, a given programme can have more or less risk, and fewer or greater options for mitigating that risk and negotiating financing arrangements. A programme with a high (but justifiable) cost might be more attractive to MDBs and international commercial banks, and might be priced out of the realm of smaller national funds. A programme with a number of partners might enjoy access to a high degree of administrative support (thereby reducing overall costs) and access to a wider variety of bilateral and national financing sources. Short-term projects are better candidates for foundation and bilateral funding. Programmes where end-users will have great difficulty purchasing the systems or electricity generated will need to pay close attention to end-user financing options.

In addition to the wide variety of factors that can differ from programme to programme, the variation between financing terms and conditions within each type of financing source category

[25] "How Beneficial is Foreign Direct Investment for Developing Countries?" *Finance and Development,* June 2001.
[26] "How Beneficial is Foreign Direct Investment for Developing Countries?" *Finance and Development,* June 2001.

is extremely large. For example, the World Bank's IBRD provides loans with a repayment term of 15 to 20 years with a 3 to 5 year grace period, but loans from the World Bank's IDA generally have 35 to 40 year repayment terms with a 10 year grace period.

Some development foundations will not consider requests for financing below a certain sum (for example 100 000 USD) or above a certain level (for example 250 000 USD). Others will not impose such restrictions. Commercial sources will often have a "floor" below which they will not consider providing financing, but the level of that "floor" can vary considerably between banks. Thus it is difficult to generalize about the terms of financing based on source types.

While it is difficult to generalise about broad categories of financing, nonetheless some conclusions can be drawn and are shown in Table 2. The financing source categories are listed along with their generalised response to key programme variables, including:

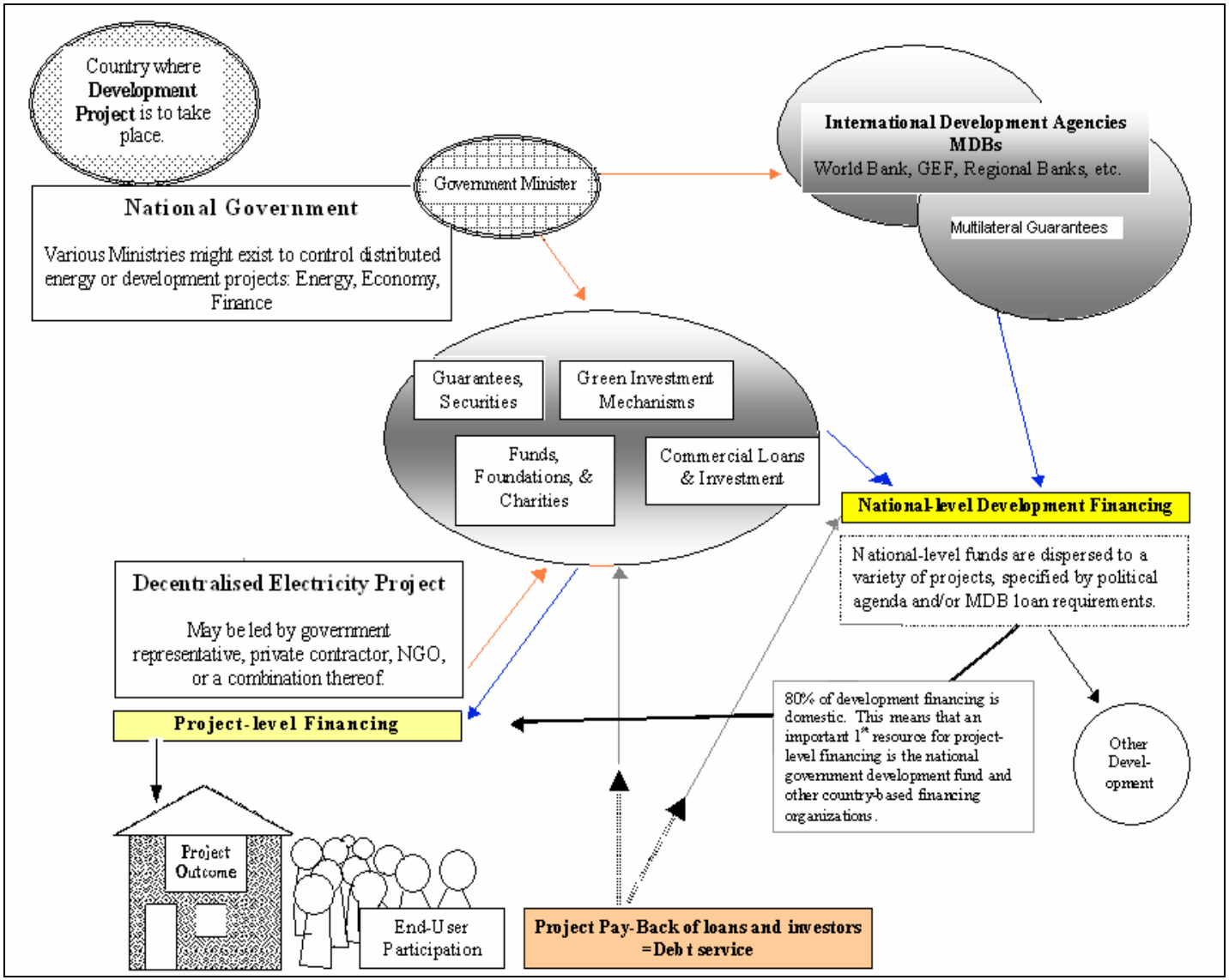
- Whether the level of financing required is high, moderate, or low.
- The degree to which the financing source requires a supportive institutional infrastructure. MDBs and bilateral funding are more flexible about existing institutional supports. National funding by nature takes into account existing infrastructure. Commercial financing and especially commercial investment will be less tolerant of highly unstable civil infrastructure.
- The project or programme time frame in years, from short-term projects of a year or less to long-term projects of several years. Commercial financing by nature generally favours short-term projects, while international concessionary financing is more flexible for long-term projects.
- The financing source's tolerance for unproven or emerging technology (high, moderate or low), which is highest with ODA and lowest with commercial loans.
- The degree to which the financing source demands government funding to support the project. Most financing sources will not cover the full cost of a given project or programme, so they will require the involvement of other financiers (including the provision of guarantees).

**Table 2: Variables Affecting Financing Options**

| | Financing Level | Requirement for Supportive Institutional Infrastructure | Project Time Frame | Tolerance for unproven or emerging Technologies | Demand for Government funding support for project |
|---|---|---|---|---|---|
| MDBs | High | Moderate | 3 + years | High | High |
| Regional MDBs | Moderate | Moderate | 3 + years | High | High |
| Bilateral Agencies | High | Moderate | 2-4 years | Moderate | High |
| Funds, Foundations | Low | Low | 1-2 years | Moderate | Moderate |
| Green Investment | Low | Low | None | Moderate | Moderate |
| Guarantees | Low | Low | 1-5 years | Moderate | Moderate |
| Government Incentives | Low | High | N/A | N/A | High |
| National Development Funds | High | High | 2-4 years | Moderate | High |
| Commercial Loans | High | Moderate | 1-4 years | Low | Moderate |
| Commercial Investment | High | Low | 1-8 years | Moderate | Moderate |

Figure 1 demonstrates how a variety of financing sources that have been reviewed in this guide might be combined in financing an end project. Many combinations of financing sources and vehicles are available to programme developers. Individual project developers may have only limited access to international development agencies, but still have a range of financing options. All local government levels (national, provincial, local, and even village) should be consulted, and local micro-enterprises, the local utility, and local social organisations (like NGOs, not-for-profit organisations and co-operatives) should also be considered as possible sources of either financing or infrastructure and support.

**Figure 1. Sources of Financing and Financing Flows**



As programme developers create a "package" of financing, they should keep the following points in mind:

1. Programmes will need to organise a variety of financing from a number of different sources. Many financiers set limits on the percentage of a project's total cost that they will carry so financing sources have to be combined to cover 100% of the project costs.

2. Programmes should avoid providing free hardware or services to end-users and should instead find appropriate end-user financing levels to allow the repayment of the programme; programmes should also handle grants and donations in such a way that they maximize the repayment of other financing sources.

3. Long-term financing is generally procured from MDBs and through foreign direct investment (FDI). Other types of financing will have varying elasticity for project time-frames, ranging from short-term (foundation grants) to medium-term (commercial loans).

4. Programme developers will give themselves a significant advantage in the process of securing financing if they have an understanding of financial "risk" and identify the main risks to which their programme is subject; they should aim to mitigate these risks by adapting their programme appropriately.

### *6.1 Mitigating Risks*

In the second section of this guide, a brief description was given of *risk* as seen from a financing viewpoint. In selecting potential funding vehicles, project planners should consider the stability of their funding resource(s) in light of the expected duration of the project and its elasticity over time (susceptibility to cost variations like interest or exchange rate fluctuations). How volatile is the local currency? What events affect the local economy (weather, harvests, etc.)? How will changing international monetary markets affect the project given its time-frame and other variables? What is the repayment time-frame?

Long-term projects will need financing that can bear the changes that inevitably occur throughout the course of a project such as changing local market conditions and varying international financial conditions. Long-term projects should choose a funding mix that will respond minimally over time to such variations, for example FDI financing or MDB soft loans. Programmes requiring a high degree of importation and therefore vulnerable to international currency market fluctuations also can benefit from FDI financing, which readjusts for changing market conditions.

The role of risk, security, and guarantees was discussed earlier in this guide. Predicting and planning for the types of eventualities that may befall a development programme is an essential factor in arranging financing. Below is a discussion of some key risks which might affect programmes depending on their location, time-frame, structure, or other factors. Means of mitigating these risks, particularly in relation to financing, are also discussed.

- **Business risk: costs, sales volumes, and prices may fluctuate.**
    - Risk mitigation: Conduct careful programme planning, including market estimates, then arrange financing with generous repayment terms, including MDB financing.

- **Country risk: world economic recession, national economic mismanagement, and political unrest.**
    - Risk mitigation: procure a large percentage of financing from multilateral sources, which are the most likely to be flexible in the event of national changes, and/or through equity investment, which automatically re-prices with market fluctuations.
- **Market risk: market for related goods or services may collapse, interest rates may rise (or fall), demand for the product or service may rise or fall.**
    - Risk mitigation: conduct market surveys as part of the programme planning process, then use financing with generous repayment terms, including MDB financing.
- **Money or interest rate risk: interest rates or the value of currency may fluctuate.**
    - Risk mitigation: arrange financing with variable interest rates, or use foreign direct investment to sell part-ownership of the project to investors.
- **Project risk: staff or trained personnel may leave the project, delays may occur, hardware may be intercepted, lost, or damaged; support for the project may decrease, plans may have to be changed**
    - Risk mitigation: Careful planning, including the arrangement of appropriate staff incentives, tracking systems for hardware, and mechanisms to continually evaluate the progress of the project and adjust plans as needed. Insurance could be engaged as a security to the overall financing package.
- **Foreign exchange risk: exchange rates may fluctuate**
    - Risk mitigation: arrange guaranteed financing that will not fluctuate with foreign exchange changes, or that will remain relative to the currency in the project country.

Securing financing with assets is a good way to hedge many risks. Assets could be used to repay loans or investors in the event of some unforeseen change in the programme's circumstances. Guarantees can also be arranged to cover risk, as was discussed in Section 2 above. In addition, projects can look into procuring insurance against the event of natural disasters or labour disruptions. While insurance will add to the overall cost of the project, it can be invaluable in the event of a disaster.

### *6.2 Impact of Institutional Framework on Costs*

Developers need to consider the interaction of institutional frameworks in the total cost of the programme. As noted in Section 5 of this guide, government subsidy and tax rebate plans can have a significant impact on both the cost of a PV programme and on end-users' engagement in the programme. In addition, the financial, market and industrial infrastructure existing in the country can affect the ease or difficulty with which hardware is transported, balance-of-system components are procured, or financial transactions are completed.

The legal infrastructure in a country can also be important. The paperwork required to import or transport equipment can affect cost, as can engaging legal advice or representation. Is there an education and trade infrastructure present in the country to provide qualified labour? If not, provision will have to be made to train workers or transport already qualified workers. Likewise,

if an industrial infrastructure is not present to provide hardware, the project itself will have to make up for this shortage.

The lack of a local financial infrastructure can complicate end-user participation in PV programmes. End-users in a country will need to comply with local laws in making payments on a PV system, so re-payment options that are part of the financing plan need to harmonise with local financial sector controls. If there are no banking facilities in the area where a project is planned, this might affect how end-users make payments. Social and fiscal patterns can also affect end-user participation. There may be a social barrier to exchanging money with people one does not know personally, thus complicating payment systems. In some economies (an agrarian economy for example), end-users may only have cash when the crop is harvested and sold, i.e. one or two points during the year. Therefore, making monthly payments on a SHS would not be a viable option to these people.

On a broad scale, PV programme planners should investigate:

- General financial sector policies and the legal environment (interest rate restrictions, government mandates and financial contract enforcement) in the host country;
- Financial sector regulation and supervision;
- Economic and social policy (economic stability, poverty levels and government policies related to social situations);
- Energy policy and renewable energy policy in the host country—if it exists;
- Industry and training infrastructure in the host country—if it exists.

Many financiers will appreciate seeing higher levels of support from the local government. Demonstrating that pro-electrification policies are in place, at the national and also local level, could greatly contribute to "selling" the project, in addition to possibly reducing the overall costs of the project through government cooperation and support.

**Example of a Infrastructure Barrier to End-User Financing: Maphephethe, South Africa**

Following their PV installation project in South Africa, project planners discovered during the evaluation phase that in order to make payments on their SHS, residents of Maphephethe had to travel several miles to a neighbouring city to deliver their payments personally to the bank. They did not have the infrastructure to pay by cheque, nor to wire or otherwise transfer funds. The cost in both time and money of traveling each month to the neighbouring city was a serious hindrance to the participation of Maphephethe homeowners in purchasing SHS.

*Source: "Maphephethe Rural Electrification" by Maryanne Green, et al, March 2001*

A more detailed discussion of conducting stakeholder inquiries is contained in the IEA PVPS Task 9 RPG: *PV for Rural Electrification in Developing Countries – Programme Design, Planning and Implementation*.

### *6.3 The Cost of Financing*

Arranging programme financing takes time, effort, and money to achieve. Programme developers need to factor this into the projected overall costs. Financing itself also has lifetime costs: for example loans charge interest and fees. It is necessary to plan for the costs of financing in the overall costs of the project.

### *6.4 Role of NGOs: Cooperating and Facilitating*

Cooperation with non-governmental organisations (NGOs) and local or regional associations can limit the overall costs of the programme. While most NGOs and associations may not have the monetary resources to provide direct funding to PV projects, they may still provide important infrastructural support by organising end-users to secure favourable financing terms, providing training to end-users or installers, facilitating the transport of project equipment and supplies, or taping into foundation or ODA money with specific local requirements.

NGOs include international organisations that operate with specific renewable energy goals, such as CARE[27], as well as international organisations with broader environmental or social purposes, such as the WWF (formerly the World Wildlife Fund and now the Worldwide Fund for Nature). Co-operatives are commonly local groups of end-users who pool resources in order to more effectively afford PV systems or other community improvements by organising favourable local financing terms or developing credit unions. PV programme developers should consider working with community leaders to enhance or develop co-operatives in project regions.

## 7. SECURING FINANCING – THE PROCESS

Securing financing for a PV programme begins with an understanding of the total programme costs and the variables of the programme discussed above. Programme developers should envision financing options and begin initial contacts early in the planning process. In addition, programme developers should plan to work with a variety of source-types to balance their financing package. A good development financing package will include financing from MDBs and/or bilateral agencies, along with a combination of national development funds and other international and commercial sources.

As programme developers review this section, they should keep in mind that one of two principal goals will be guiding the financing sources they approach. Development agencies, including MDBs, bilateral agencies, and national funds, will fund programmes that fall within their stated goal areas. They will emphasise the sustainability and feasibility of proposed programmes. Commercial sources' principal goal will be to make a return on investment (ROI) or equity (ROE). Financial institutions will want to see a project that:

1. Can sustain projected cash flows throughout its lifespan;

2. Takes into account the effect of inflation and taxes; and

3. Provides an appropriate return – increasing the real wealth of the investors[28].

A recent report on securing financing for renewable energy projects summarised the following priorities: "The keys to securing a loan for renewable projects are first to establish the appropriateness of the selected technology, second to understand any local regulatory requirements and third to be aware of the high loan transaction costs[29]." Once this base knowledge is in place, then begins a process that can be generalized as a series of discussions and exchanges of information between the programme developer(s) and the financial organisation(s).

[27] Information is available online through www.care.org
[28] *Development Banking and Finance.* Victor Murinde, 1996.
[29] "Financing Renewables: Report from 4th Annual RE Finance Forum," Don C. Smith; 2002.

At a minimum, financiers will want to have information on the following factors:

1) Intended end-use of the project;
2) Regional or geographic scope of the project;
3) Size and duration of the project;
4) Degree to which end-users will participate in the project;
5) Degree to which the technology's dependability has been demonstrated;
6) Ongoing maintenance needs of the project; and
7) Infrastructure development needs of the project.

The detailed "rules of engagement" differ from institution to institution and programme developers will have to contact individual financial organisations directly to ensure that they are following the correct protocols. However, by preparing the information summarised in this section, programme developers should be ready to begin the process of procuring financing, adjusting for the different requirements they may encounter in specific organisations.

### *7.1 Selling the Programme: Least-Cost Analysis and Externalities*

One of the keys to obtaining project financing from *any* of the sources outlined in this guide is documentation of the value and justification of the project. This includes preparing a least-cost analysis to other conceivable electrification options, creating a business plan with costs and a budget, and conducting marketing analyses to demonstrate the probable success of the project.

Least-cost analysis involves the demonstration of how the cost and maintenance of a PV system (or other rural electrification technology) compares to the cost of supplying comparable electricity by other means. In most rural situations where SHS are considered, residents are already supplying their energy needs through such simple technologies as kerosene lanterns, dry cell batteries and car batteries. Other options for providing electricity might include diesel generation or extension of the grid. If programme developers can demonstrate to financiers that PV systems represent a lower-cost option than current fuel use or other electrification options, this can help “sell” the project.

Commercial financiers will also be interested in the resale value of a system. While end-users may not actually plan to resell their systems, the projected market value of systems is important to allow financial service providers to calculate the value and risks of the project. An electricity-generating system’s resale value is determined by estimating the present value of the expected cash flow that it will generate during its lifetime. If there is no market for used PV systems in the project country, then the system has no effective resale value[30].

Programme developers should also prepare to “sell” their programme by highlighting the positive externalities of the PV systems. Even when a least-cost analysis indicates that PV systems may not be the cheapest method to electrify homes in a particular area, PV technology has many advantages over other energy delivery mechanisms. These “positive externalities” are not taken into account when doing a least cost analysis, but have their importance in a wider economic analysis. Some of these factors include:

[30] "Financing Renewables: Report from 4th Annual RE Finance Forum," Don C. Smith; 2002.

- Local job creation;
- Higher reliability of PV, when compared to the procurement and transportation of diesel and propane or the security of grid lines;
- Time saved on travel to get fuel supplies; and
- Avoidance of environmental degradation and avoidance of greenhouse gas emissions.

Considering positive externalities like these when planning a PV programme for a developing country presents a truer understanding of the real costs than traditional least-cost analysis. In the end, the monetary-cost of the programme must be covered through funding mechanisms, but taking into account these externalities can yield a different conclusion with least-cost analysis than consideration of actual monetary costs alone.

### *7.2 Creating a Business Plan*

Programme planners need to have a variety of information ready to present to potential funding organisations. It is useful to prepare a business plan outlining the goals, costs, methodologies, and projected cash flow of the programme. The business plan should include a feasibility study showing a least-cost analysis, external benefits of the programme, and social and economic analysis of the project. The business plan should also include a budget and basic financial plan as well as strategies for procuring personnel and material, dealing with local conditions and constraints, and implementing the project in a way that is sustainable and will yield an acceptable outcome. If the funding plan includes loans and will need to be repaid, the programme planners will need to demonstrate through their business plan that they will be able to repay the loans.

In order to prepare the business plan, programme developers should conduct thorough research related to the programme variables listed in Section 6 above. They need to have an understanding of the local economic and policy environment, as well as the fiscal infrastructure already present in the host country. Market research supporting the local usefulness and demand for PV systems is also important in building a realistic business plan and in making the case for financing. How many end-users will be able to afford the cost of the planned PV systems? How great is the current demand for electricity?

The time spent putting together a clear, objective, and logical business plan is a benefit to the programme not just through potentially helping to secure funding, but also by aiding the programme managers to define their vision and plan accordingly.

Templates for business plans are available online[31] and through small business development offices in many countries.

### *7.3 Preparing to Answer Questions*

Before making an application for financing, a programme developer should research the financier, look at the website, talk to its representatives, and thoroughly understand the requirements, restrictions, limitations, and demands of the financing source. Developers need to be able to demonstrate to various funding sources that they have designed a programme that will meet the specific terms of financing. Usually that will include meeting return-on-investment,

[31] An example of a business plan template available online can be found at the following website developed by the IFC: http://africa.smetoolkit.org

ethical and geographical requirements established by individual financing organisations. Studying the requirements before applying for financing will save time and effort and increase the likelihood of favourable outcomes. In addition to a business plan, financial organisations will generally want to know the history of the applicant or applicants, including past projects carried out. Having references, preferably people and organisations already known to the financing organisation, can be helpful as well.

Requests for funding will be considered by lenders or grant-makers based on a series of priorities. Lenders might ask several key questions in qualifying a loan:

- Is this installation economically-advantageous for the borrower?
- Can the system be easily installed by qualified contractors? Does it meet all of the applicable building codes and safety standards?
- How long will the system perform? Is there a warranty on the system? Is there a guarantee on performance over the life of the system?
- What will be the ongoing or recurring costs of operation, maintenance, repairs, and potential removal of the system?
- What are the energy cost savings that the borrower will receive from owning the PV system? Are these savings certain enough to count as "income" for loan qualification purposes?
- What is the current market value of the system? How does this change over time? What is the likely residual value of the system at the end of the loan period?
- What are the risks on repayment? Technical? Economic? Others? Are the risks well known and understood?[32]

Programme developers should be prepared to answer these and other questions about their project as they approach financiers. For additional financing criteria, see section 4.3 above on the OECD's DAC criteria.

### *7.4 Application Process*

The process of applying for financing is as varied as the number and variety of funding providers. Generally, the process will begin with an initial contact: interested parties should seek out the correct contact for their particular project's technology and region to inquire about the process for seeking funding. Applications for funding might be competitive and limited to a small open-window time frame, or they might be accepted year-round. Some financing sources might put more emphasis on the informal aspects of the process (conversations, explanations, and in-person meetings to review of project plans) than on the formal paperwork. Other financing sources emphasise the formal paperwork and published guidelines, with minimal conversation and interaction.

The Internet is a valuable resource not only for identifying the correct point of contact within a given organisation, but also for obtaining background information that can help programme developers focus their efforts. Each multilateral and bilateral agency has different eligibility criteria for providing funding and often a unique application process which is usually outlined on

[32] "Financing PV Growth," Michael Eckhart et al; 2001 quoting a study by Wiley & Sons.

the organisation's website. Calls for tenders and proposals are also made through the Internet, although these can also usually be found in magazines or journals published by organisations that fund development projects. The publication of a call for proposals will indicate the relevant funding priorities, eligibility criteria and any other conditions for the award of a grant.

**Example of Securing International Concessionary Financing**

In order to access funding through an MDB, a regional MDB, or a bilateral development agency, a developing country representative must first identify an appropriate representative of the bank or agency. Correct contacts change often, so the importance of networking, reaching out to these financial organisations and holding ongoing conversations with them, cannot be understated.

Following an initial conversation, a series of increasingly detailed exchanges of information ensues, including the development of programme plans and implementation schedules. For example, in order to access World Bank financing, a national government would first contact the WB with a request. The WB then creates a team of their own to review the request and write specifications. The developing country would then write a concept paper, followed by a project brief. The process culminates in the creation of a detailed statement of work in the form of a project document, which can be an extremely long, detailed document requiring many person-hours to create.

The process in seeking financing from the UN and its GEF is somewhat different. Most developing countries will have a local UN office. The local government will make initial inquiries in that local office, and from there the programme will be communicated to the UN headquarters (financing is located in New York City).

# 8. CONCLUSION

This guide has defined potential sources of financing for rural electrification programmes in the developing world, as well as the variables influencing financing decisions.

PV programme planners in developing countries have a range of financing options to choose from. Both multilateral and bilateral development funds can be important resources. Perhaps more important though are the resources within developing countries themselves. Many developing countries have national funds that can support PV programmes. Foundations and commercial loans can fill further funding needs. Finally, there are funding mechanisms or means to structure the funding that will reduce the overall cost, including working with local non-profits and co-operatives, local micro-enterprises, or even the local utility.

Programme planners should consider both the government infrastructure in the country or region where the programme will take place and the constraints of the project itself when developing a financing mix for the programme. The role of end-users must be considered and facilitated. Planners must be cognizant of the types and levels of risk incurred by their planned programme, and should both plan their programme and structure their financing package to mitigate those risks. Project time-frame, the level of needed financing, and the engagement of national and local actors are all factors that will affect the desired financing mix.

Finally, the financing process can be a lengthy one and should be considered early in the programme planning-phases. The costs of financing itself, including interest and fees and time requirements, needs to be factored into the programme. Conversations with potential financiers should be held early, even before the risk analysis and business plans have been drawn up, to guide programme planners in the requirements and interests of individual financiers.

With careful attention to financing options and programme variables, there are many combinations of financing sources available to support decentralised electrification and PV projects in the developing world.

# APPENDIX I: BIBLIOGRAPHY


1. *Accelerating PV Markets in Developing Countries*. Michael Philips and Brooks H. Browne. http://www.repp.org/repp_pubs/articles/pv/7/7.html
2. *Best practice manual: Promoting decentralised electrification investment*. October 2001. Joint UNDP/ESMAP. http://www.worldbank.org/html/fpd/ESMAP/PDFS/248-01.pdf
3. *Best Practices for Photovoltaic Household Electrification Programs: Lessons from Experiences in Selected Countries*; Anil Cabraal, Mac Cosgrove-Davies, and Loretta Schaeffer. World Bank Technical Paper Number 324. August 1996.
4. *China Village Power Project Development Guidebook*: *Getting Power to the People Who Need it Most*. Co-edited by Charlie Dou and James Graham, SETC/UNDP/GEF, Project CPR/97/G31. February 2002.
5. *Development Banking and Finance*. Victor Murinde. (Aldershot: Avebury Publishers) 1996.
6. *Financing Solar Energy in India: A Guide for Financing Organisations and their Potential Clients*. European Commission. (Germany: European Commission) 2000.
7. *Finance for Renewable Energy, A Guide for Development Workers*, Gregory, Silveria, Derrick, Cowley and Allinson, IT Publications, London, 1996.
8. *Finance for the Developing Countries,* Richard L. Kitchen. (New York: John Wiley & Sons) 1986.
9. "Financing Renewables: Report from 4th Annual RE Finance Forum," Don C. Smith, *ReFOCUS*. Nov/Dec 2002. Vol 2002, Issue 11/12. p60-1.
10. *Financing of Solar Home Systems in Developing Countries: The Role of Financing in the Dissemination Process*. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Environmental Management, Water, Energy and Transport Division 44. Vol.1: Main Report. Pp18-19.
11. *Global Banking, 2nd Edition,* Roy C. Smith and Ingo Walter. (Oxford University Press) 2003.
12. *International Dictionary of Banking and Finance*. John Clark. (Chicago: Glenlake Publishing Company, Ltd.) 1999.
13. *The Key Elements of Project Finance (for RE-projects)*. Presentation by Alex Arter, Entec. July 2003.
14. *Making a Different in Emerging PV Markets: Experience and Lessons from a Workshop in Marrakech, Morocco, September 2000*. By Eric Martinot, Global Environment Facility, November 2000. http://www.gefweb.org/ResultsandImpact/Experience_and_Lessons/Morocco_experience.pdf
15. "Maphephethe Rural Electrification (Photovoltaic) Programme: The Constraints on the Adoption of Solar Home Systems." By J. Maryann Green, Merridy Wilson, and Will Cawood. Published in *Development Southern Africa*, Vol 18. No 1, March 2001.
16. *Market Development models for household PV systems in developing countries*. Vleuten-Balkema, et al. Paper presented at the 16th European PV conference in Glasgow, May 2000. http://www.free-energy.net/files/16epvsec.pdf
17. *Methodological and Technological Issues in Technology Transfer*. Chapter 2: "Trends in Technology Transfer: Financial Resource Flows," lead author: Mark Radka for Intergovernmental Panel on Climate Change. (Cambridge, Cambridge University Press) 2000.
18. *Photovoltaic Technology and Rural Electrification in Developing Countries: The Socio-economic Dimension*. Juan Carlos Císcar, the IPTS. http://www.jrc.es/iptsreport/vol19/english/ENE1E196.htm
19. *PV Engineering Handbook*, edited by Professor Antonio Luque: "Financing PV Growth," by Michael Eckhart, Jack L. Stone, and Keith Rutledge. Chapter 24. (Wiley and Sons) 2001.
20. *Recommended Practice Guide: Institutional Infrastructure*, Shanker, Anjali. IEA Task 9; 2003
21. *Renewable Energy Investment And Technology Transfer in Asia: Report of a workshop at RIIA on 7 May 1998*. By Tim Forsyth for The Royal Institute of International Affairs, October 1993, Briefing No. 51.
22. *Solar Energy, Lessons from the Pacific Island Experience*, World Bank Technical Paper 244, A. Liebenthal, S. Mathur, H Wade, May 1994
23. *The Caribbean Development Bank*. Chandra Hardy (U.S. Lynne Rienner, Publisher) 1995.

24. *The Complete Investment and Finance Dictionary*. Howard Bryan Bonham. (Holbrook, MA, Adams Media Corporation) 2001.

25. *The GEF Solar PV Portfolio: Emerging Experience and Lessons*, Martinot, E., et al, Global Environment Facility, August 2000

26. *World Bank / GEF solar home systems projects : experiences and lessons learned 1993-2000*. Martinot, E. et al. Renewable & Sustainable Energy Reviews 5 (1) : 39-57 (2001).

27. *Yearbook of International Co-operation on Environment and Development*. Developed by the **Fridtjof Nansen Institute** in Norway, published by Earthscan, 2002-2003.

# APPENDIX II: GLOSSARY OF SELECTED TERMS

**Collected by Alex Arter, Entec**

amortisation: Reduction of capital of up-front expenses (capitalised) over time, often an equal amount p.a. Sometimes describes Repayments.

annuity: The sum of Principal and interest is equal for each period.

asset: The physical project and its associated contracts, rights, and interests of every kind, in the present or future, which can be valued or used to repay Debt.

audit: An independent examination of the financial statements or project studies/projections.

available cash flow: Total cash sources less total cash uses before payment of Debt Service.

average life: Average for all repayments, usually weighted by amounts outstanding.

avoided cost: The capital and expense that would otherwise have to be spent if the project did not proceed.

balance sheet: The accounts which show Assets, Liabilities, Net Worth/Shareholders' Equity.

bid bond: A small percentage (1-3%) of the tender contract price is established as a bid "performance" bond. Once the contract is awarded. Bid Bonds are refunded to the losers.

bilateral agency Agency within a single developed country (a branch of government or a semi-governmental division) that has as its specific mandate to carry out development projects that fit the current administration's agenda.

break even: The reduction of a Project Finance Net Cash Flow to zero by changing an input variable such as price or costs.

cash flow: The generation of cash by a Project.

CDMs Clean Development Mechanisms were created by the Kyoto Protocol of the UN Framework Commission on Climate Change; they are designed to provide a market for the positive externalities (reduced greenhouse gas emissions of clean development).

co-financing: Where the different lenders agree to fund under the same documentation and security packages yet may have different interest rates, repayment profiles, and terms.

collateral: Additional security pledged to support a Project Financing.

commitment fee: A per annum fee applied to the portion of the unused Project Financing (the amount not yet drawn down) until the end of the Availability period.

compensation trade: The form of counter-trade where an incoming investment is repaid from the units/revenues generated by that investment.

complementary financing: Where different lenders agree to fund under similar yet parallel documentation and a pro-rata security package.

completion: In a Project Financing, when the Project's Cash-flows become the primary method of repayment. It occurs after a Completion Test. Prior to Completion, the primary source of repayment is usually from the Sponsors or from the Turnkey Contractor.

completion risk: Construction, development, or cost overrun risk. The risk that a project will not be able to pass is Completion Test.

consortium: All of the Participants or developers. For the early stages to a Project, it may be a loose association, not a legal or contractual entity/JV.

contingent: For liabilities, those that do not yet appear on the Balance Sheet – guarantees, supports, lawsuit settlements. For support or Recourse, the trigger may occur at any time in the future.

country risk: Includes sovereign risk but usually an estimate of the likelihood of a country debt rescheduling which will prompt currency Inconvertibility. Sometimes referred to a sovereign risk.

credit enhancement: The insurance of a Guarantee. L/C, or additional Collateral to reinforce the credit strength of a Project Financing

creditworthy: The risk of default on a Debt obligation by that entity is deemed low.

cross default: A default by another project participant or by the Sponsor (other than the Project Financing) triggers a Default.

cross-collateral: Project Participants agree to pool Collateral i.e. allow Recourse to each other's Collateral.

current asset: Cash or Assets that can be converted to cash within one year.

current liabilities: Liabilities payable within one year.

current ratio: Current Assets divided by Current Liabilities (a Liquidity ratio)

D/E ratio: The amount of Debt as a ration of Equity, often expressed as a percentage.

debt service: Principal Repayments plus Interest Payable: usually expressed as the annual dollar/currency amount per calendar or financial year.

debt: The obligation to repay an agreed amount of money.

default interest: A higher interest rate payable after Default.

default: A Covenant has been broken or an adverse event has occurred. A Money Default means a repayment was not made on time. A Technical Default means a Project parameter is outside defined/agreed limits or a legal matter is not yet resolved.

deficiency Where cash flow, working capital, or revenues are below agreed levels or are insufficient to meet

agreement: Debt Service, then a deficiency or Make-Up agreement provides the shortfall to be provided by the Sponsor or another party, sometimes to a cumulative limit.

deficiency: The amount by which Project Cash-flow is not adequate for Debt Service.

depreciation: Amortisation for accounting (book), tax calculations, or Income calculations. A regular reduction in asset value over time.

discount rate: The annual percentage applied to NPV or PV calculations (and is often the All-in Interest Rate or the Interest Rate plus Margin for Project Financing).

dividend: The amount paid out per share, usually once or twice a year, by a company from its profits as decided by the board of directors.

equity: In a Project Financing, the cash or Assets contributed by the Sponsors. For accounting, it is the Net Worth or Total Assets minus Liabilities.

escrow: Where documents or money accounts are put beyond the reach of the parties.

financial close: When the documentation has been executed and conditions precedent have been satisfied or waived. Drawdowns are now permissible.

force majeure: Events outside the control of the parties. These events are acts of man, nature, governments / regulators, or impersonal events. Contract performance is forgiven or extended by the period of force majeure.

full recourse: No matter what risk event occurs, the borrower or its guarantors guarantee to repay the debt. By definition, this is not a Project Financing unless the borrower's sole asset is the project.

fund/foundation Collected monetary resource managed by a private (non-governmental) organisation dedicated to charitable (as opposed to profit-aimed) work.

funding risk: The impact on project cash flow from higher funding costs or lack of availability of funds.

FX: Foreign Exchange.

gearing: The level of Debt : Equity. Interest-bearing Debt divided by Shareholders' Equity.

general partner: The partner with unlimited liability,

| | |
|---|---|
| grace: | After a default, days of grace may be stated within which the cure is effected. A period when interest or principal is not yet payable, usually a period after start up/commissioning/Completion in a Project Financing. |
| guarantee: | An undertaking to repay in the event of a Default. It may be limited in time and amount. |
| income: | Operating Cash-flows less Overheads and Depreciation, either before Tax (BT) or after tax (AT), Earnings. |
| inconvertibility: | Where a local currency cannot be exchanged for another currency. Often includes Transfer Risk. |
| L/C: | Letter of Credit, a guarantee to pay limited to an amount and time triggered by defined events or exchange of agreed documents. Used for Credit Enhancement. |
| lead bank: | A senior bank involved in the negotiations for a Project Financing. Subordinate to an Arranger. Lead Manager. |
| liability: | The obligation to repay a defined amount or to perform a service. |
| MDBs | Multilateral Development Banks = international financial organisations specifically designed to fund development projects alleviating poverty; member nations pay into the common development fund in order to provide high-levels of development financing |
| NPV: | The periodic Net Cash-flows are each discounted by the Discount Rate to a present date and the appropriate cash outflows / investment for construction or acquisition are deducted from the total. |
| O & M: | Operations and Maintenance. |
| p.a.: | per annum, yearly. |
| partnership: | The partners agree to a proportional share of profits and losses and thus have the same tax treatment. |
| pay-back: | The period in years to receiver the investment or loan. It may be calculated on a discounted, non-discounted, leveraged, or unleveraged basis. |
| performance bond: | A bond of 5 – 10% of a contract payable if a project is not completed as specified. Usually part of a construction contract or supply agreement. |
| political risk: | Eight risks usually comprising currency Inconvertibility, expropriation, war and insurrection, terrorism, environmental activities, landowner actions, non-government activists, legal, and bureaucratic / approvals. The first three are insurable. It overlaps with the political component of Force Majeure risk. |
| PPA: | Power Purchase Agreement, a long-term power supply contract. |
| PRI: | Political Risk Insurance. |
| principal: | The quantity of the outstanding Project Financing due to be paid. Generic: A principal is a party bearing an obligation or responsibility directly (as distinct from an agent). |
| private placement: | The Placement of Debt or Equity investment is not publicised and may not be tradeable. |
| pro rata: | Shared or divided according to a ratio or in proportion to their Participations. |
| pro-forma: | A financial projection based on assumptions. |
| project financing: | A loan structure which relies for its repayment primarily on the Project's Cash-flow with the Project's Assets, rights, and interests held as secondary security or Collateral. |
| project: | The Asset constructed with or owned via a Project Financing which is expected to produce cash-flow at a Debt Service Cover Ratio sufficient to repay the Project Financing. |
| recourse: | In the event that the Project (and its associated escrows, sinking funds or cash reserves/standby facilities) cannot service the financing or Completion cannot be achieved the Financiers have recourse to either cash from other Sponsor/corporate sources or other non-Project security. |
| retention: | An amount held back from construction contract payments to ensure the contractor completes the construction before the retention (5-15% of the contract price) is returned to the contractor. |
| risk: | The event which can change the expected cash-flow forecast for the Project Financing. "At risk" means the cash or loan. For insurance, it means the total amount or type of event insured. |

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| royalty: | A share of revenue or cash-flow to the government or grantor of the concession or licence. |
| security: | A legal right of access to value through mortgages, contracts, cash accounts, guarantees, insurances, pledges, or cash-flow including licences, concessions and other Assets. A Negotiable certificate evidencing a debt or equity obligation/shareholding. |
| senior: | Ranking for repayment or security. Most Project Financings are Senior debt obligations with first Senior Security. |
| shareholders equity: | Net worth. Book value of Total Assets less Total Liabilities. |
| sovereign risk: | The government's part of political risk. |
| sponsor: | A party wishing to develop a Project. A developer. A party providing financial support. |
| structure: | How a Project Financing is drawn down repaid and collateralised/secured. |
| supplier credit: | The supplier of goods or services agrees to deferred repayment terms. |
| trustee: | An independent or nominated third party who administers corporate or financial arrangements. |
| working capital: | Cash required to fund inventories and accounts receivable. Accounting definition is Current Assets less Current Liabilities. It is recovered entirely when the project ceases. |

# APPENDIX III: DEFINITIONS OF BASIC TYPES OF FINANCING

### *Grants and Contracts*

Both grants and contracts have the advantage of not requiring repayment: they are essentially "gift" money with specific requirements or terms for use attached. Both usually include a statement of the work that will be performed using the money, including restrictions on how the money can be spent and the time-frame during which it can be spent. Grants will often be directed toward the purchase of hardware and equipment required for a PV project. Contracts often cover the "soft" costs of a PV project such as project planning, implementation, management, monitoring and evaluation.

These financing vehicles often originate from private foundations, but can sometimes be procured from international development organisations like the World Bank (WB), the Global Environment Fund (GEF), bilateral funding organisations, or through national renewable energy funding divisions as well.

### *Loans*

Loans, or “debt” financing, unlike grants and contracts, require repayment of both the principal borrowed *and* interest charged on that principal, increasing the cost of PV development projects. Despite this, loans are a very common financing vehicle for development projects because they continually replenish the development fund from which they are drawn. Loan payments usually must be made on a specific schedule, and if they are late or if the loan is defaulted, the borrowing organisation may have an extremely difficult time accessing financing in the future.

An additional consideration with loan funding is that foreign loans are subject to foreign currency oscillations, risking that the principal amount borrowed and the interest owed could increase dramatically if exchange rates fluctuate. Project planners should keep this possibility in mind. The economies of many developing countries tend to be unstable, and the costs of labour, goods, or equipment could fluctuate during the course of a long-term project, while the loan currency might fluctuate as well.

International funds dedicated to development projects (like Multilateral Development Banks – described in more detail below) will often create loans with generous repayment terms, low interest rates and flexible time-frames. Such loans are called "soft-loans," and precisely because of their lower interest rates and flexible terms, they are generally preferable to commercial loans.

### *Equity*

Equity financing consists of selling an ownership interest in the project to investors. The most basic difficulty in arranging equity financing is finding investors who are willing to buy into the PV project. The second challenge is ceding partial control of the project to the equity financier(s), who becomes part-owner of the project. Commercial lending organisations, especially renewable-energy specific fund organisations, can be sources of equity financing. More commonly, equity financing can be identified through commercial investment channels: investment banks with an environmental focus, international insurance companies, or the occasional venture capitalist may be interest in providing equity financing to PV projects that can show a healthy return on their investment.

Quasi-equity financing is a financing term for funding that is technically “debt” but has some of the characteristics of equity financing, such as unsecured funding with flexible repayment terms.

Stakeholders in a project may loan the project money with a formal postponement of repayment[33].

### *In-Kind or Non-Cash Contributions*

Beyond outright funding, a number of methods exist to reduce PV project costs, share costs, or eliminate costs altogether. For example, working with local non-government organisations (NGOs) to facilitate financing mechanisms for local end-users, to provide transportation of materials, or to channel local funding, can alleviate the total financing burden on PV project planners. Subsidies, tax rebates, or other policy tools provided by the local government can reduce or offset the total financing cost as well. In addition, project planners might look to local workers (with the added benefit of national infrastructure development) or might link the project to income-producing outcomes such as home-based businesses resulting from the SHS[34]. A variety of creative options exist to either mitigate or reduce the total cost of PV project.

### *Guarantees*

Guarantees are a contractual promise from a financing or otherwise well-capitalised organisation to provide back-up to a loan. For example, when an individual purchases a house, the house is secured as collateral. If the individual defaults on the loan, the house may be claimed by the lender to offset losses. In the case of development projects, there is often little or no acceptable collateral to pledge as security against the risk of the loan. Instead, a developer might seek a guarantee from a large, well-capitalised organisation that should the project or national programme fall into arrears, the guarantor will cover the loss. This makes lending to and investing in decentralised electricity programmes more attractive to commercial lenders.

Guarantees are offered by multilateral development banks and national development banks. For example, the Multilateral Investment Guarantee Agency (MIGA) was organised by the World Bank in 1988 to mitigate the risks commercial lenders face in engaging a development project. MIGA fulfils this mandate and contributes to development by offering political risk insurance (guarantees) to investors and lenders, and by helping developing countries attract and retain private investment. In addition, the International Finance Corporation (IFC) has the Guaranteed Recovery of Investment Principal (GRIP) programme through which private investors are guaranteed a minimum return on investment[35].

### *Emissions Trading Mechanisms*

Innovative forms of financing are continually evolving, but one important form is offsets from Emissions Trading Mechanisms, which are a provision of the 1997 Kyoto Protocol. The idea is to quantify the externalities associated with technologies or systems that reduce greenhouse gas emissions. The most relevant of these emissions trading mechanisms for PV projects in developing countries is the Clean Development Mechanism (CDM). For a CDM approved project, Certified Emission Reductions (CERs) are awarded to a project depending on the offset that the project will make in worldwide $CO_2$ emissions. CERs can then be traded with businesses, industries, or countries that are not meeting their $CO_2$ emission targets. PV technologies create no $CO_2$ emissions (where other forms of generating electricity do), and so can be used in development projects to generate CERs. Countries or industries that are failing to meet imposed $CO_2$ emission reduction targets, may buy the “credit” earned by a PV development project.

[33] http://strategis.ic.gc.ca/epic/internet/insof-sdf.nsf/vwGeneratedInterE/so00390e.html
[34] "Renewable Energy Investment and Technology Transfer in Asia" : Tim Forsyth; 1998.
[35] *Development Banking and Finance*. Victor Murinde, 1996 (p.207)