

Global

**GLOBAL  
ENVIRONMENT  
FACILITY**

**MOHAMED T. EL-ASHRY**  
CHIEF EXECUTIVE OFFICER  
AND CHAIRMAN

May 4, 1998

Dear Council Member:

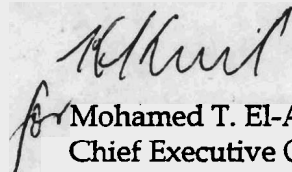
The World Bank as the Implementing Agency for the project entitled, *India, Kenya, Morocco - Photovoltaic Market Transformation Initiative (PVMTI) - (IFC)*, has submitted the attached draft project document for CEO endorsement prior to final approval of the project document in accordance with World Bank/IFC procedures.

Over the next four weeks, the Secretariat will be reviewing the proposed project document to ascertain that it is consistent with GEF policies and procedures. The Secretariat will also ascertain whether the proposed level of GEF financing is appropriate in light of the project's objectives.

The project's scope and objectives remain the same as presented to the Council in October 1996. The original proposal was to provide \$25 million in concessional financing for private sector photovoltaic (PV) projects and utilize up to \$5 million for costs associated with implementing the project. The current proposal is consistent with this allocation. However, based on detailed appraisals in the three countries following Council approval, IFC is proposing to add a significant level of technical assistance and a fund management structure with an innovative incentive mechanism. Although the total non-investment costs required to execute the project are therefore higher than \$5 million, the additional expenditures required for technical assistance and implementation from the GEF grant can be financed from the reflows from non-grant project financing. All project-related costs are summarized in a cover sheet. The details of the project implementation modalities and costs are discussed in detail in Sections VI and VII and Appendix A of the document.

If by June 1, 1998, I have not received requests from at least four Council Members to have the proposed project reviewed at a Council meeting because in the Member's view the project is not consistent with the Instrument or GEF policies and procedures, I will complete the Secretariat's assessment with a view to endorsing the proposed project document.

Sincerely,



Mohamed T. El-Ashry  
Chief Executive Officer and  
Chairman

Attachment

CC: KK, AM, DA

THE WORLD BANK/IFC/M.I.G.A.

# OFFICE MEMORANDUM

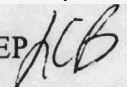
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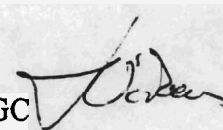
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GEF SECRETARIAT

**DATE:** June 11, 1998

**TO:** Mr. Mohamed T. El-Ashry, CEO, GEF

**FROM:** Louis Boorstin, Chief, CTEEP 

**THROUGH:** Lars Vidaeus, GEF Executive Coordinator, ENVGC 

**EXTENSION:** 36684

**SUBJECT:** **INDIA, KENYA, MOROCCO: Photovoltaic Market Transformation Initiative (PVMTI) -- Comments of GEF Council Members**

1. We have reviewed the comments of GEF Council members on the PVMTI Project Document included in Ken King's fax letter to Lars Vidaeus dated June 4, 1998. We are pleased to provide clarifications on the three points that have been raised.

## Guidelines on the Use of Concessional Resources

2. Given that commercial sustainability, expansion, and replication of PVMTI's sub-projects (either by the original sponsors or by other interested parties seeking to emulate the market success of PVMTI sub-projects) is the ultimate goal of this initiative, IFC will seek to minimize the concessionality provided to each sub-project and support those investments that are closest to being market ready. Furthermore, IFC will seek to match the financing modality (e.g., low interest loan) to the barrier or risk (e.g., excessive cost of debt) which is constraining a sub-project's implementation. Minimizing concessionality and assessing the appropriate financing modality will be achieved in several ways. Initially, the quasi-competitive nature of PVMTI's Project Solicitation will provide an incentive to sponsors to request the least amount of concession needed to catalyze their sub-project. The proposals received will provide valuable indications of what the market is likely to bear in each country. The External Management Agent (EMA) and IFC will collectively analyze proposals to determine an "appropriate" level and type of concessionality that brings the project's IRR to an acceptable level capable of attracting other commercial financing. For example, if the financial projections for a project indicate too high an expected return for the sponsors based on the risks inherent in that market, IFC will negotiate a GEF investment with a lower level of concessionality to avoid providing windfalls to sponsor companies and to avoid creating market distortions. The appropriate level of concessionality will also depend on the sponsor's financial status and the requirements of the sector they are addressing. Similarly, the Project Solicitation will request that the sponsor's specify -- subject to negotiation by IFC -- the financing modalities (concessional debt, contingent equity, guarantees, grants, etc.) best suited to the requirements of the individual sub-project and market and risk conditions in that country. The issue of the degree of concessionality is discussed in paragraphs 78-79 of the project document.

3. IFC fully intends to share the lessons learned from PVMTI's experience with concessional finance as the project progresses. IFC's investments for its own account in any PVMTI sub-project will be treated in the same manner as funding from commercial sources of financing.

4. It is not PVMTI's intention to utilize concessional resources to directly subsidize any segment of the off-grid end-user population. IFC expects that all segments of the off-grid population (including poor households) will ultimately be served by affordable PV service by encouraging the development of the market on a commercially sustainable basis including the development of appropriate credit mechanisms. PVMTI is designed to discourage direct subsidy of the equipment or services provided to the end-users.

#### **Coordination with Other Bilateral and Multilateral Activities**

5. Although PVMTI will make investment decisions independently, IFC and its EMA will coordinate closely with other established donor activities and government programs involved in this sector as appropriate. IFC reviewed all such existing activities as part of its appraisal and clearly recognizes the need to consider this information in making PVMTI investments. PVMTI will welcome proposals that show synergies with existing donor programs and benefit from lessons learned previously. For example, in Morocco, PVMTI is expected to offer practical models for franchise or concessionaire types of service provision in concert with (not in competition with) the national utility. In India, projects may benefit from the wide variety of incentives available there, but the near-commercial orientation required is expected to provide valuable market discipline that will help companies reduce their long-term dependence on subsidies. An independent evaluation of a donor-funded PV credit line in India also strongly supports the PVMTI approach. In Kenya, PVMTI projects will build on the experiences and models demonstrated by the World Bank and other donors in bringing small scale PV to a more commercial status. Finally, IFC's expectation is that PVMTI's private sector orientation can "raise the bar" for future projects and attract future donor financing and government support to more sustainable activities capable of providing significant energy resources on a larger scale.

6. To avoid "double-dipping" into GEF's limited concessional resources, PVMTI will not provide financing to any project that is receiving (or is likely to receive) GEF funds from another GEF-funded project (through any of the implementing agencies). For example, GEF funds from the World Bank's credit line for PV in India will not be used for the same projects that PVMTI invests in. Similarly, the IFC/GEF SME Program has received requests from PV companies (notably in Morocco) for funding and these companies have been advised that any funding from the SME program will preclude them from applying for a PVMTI investment (or vice versa). For exactly the same reasons, GEF resources available through REEF cannot be co-invested with PVMTI funds. However, as REEF has a significant commercial debt and equity component, PVMTI projects that also meet REEF's criteria for commercial investment could be considered by REEF's management for investment without co-financing from REEF's GEF resources – and will be treated like any other potential (commercial) source of financing including IFC's own funds.

#### **Reporting and Monitoring Between IFC and EMA and Indicators of Success**

7. IFC will monitor PVMTI's execution closely. While IFC will use the services of the EMA to assist with the evaluation, implementation, and monitoring of PVMTI sub-projects, this approach is primarily designed to provide a heightened level of technical assistance and oversight at the country level, as well as to allow for closer monitoring of sub-project implementation in each of the three countries. It is, however, important to note that IFC's oversight and responsibility for PVMTI is no way diminished by using the EMA -- which will act as IFC's agent with all decision-making remaining the sole authority of IFC staff and management. IFC's responsibilities and commitments

regarding reporting and monitoring also apply to the EMA by extension and IFC's own oversight of the EMA is described in detail in paragraphs 95-99 of the project document.

8. The EMA will take the lead in initial screening of proposals received in response to the project solicitation, but will make available all proposals -- with comment -- to IFC for review. Later in the process, proposals forwarded to IFC for consideration by the PVMTI Investment Review Committee will include the results of the due diligence undertaken by the EMA in a specified format and coordinated with the IFC project officer responsible for PVMTI. The EMA will also periodically provide summaries of all potential projects received, including reasons for rejection if any, prospects, investment status, etc.

9. After an investment is approved in a project, the EMA will review periodic progress and compliance reports from the investee companies and otherwise monitor compliance of the terms of the investment agreement, and notify IFC immediately of any defaults or potential for default. The EMA will provide quarterly reports on the status of all PVMTI investments and projects in the pipeline, and an annual supervision report on each approved sub-project including information on the achievement of strategic objectives, market activities (sales, technical performance, etc.), financial performance of the investee companies (profitability, repayment history, etc.), and any remedial action required or taken. The EMA will also certify that all conditions precedent to a disbursement have been met and then track all disbursements and repayments in quarterly and annual reports. The IFC project officer will participate in selected appraisal and supervision missions in each country and will arrange for an independent review to assess the program at the mid-point (approximately 2003) and a final review in 2008.

10. The EMA will also obtain approval from IFC for its annual operating budget and provide quarterly and audited annual reports on its expenses.

11. IFC believes that PVMTI's expected strategic outcomes, in terms of systems installed, distribution chains developed, and financing modalities established, will tend to be maximized by the competitive nature of the PVMTI concessional investment process. The overall strategic impact of PVMTI will be periodically assessed and reported by IFC. Issues regarding assessment of PVMTI's impacts are discussed in the Project Document in paragraphs 49-58.

12. The main indicators of success will be based on the rate of market growth in each country, with estimates made on the specific contributions of the PVMTI investments. In each of the three countries, PVMTI is expected to stimulate a significant increase in market growth and number of systems installed over the growth otherwise anticipated during PVMTI's 10-year lifetime. An additional long-term outcome of PVMTI will be the demonstration of profitable business enterprises that competently manage the various technical, marketing, and financing challenges facing PV. These successful business models will help set the stage for large-scale replication on a commercial (or more nearly so) basis.

**cc:** Messrs./Mmes. Raczynski, Riddle, Younger, Widge, Kennedy, Feinstein, King, Ahuja, Miller

# OFFICE MEMORANDUM

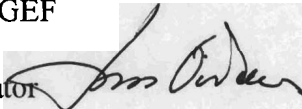
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GEF SECRETARIAT

DATE: February 2, 1998

TO: Mr. Mohamed El-Ashry, CEO/Chairman, GEF

FROM: Lars O. Vidaeus, GEF Executive Coordinator 

EXTENSION: 34188

SUBJECT: **INDIA, KENYA, MOROCCO: Photovoltaic Market Transformation Initiatives  
Final Council Review/CEO Endorsement**

1. Please find attached 2 copies of the Project Document for the above-mentioned project for review by Secretariat staff, prior to circulation to Council and your final endorsement.
2. The project document is fully consistent with the overall objectives of the proposal endorsed by Council as part of the October 1996 work program, and with guidance received from the GEF Secretariat, STAP reviewer, and GEF Council (see attached memo from Louis Boorstin).
3. Please let me know if you require any additional information to complete your review of the project document prior to circulation to Council. Many thanks, and we look forward to hearing from the Secretariat as soon as possible, so that we may prepare the 75 copies for distribution.

Attachments

cc: Messrs./Mmes. King, Ramos (GEF); Raczynski, Riddle, Kennedy, Widge,  
Younger, Albert, Feinstein, ENVGC ISC

ENVGC ISC

Tina Kimes  
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# OFFICE MEMORANDUM

**DATE:** January 26, 1998

**TO:** Mr. Lars Vidaeus, Chief, ENVGC

**FROM:** Louis C. Boorstin, Unit Head, CTEEP

**EXTENSION:** 36684

**SUBJECT:** **INDIA, KENYA, MOROCCO: Photovoltaic Market Transformation Initiative GEF Project Document**

1. Attached is the Project Document for the IFC/GEF Photovoltaic Market Transformation Initiative (PVMTI) to be forwarded to the GEF Secretariat for their final review prior to CEO endorsement.
2. CTE management reviewed PVMTI on January 7, 1998 and provided preliminary approval for IFC's implementation of PVMTI as proposed in this document. IFC will obtain final management approval following endorsement of PVMTI by the GEF CEO and will continue preparations for implementation pending that endorsement.
3. Comments on PVMTI received from the US and other GEF Council members (as recorded in ENVGC's "black book" on the project) were considered during appraisal and further development of the project. These have been addressed in the Project Document and/or incorporated in the design where appropriate. These include issues of IFC co-investment, administrative structure and operating budget for the project, investment policies and modalities for utilizing GEF funds, links to bilateral donor funding for PV projects, link to Solar Development Corporation, and credit for rural households. The comments and related issues can be discussed individually at the Secretariat's request.
4. In addition, IFC noted comments from the French Government at the GEF Council Meeting in October 1996 regarding their concern over bias for multinational corporations, the program's relationship with state-owned utilities, and their preference for PVMTI to concentrate on loans rather than grants. Each of these issues is also addressed in the program's design as detailed in the Project Document.
5. During bilateral discussions between GEF Secretariat and the Bank/IFC in August 1996, IFC was asked to consult with the GEF Secretariat on criteria for selecting sub-projects prior to receiving GEF CEO endorsement. The process for selecting and making PVMTI investments is described in the enclosed Project Document provided for review and approval by the GEF Secretariat. In this regard it should be noted that PVMTI will not be simply making awards to the "best" projects received in response to a project solicitation (request for proposals). IFC has developed criteria to screen proposals for investment rather than to select "winners" directly on the basis of this solicitation. Projects will be evaluated both on the strength of their proposed business plans and their contribution to market development and only selected for investment after appropriate due diligence. The solicitation itself will be designed to encourage competition between market players for the limited GEF funds available, maximize financial leverage in utilizing these funds, and minimize requests for grants. Providing appropriately structured concessional financing is expected to address a key barrier to adoption of PV

technologies in these markets and aid in establishing business activities (including end-user financing through intermediaries) that are likely to sustain their growth and encourage replication in due course.

6. The GEF Secretariat had also requested consultation on the use of Early Opportunity Notices (EONs). On the basis of the project appraisal activities in each recipient country, IFC has concluded that the use of EONs as envisioned earlier is no longer necessary or practical; broad consultation with existing and potential market players during appraisal was an appropriate substitute. The availability of GEF funds for investments in PV projects will be advertised in mainstream and trade publications in each country and the project solicitation documents sent to all those responding to the advertisements, as well as to all contacts made during appraisal.

7. We look forward to discussing PVMTI with the GEF Secretariat at their convenience.

**Attachment**

**cc: Messrs./Mmes. Raczynski, Riddle, Kennedy, Widge, Younger, Albert, Broadfield, Feinstein**

**IFC/CTEEP Files**

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January 26, 1998 17:09

# **India, Kenya, and Morocco**

## **Photovoltaic Market Transformation Initiative**

Project Document  
January 1998

International Finance Corporation  
Technical and Environment Department  
Environment Division  
Environmental Projects Unit

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**International Finance Corporation  
Global Environment Facility**

**Photovoltaic Market Transformation Initiative (PVMTI)  
Project Document**

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**Appendices**

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  - C. Timetable of Key Project Events
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## CURRENCY EQUIVALENT

(November 1997)

Indian Rupee 38.10 = US\$1.00

Kenyan Shilling 63.50 = US\$1.00

Moroccan Dirham 9.50 = US\$1.00

(All references to "\$" are to US\$)

## GLOSSARY OF ABBREVIATIONS

BoS	Balance of Systems
EMA	External Management Agent
GEF	Global Environment Facility
IFC	International Finance Corporation
kW, MW	kilowatt, megawatt
PV	Photovoltaic
SHS	Solar Home System
UPS	Uninterruptible Power Supply
Wp	Watt Peak

**International Finance Corporation  
Global Environment Facility**

**Photovoltaic Market Transformation Initiative (PVMTI)**

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**Grant Summary**

<b>Project Title:</b>	Photovoltaic Market Transformation Initiative (PVMTI)
<b>GEF Focal Area:</b>	Climate Change
<b>Eligible Recipient Countries:</b>	India, Kenya, and Morocco
<b>GEF Financing:</b>	US\$30 million
<b>Other Financing:</b>	US\$60-90 million in equity from investee companies, commercial debt financing, potential IFC co-financing in selected projects, and other sources.
<b>Beneficiaries:</b>	Private sector photovoltaic companies and financial intermediaries engaged in PV activities.
<b>Terms:</b>	Non-grant financing on concessional terms in loan, equity, and guarantee form; limited grants in support of business plan development and training; grants for project management and administration.
<b>Executing Agency:</b>	International Finance Corporation (IFC)
<b>Estimated Starting Date:</b>	February 1998
<b>Project Duration:</b>	10 years

## **I. EXECUTIVE SUMMARY**

1. The Photovoltaic Market Transformation Initiative (PVMTI) is a strategic intervention to accelerate the sustainable commercialization and financial viability of PV technology in the developing world. It is based on the premise that private sector project design and financing on a commercial basis will stimulate more sustainable ventures than government or donor financed PV procurements. This direct engagement of the private sector and placement of targeted financing from a limited pool of funds is expected to maximize co-financing and result in support for the most sustainable and replicable projects.

2. Photovoltaics (PV), a modular zero-emission technology that converts sunlight into electricity, has broad applicability in much of the developing world and unrealized potential for significant price reductions. Opportunities to advance PV are larger in the developing world than in OECD countries because of high growth in energy demand and because the relative immaturity of the energy sector provides entry points for alternative energy solutions. The large market potential created by these circumstances offers commercial and near-commercial opportunities to serve these growing energy needs with photovoltaics, while simultaneously improving the availability of PV for global applications and benefits. Potential PV markets now in early stages of development include: a) approximately 300-400 million unelectrified households in developing countries that are unlikely to receive grid power in the near future; b) widespread applications in water pumping and agriculture; and c) stand-alone power for commercial applications and grid-augmentation.

3. PVMTI will use up to \$30 million in funds provided by the Global Environment Facility (GEF) to provide concessional financing of private sector PV market development projects in India, Kenya, and Morocco. It is expected that approximately \$13 million of these funds will be recovered by the end of the 10 year operation of PVMTI.

4. Of the GEF funds, \$15 million is allocated for project financing in India, with \$5 million each allocated for Kenya and Morocco. The remaining \$5 million will be used for administration, implementation and supervision of PVMTI. Approximately 4 to 7 projects are expected in each country and funds placed in individual projects are expected to range from \$500,000 to \$5 million. IFC will consider investing its own funds on a case-by-case basis in a limited number of PVMTI projects which meet IFC's requirements for commercially viable investments. Additional co-financing of \$60-90 million by project sponsors and other sources (including commercial banks) is expected to result in total project costs of \$85-115 million.

5. The PVMTI program was endorsed by the respective country governments following consultations undertaken during 1996. The GEF Council approved PVMTI as part of its work program at its meeting in October 1996.

6. Use of the GEF funds is consistent with the GEF Operational Strategy and Operational Programs in climate change mitigation, and is specifically targeted at the reduction of barriers to market penetration of photovoltaic technology. PVMTI addresses GEF *Climate Change*

*Operational Strategy #6* regarding the reduction of barriers to the introduction of renewable energy technologies. The barriers to PV market development include: high technology cost and transaction costs, lack of financing for working capital and end-user credit, insufficient management skills, lack of effective distribution and service infrastructure, inadequate standards for design and installation, and a variety of policy barriers. While technology price reductions directly attributable to PVMTI (as addressed in GEF Operational Strategy #7) are expected to be modest, successful examples of market development will likely continue to be important in translating future price reductions into greater long term market penetration.

7. PVMTI projects will be designed by private sector companies or consortia and submitted in response to a broadly distributed solicitation for project proposals. Financing terms will be flexible, and most investments are expected to request below-market debt. The use of other financing such as partial guarantees, equity, or other instruments will be considered if the benefits justify the additional complexity. Project selection will be based on normal business plan criteria (including evaluation of the proposed project's financial and technical viability, management capability of the sponsors), as well as additional criteria to assess consistency with GEF policy objectives and to measure the project's strategic impact on transforming the PV market. These criteria will assess the type of financial innovation, degree of financial leverage, sustainability and replicability of projects, and the expected level of market growth. Projects will be evaluated both in absolute terms and relative to other proposals received.

8. PVMTI activities will be similar in all three country markets but the projects selected for funding will be unique to each country due to differences in government policy, demand profiles, and business infrastructure. PVMTI will magnify commercial activities in potentially large market segments now in early stages of development and demonstrate alternative models to grid extension. PVMTI is expected to have a definitive impact in increasing sales and assuring the financial viability of a number of "beacon companies" providing successful and replicable examples of good business and technical practices. The impact in each of the three national markets is expected to be significant, with sales growth over the base case ranging from 33% in Morocco to 55% in India and 66% in Kenya, and a world market increase of 5% over the life of the program. These incremental, but demonstrable, effects on reducing barriers to market growth and availability of capital are expected to accelerate market dissemination and improve the attractiveness of the sector to commercial finance.

9. IFC will implement PVMTI with the assistance of an External Management Agent (EMA). The EMA will provide a project investment manager for the duration of the program and three individual country managers during the project financing phase, expected to be completed within 2-3 years. The EMA will issue the solicitation for projects, review and screen project proposals received, perform due diligence, mobilize co-finance, undertake appropriate environmental review, and structure projects for submission to an IFC investment committee. IFC will closely supervise the EMA and will make all decisions on investment selection, approval, and recovery of funds.

10. PVMTI will provide funds on concessional terms and will operate at a level of investment that is generally smaller and more specialized than that offered by commercial financial channels. It will also provide a higher level of management oversight and technical

assistance. While these elements will increase costs above the level normally incurred by a commercial investment fund, these incremental costs are considered key to overcoming market barriers and transitioning PV business activities toward greater commercialization. Over the life of the program, PVMTI expects to recover approximately 60-70% of the invested funds, with approximately 50% available for potential repatriation to GEF. The total cost for the EMA (*including* performance-linked compensation) is expected to be about \$8 million or the equivalent of about 3.1% each year of the total funds available for investment. This is comparable to the management costs charged by fund managers for smaller or more innovative fund but *excluding* incentive payments (i.e., carried interest). Only \$4 million in EMA costs is available from the GEF grant. The balance of \$4 million will be subject to the availability of reflows from project financing.

11. The outcome of PVMTI project financing will be summarized by the EMA and IFC and presented in the recipient countries as well as internationally at future conferences or seminars. The intent will be to convey the lessons learned to other potential investors, financial institutions, and donor organizations so that they may better understand the actual risks and rewards of engaging in PV financing and continue to respond to new opportunities to replicate or expand existing PV activities financed through the program. IFC will also disseminate PVMTI's outcomes broadly within the World Bank Group and to GEF so that these lessons can be incorporated into the design of new PV and related investment programs.

## **II. PROJECT BACKGROUND**

### **Photovoltaic Technology**

12. Photovoltaics (PV) include crystalline and various emerging thin-film technologies that convert sunlight to electricity. PV manufacturing costs have dropped from several hundred dollars per peak watt (Wp) in the early 1970s to current prices of \$4 to \$5/Wp. Installed costs, including balance of systems (BoS) components such as batteries, charge controllers (and in some cases voltage inverters) range from \$10 to \$12/Wp for many applications. PV has become the least-cost, most dependable energy choice for many applications in remote locations, such as telecommunications, water pumping, cathodic protection, signaling, and housing, as well as a variety of consumer products (e.g. lanterns, walklights). Price reductions have also brought PV to the point of becoming cost-competitive for peaking and line augmentation under some circumstances.

### **Photovoltaic Markets**

13. There are approximately 300-400 million unelectrified households worldwide (representing almost two billion people) that are unlikely to be served by grid power in the foreseeable future. In the PVMTI target countries, there are approximately 75 million unelectrified households in India, 3 million in Kenya, and 2 million in Morocco. Economic growth in the rural sectors has created significant demand for access to electrical energy that is often not available from the grid. Overall capacity constraints already faced in many developing countries, coupled with high technical losses and low revenue collection rates, continue to hinder the operation of grid electricity supply systems and slow economic growth. The relatively low

energy usage and revenues available from rural customers makes grid extension in large areas a poor economic investment. Fiscal constraints are significantly limiting construction of new generating capacity, and plants that are built are highly reliant on fossil fuels.

14. These growth pressures and energy needs in both the grid and off-grid sectors, coupled with liberalization of energy sectors, price reforms, and budget constraints, continue to offer new opportunities for private, commercial power alternatives such as PV that represent a fundamentally different approach to power sector development. Commercial opportunities to expand use of PV technology are larger in the developing world because of the relative immaturity of the energy sector compared with developed countries and the enormous growth in energy demand that is outstripping supply. The major off-grid markets for PV in developing countries include telecommunications, village water and irrigation pumping, captive power for commercial applications, and small solar home systems (SHS). While currently small in scale, PV is a modular technology with broad applicability in much of the developing world at current prices. Successful demonstration of commercial PV energy systems can accelerate market dissemination to achieve global benefits.

15. Although PV markets are growing, market penetration of PV remains low, and sustained growth may remain elusive unless deliberate actions are taken to develop significant latent markets on a commercial basis and accelerate market penetration. Global PV shipments were approximately 90 MW annually in 1996, i.e. less than the capacity of a single medium-sized gas fired power plant. The business-as-usual scenario for PV indicates markets will grow by approximately 15% annually to 600 MWp by the year 2010. In order to expand PV to a scale where it can fulfill its potential as a mainstream zero-carbon energy option with global benefits, both market development and manufacturing investment are required. In particular, increased manufacturing investments in a variety of low cost thin film technologies now emerging could result in considerable price reduction. Accelerated development of markets and financing chains to deliver PV products is a prerequisite for attracting manufacturing investment, regardless of the PV technology utilized.

16. Developing country markets now account for about one-half of current PV shipments, and the lack of extended electrical grids in many of these countries makes PV competitive in a broad set of markets even at current prices. Over 500,000 SHS are now installed in developing countries, with over 80,000 systems being added annually. The large market potential that PV offers is currently constrained by high transaction costs due to undeveloped distribution chains, lack of working capital for companies, and lack of finance for customers. Manufacturing remains below optimum scales and faces a dilemma of constructing larger scale manufacturing plants without assurances that the market will absorb increased output.

### **III. PROJECT OBJECTIVES AND BENEFITS**

17. PVMTI represents a strategic intervention to stimulate PV business activity in selected countries and to demonstrate that quasi-commercial financing can accelerate its sustainable commercialization and financial viability in the developing world. The program is based on the premise that private sector project design and management will result in more sustainable

ventures than government or donor financed PV procurements alone could provide. Previous experiences with highly subsidized or give-away systems has not resulted in system longevity or widespread dissemination of the technology. It is believed that private sector sales will result in more enduring relationships with customers, a stronger sense of ownership on the part of the consumer, and will be more likely to require and sustain an adequate service infrastructure to assure continued performance of systems.

18. Commercial experience in niche markets has shown PV to be reliable and durable, and the technology itself is considered to be mature. While significant advances are still being made in manufacturing which could result in lower costs, the developments required to bring PV to a more commercial status include growth in financing, marketing and infrastructure, support for entrepreneurship, and building customer experience through delivery of value.

19. **Barriers to Market Development:** There are a number of barriers endemic to the introduction of renewable energy technologies. These barriers pose particular obstacles to small companies of the kind engaged in delivery of PV-based services that cannot absorb these costs as readily as larger, conventional energy project sponsors. The primary barriers include:

- Technology cost, while declining, remains relatively high. In spite of life-cycle costs that are competitive with power sources such as diesel, the up-front costs of PV are substantial.
- Financing for consumer credit or working capital remains expensive or unavailable, resulting in customers unable to amortize system costs over time and companies without funds to finance expansion of operations. Due to the small scale of the market and lack of familiarity with PV, banks tend to overprice the risk of operating in this sector or do not lend at all. Companies find borrowing costs prohibitive and instead finance growth out of cash flow which is usually meager. As a result, financial linkages remain undeveloped and consumer credit is generally unavailable.
- Low product volume, combined with the difficulties of developing a consistent supplier-dealer chain, results in high unit transaction costs and continues to hinder the expansion of the market. Consumer awareness also remains low.
- Managerial and technical skills remain limited among many companies selling and installing PV systems, resulting in inadequate business planning and poor cost and quality control. PV manufacturing firms, while often larger and with stronger management, typically lack the broad market reach to develop consistent and profitable distribution chains. Companies also face investments which can be considered, in part, as public goods (e.g. the benefits of raising consumer awareness or training personnel may not accrue to the company making the investment).
- Policy barriers remain widespread and create an uneven playing field for PV and other renewable energy technologies. These include market distortions in electricity tariffs, subsidies for conventional fuels, and high import taxes on PV modules, materials, and BoS components such as batteries or efficient lighting fixtures.



- Standards, certification, and accepted system design and installation guidelines are incompletely developed and are erratically applied in much of the developing world, with a detrimental effect on system performance and quality.

20. Further investment by national governments in both fossil fuel-fired generation plants with 25+ year lifetimes and grid extension or connection strategies will continue to contribute to significant growth in emissions of greenhouse gases (GHG). India, for example, currently produces over 70% of its power by burning poor quality coal and ranks second (behind China) in its rate of growth in both the power sector and aggregate GHG emissions. While developing world options for avoiding growth in carbon emitting technologies are relatively limited and require difficult economic tradeoffs, PV offers an alternative to continued, uneconomic grid-extension that can relieve some of the pressure of this growing dilemma.

#### IV. RATIONALE FOR GEF FINANCING

21. A central objective of the GEF Operational Strategy is to promote sustainable growth in development and financing of renewable energy as direct alternatives to fossil fuel combustion -- the main source of CO<sub>2</sub> emissions implicated in global warming. Growth of fossil fuel-fired power generation in the developing world has particular ramifications due to its high rate of growth, even if broad opportunities for energy efficiency are availed.

22. PVMTI specifically addresses GEF *Climate Change Operational Program #6* regarding the reduction of barriers to the introduction of renewable energy technologies. GEF funds will be primarily directed towards market development projects (not manufacturing) as this is the area considered most productive in terms of reducing barriers and increasing dissemination of PV. Successful market development projects will indirectly stimulate additional manufacturing and technical improvements, resulting in the secondary benefit of long-term cost reductions (as targeted by *Operational Program #7*).

23. In terms of reducing and overcoming barriers to building PV markets, the private sector is considered the best agent to catalyze investment and business activity to accelerate this important zero-GHG emission technology. PVMTI's solicitation and selection approach provides a competitive element that is expected to maximize financial leverage from the private sector and deliver near-commercial projects. Consistent with other GEF-supported IFC initiatives now under implementation (such as the Renewable Energy and Energy Efficiency Fund and the Terra Capital Biodiversity Fund), the results of implementing projects directly with the private sector are expected to be larger and more enduring than those that could be achieved through grants or through projects implemented by country governments with donor support.

24. PVMTI is also consistent with GEF's focus on strategic investment in technologies with substantial future potential (despite high present costs or a low present level of market development). Among the technologies fitting this description (e.g. solar thermal electric, biomass gasification, and fuel cells), PV is particularly attractive because it is modular (in applications ranging from less than 10 Wp to potentially millions of Wp), versatile (capable of

operating in stand-alone applications, in hybrid configurations, or connected to the grid), uses a solar energy resource broadly available throughout the developing world and has high potential for significant cost reduction.

## **V. PROJECT DESCRIPTION**

### **Program Background**

25. PVMTI is designed to encourage private companies offering innovative PV goods and services by providing them with concessional financing which is not available from the market or other sources. The competitive basis created by the project selection process is focused on identifying investments and modalities most likely to result in sustainable and replicable market development vehicles. As PVMTI funds are limited, some companies will receive financing and others are likely to be passed over, but successful project financing support should result in a stronger market which will eventually benefit many other market participants.

26. PVMTI will operate at a level of financing activity that is too small for most traditional IFC investment channels or international investors and in a sector that is too specialized or too risky for local commercial financial institutions. Although the average financial rate of return for PVMTI is expected to be below market rates and may include higher losses than would be expected in commercial loans or investments, the financing rationale for PVMTI is based on overcoming some of the barriers described above. The rate of return differential to be absorbed by PVMTI and the higher rate of project losses are justified by: (1) allowing PV companies to expand their existing activities more rapidly than they otherwise could have; (2) permitting financial institutions to gain experience that will enable them to price their risk accurately and thus fund PV companies on a commercial basis; and (3) broadening markets resulting in increased consumer awareness of the benefits of PV.

### **Country Markets: Expected Deal Flow and Business Case**

27. Information gathered on appraisal missions during the summer of 1997 demonstrated a potential deal flow and business case consistent with PVMTI's financing approach. About 25 projects totaling nearly \$175 million (of which more than \$100 million were in India) were identified -- even after excluding projects with a low probability of being implemented. This preliminary assessment indicates that the market should be sufficient to absorb the \$25 million of PVMTI funds.

28. The initiative has been favorably received during appraisal in the target countries as a cost-competitive financing source which is directly responsive to the financial needs of the PV industry. A wide variety of business plans showing innovation and commitment to market development have already been presented and discussed. In India in particular, a number of companies expressed a desire to diversify away from government and donor supported markets and presented viable business approaches to take advantage of significant new market niches.

29. However, a number of PV operations will find it difficult or risky to expand operations or to mobilize a high level of co-finance, and there may be a greater reluctance to form consortia than was originally expected. The current small size of many operations and the undeveloped state of many markets will likely require that PVMTI provide financing on a staged disbursement basis, especially in Kenya (discussed in greater detail below).

30. PVMTI activities will be similar in all three country markets, but the types of projects which are funded will be unique to each country due to differences in government policy, demand profiles, and business infrastructure. In India, PVMTI will likely stimulate investments and activities in new commercial (not government driven) sectors as well expand existing sectors. In Kenya, it is expected to provide working capital and end-user financing to a market dominated by small-scale enterprises that is thriving but constrained by inadequate sources of funding. In Morocco, there is a particular potential to demonstrate private franchise models and guarantee facilities (with national utility support) to finance alternatives to non-viable grid-extension.

### *India*

31. With about 11 MW in annual sales, India is the largest developing country market for PV and represents more than 10% of world PV sales. It is unique in the developing world in having a complex PV industry with multiple suppliers and many market segments. Government equipment procurements, 100% first year depreciation for corporate-owned renewable energy projects, and low cost financing (in part financed by an earlier World Bank/GEF project) available through the Indian Renewable Energy Development Agency (IREDA) have resulted in rapid growth to the current installed PV capacity of 27 MW. In response to these incentives, and given strong import tariffs on modules, over a dozen cell and module manufacturers have emerged, with almost the entire market served by indigenous manufacturing companies.

32. However, the annual market of approximately 11 MW uses less than half the available module manufacturing capacity. Approximately 80% of wafers and 50% of cells are imported, as are virtually all glass and lamination materials, so a large portion of the PV manufacturing industry consists of basic assembly operations. Module quality and efficiency are mixed, and relatively few companies would be price-competitive in world markets. The attractive government incentives have also served to distract some companies from quality and customer value. Many systems are poorly installed and do not perform well. The overall Indian market suffers from high customer dissatisfaction and limited market penetration outside of government purchases. As in the rest of the developing world, the SHS market and consumer financing modalities have not been well developed. The “business as usual” scenario for India is that growth would continue to rely on government subsidies and PV would fail to capitalize on the potential to benefit from the acute shortfall in electricity supply.

33. Despite these shortcomings, India remains an attractive market. While 85% of villages are nominally on the grid, household connections are very limited, and power quality and availability are low. There is a burgeoning middle class desiring and able to afford small power systems, and household, commercial, and agricultural customers alike are increasingly frustrated with the inability of the grid to deliver reliable power.

**Table 1: Anticipated Deal Flow for India**

<b>Sponsor</b>	<b>Project</b>	<b>Project Cost (US\$)</b>	<b>Potential Volume Increase</b>	<b>Potential PVMTI Investment (US\$)</b>
PV manufacturer + distributor	Solar home system retailer	10 m	0.8 MW	2.5 m
PV manufacturer + NGOs	Build network of off-grid dealerships	55 m	17.5 MW	5.0 m
PV manufacturer	Solar home system/lantern retailer	5 m	1.0 MW	1.25 m
BOS supplier	Solar home system retail	2.5m	0.8 MW	1.0 m
BOS supplier	Develop market for uninterrupted power supply systems	22 m	1.5 MW	3.0 m
BOS supplier + NGOs	Water pumping systems for housing projects	10 m	1.3 MW	1.0 m
General business conglomerate	PV telecommunications	30 m	2.0 MW	5.0 m Low probability
Pump manufacturer	Develop end-user finance for PV pumping	65 m	12.0 MW	5.0 m Low probability
BOS supplier	Retail networks for PV applications	12 m	2.5 MW	3.0 m Low probability
BOS supplier	Retail networks for PV applications	2.5 m	0.8 MW	0.75 m Low probability
<b>Total 1</b>	<b>All above projects</b>	<b>214 m</b>	<b>40 MW</b>	<b>27.5 m</b>
<b>Total 2</b>	<b>Excl. low probability projects</b>	<b>105 m</b>	<b>22.9 MW</b>	<b>13.8 m</b>
<b>Total 3</b>	<b>Including 35% of low probability project values</b>	<b>143 m</b>	<b>28.8 MW</b>	<b>18.6 m</b>

34. The case for PVMTI in India is predicated on a business environment characterized by strong financial skills, a broad technical base capable of significant improvements, and a strong desire within the industry to diversify beyond government assisted markets. Significant additional benefits will include: strengthening existing key players; increasing the range of good quality urban and rural applications of PV; and introducing new organizations to the industry with consumer marketing and customer financing expertise. Sufficient deal flow (summarized in Table 1 above) has been identified to invest all of the available \$15 million of PVMTI funds at an expected leverage ratio of about 3:1. Even though only 4-7 projects are likely to receive PVMTI funds, financing in these projects is expected to be instrumental in increasing annual sales by more than 50% over the 18 MW annual sales base case projection for 2003.<sup>1</sup>

<sup>1</sup> The appraisal team estimated base case or business-as-usual scenarios for each of the country markets from historic growth rates and other information gathered from various reports and meetings with potential private sector investee companies. Actual growth rates could be substantially different depending on world PV prices and availability, the impacts of other PV incentive programs, and economic conditions in the three countries.

## *Kenya*

35. Kenya is viewed as a true free market for PV products. Three quarters of the population (some 20 million people) live in rural areas, and there are now over 50,000 solar home systems installed. The SHS installation rate exceeds the rate of rural grid connections provided by the government-operated Kenya Power and Light Co. The current market is approximately 0.3 MWp per annum, the vast majority of which is for small systems often utilizing 12 Wp amorphous silicon modules. Although there is no indigenous cell or module manufacturing capacity, there is some local BoS manufacturing and assembly of widely varying quality. Despite some inconsistencies in import tariffs, the government is broadly supportive of PV technology imports.

36. While Kenya offers a promising private-sector driven market, many Kenyan PV companies are quite small and have inadequate management and technical skills. In many cases, these companies are unable to design and install reliable products. An extremely high level of cost consciousness leads many consumers to purchase PV components and assemble/install systems on their own, resulting in wide variations in quality and the use of undersized and sometimes inferior modules. The vast majority of sales have been for cash, and financial institutions operating in rural areas have only recently begun to experiment with offering services to the PV sector. While quality problems are acute and could result in long term consumer dissatisfaction, current satisfaction levels with SHS are over 60% and consumers show considerable understanding of the limits and benefits of PV systems.

37. It is anticipated that the majority of proposals submitted to PVMTI will be related to distribution of SHS. In addition to investing in companies directly, there is particular potential for PVMTI to provide capital to Kenyan banking institutions capable of on-lending funds for individual consumer credit and as working capital at affordable rates for companies too small to apply for direct PVMTI financing. Sufficient deal flow (summarized in Table 2 below) has been identified to invest \$5 million of PVMTI funds over time in 4-7 projects at an expected leverage ratio of about 1:1. The size of the projects likely to be proposed and the absorptive capacity of both the market and individual companies indicates that projects selected for PVMTI financing should be undertaken in stages -- with disbursement of funds phased over a longer time period than is expected for India or Morocco. Even though the level of PVMTI financing in individual projects is initially expected to be small, these projects will be instrumental in increasing annual sales by more than 60% over the 0.6 MW base case projections for 2003. It is also strongly recommended that additional training, business advisory, and consumer awareness initiatives be undertaken in Kenya to facilitate sustainable market growth and improve the likely performance of the project portfolio. These services are likely to be subsidized using PVMTI funds (either as direct grants to investee companies or as additional required financing at more favorable terms) and will be provided locally through the EMA or its consultants.

**Table 2: Anticipated Deal Flow for Kenya**

Sponsor	Project	Project Cost (US\$)	Potential Volume Increase	Potential PVMTI Investment (US\$)
Battery manufacturer	Develop battery dealerships	1m	0.2MW	0.5m
Battery manufacturer	Develop market for new PV battery	1m	0.15MW	0.5m
PV distributor	Build dealership network	1m	0.15MW	0.5m
PV distributor	Develop solar home system sales and end-user finance	1m	0.1MW	0.5m
Bank	Develop end-user finance schemes	1.5m	0.2MW	0.75m
Bank	On-lend to small distributors	1.5m	0.2MW	0.75m
Bank	On-lend to small distributors, NGOs, tourist operators	1m	0.1MW	0.5m
Bank	On-lend to small distributors, NGOs, large agro-industrial cos.	1m	0.1MW	0.5m
(Reserve)	Quality guidelines, training and standards support as necessary. Reserve funds for additional loans to above companies	1m	0.1 MW	0.5m
<b>Total</b>		<b>10m</b>	<b>1.3MW</b>	<b>5m</b>

**Morocco**

38. The Moroccan PV market to date has been largely government driven. As of 1997, approximately half of the population has been electrified with a grid that is largely reliable. Building on a sequence of rural electrification programs, the government is committed to electrifying much of the country (an additional 1.6 million households) by 2010, and has indicated that approximately 5 percent of those buildings will likely be electrified using off-grid solar and wind technologies. The state owned electricity provider, the Office Nationale du Energie (ONE), is now willing to contract for private PV-based electricity for these services and has recently undertaken its first such contract on an experimental basis.

39. Sources indicate an installed PV base of 2 MWp with annual installations of around 500 kW. Import of panels by immigrant Moroccans returning from Europe is believed to have contributed a further 1 MW to the installed base and currently accounts for an additional 500 kW per annum.

40. There is a strong rationale for PVMTI financing in Morocco to be integrated closely with the national commitment to rapid rural electrification, and private sector participation is seen as greatly increasing the chances for success in sectors served by PV. Sufficient deal flow (summarized in Table 3 below) has been identified to invest \$5 million of PVMTI funds at an expected leverage ratio of about 2:1. Even though only 4-7 projects are likely to receive PVMTI funds, the financing in these projects is expected to be instrumental in increasing annual sales by more than 30% over the 1.5 MW base case projections for 2003.

**Table 3: Anticipated Deal Flow for Morocco**

Sponsor	Project	Project Cost (US\$)	Potential PV Volume Increase	Potential for PVMTI Investment (US\$)
BOS Supplier	Retail networks for PV application	5 m	550kW	1.5 m
Solar Home System Retailer	Retail and networks for SHS finance	6.2 m	450kW	1.5 m
Rural Services Company	Village lighting and water supply	44 m	2.1MW	3.0 m
Solar Home System Retailer	Retail and networks for SHS finance	32 m	820kW	2.0
PV Integrator and Distributor	Large-scale village lighting and water supply	4 m	400kW	1.0 m
PV Integrator and Distributor	Rural community and mini-grid services for electricity and water supply	16 m	600kW	1.5 m
<b>Total</b>		<b>107 m</b>	<b>4.9 MW</b>	<b>11.5 m</b>

### **PVMTI Project Impacts**

41. PVMTI will provide financing to private enterprises in India, Kenya, and Morocco engaged in PV market activities including sales, distribution, installation, and service, and in related activities providing financing or leasing services to the PV sector. PVMTI is expected to have a major impact in increasing sales and assuring the financial viability of a number of "beacon companies" providing successful and replicable examples of good business and technical practices.

42. With current global shipments approaching 100 MW per annum and expected to double within 3-5 years, it is expected that PVMTI investee companies will increase those shipments by 11 MW per annum within five years, i.e., approximately 5 percent of the global market at that time. Although this is not a market transformation in absolute or global terms, the impact in each national market will be significant, ranging from 33% in Morocco to 55% in India and 66% in Kenya. These incremental, but demonstrable, effects on reducing barriers to market growth and availability of capital are expected to accelerate market dissemination and improve the attractiveness of the sector to commercial finance. A summary of the expected impact of PVMTI is given in Table 4 below.

Country	Current Annual Sales (MW)	Sales Expected in 2003 without PVMTI (MW)	Sales Expected in 2003 with PVMTI (MW)	% Increase with PVMTI	PVMTI Investment	Expected Minimum Leverage	Co-financing Likely Over Life of Project (US\$ million)	Total Investment in PVMTI Projects (US\$ million)
India	11.0	18.0	28.0	55%	15	3:1	45-60	60-75
Kenya	0.3	0.6	1.0	66%	5	1:1	5-10	10-15
Morocco	1.0	1.5	2.0	33%	5	2:1	10-20	15-25
<b>Total</b>	<b>12.3</b>	<b>20.1</b>	<b>31</b>	<b>54%</b>	<b>25</b>	<b>2.4:1</b>	<b>60-90</b>	<b>85-115</b>

43. At this level of increased shipments, PVMTI is unlikely to have a direct impact on technology cost (except in cases where projects are linked to long-term reduced cost supplier commitments). However, these estimates do not account for the likely multiplier effects from expansion or replication of successful projects. By supporting the growth and management skills of companies, and encouraging the entry of financial institutions into PV financing, PVMTI will be able to demonstrate to other market players how the PV market can be successfully approached.

44. As an IFC-executed, private sector project, direct opportunities for policy intervention are limited. However, by increasing the success and profile of the industry, PVMTI can demonstrate PV's value as an alternative to grid extension and as a commercial focus for local business, and may informally be able to influence policy and standards issues.

45. **Global Benefits.** The project is expected to displace 1.2 million tons of carbon at a cost per ton (undiscounted) of \$14.70 (see appendix on Incremental Costs). Additional long-term effects resulting from increased market activity, reducing market barriers to PV dissemination, and successful demonstration of private-sector-based financing schemes are anticipated to create a strong multiplier effect. PVMTI will magnify commercial activities in potentially large market segments now in early stages of development and demonstrate alternative models to grid extension. And while many components will remain imported in the near term, PV offers an opportunity to harness -- in many cases with local labor and component inputs -- the solar resource found throughout most of the developing world. An additional potential benefit could



be to help effect a shift in other donor funding sources toward more sustainable commercial financing vehicles.

46. Formal evaluation of the program by an independent consultant will be undertaken 4-5 years from the launch and at program closure, but anecdotal evidence will be available sooner. The outcome of PVMTI financing will be summarized by IFC and the EMA and presented in the recipient countries and internationally at workshops, conferences or seminars. The intent will be to convey lessons learned to additional potential investors, financial institutions, and donor organizations so that they may better understand the demonstrated risks and rewards of engaging in PV financing and continue to respond to new opportunities to replicate or expand these activities. IFC will also communicate the PVMTI outcomes within the World Bank Group and to GEF so that these lessons can be incorporated into the design of new investment activities.

47. **Additional Domestic Benefits.** In-country entrepreneurial interests will be able to respond to expanded opportunities for organizing PV distribution, assembly, and financial enterprises, with associated increases in local employment. Rural energy users will have access to a renewable energy resource with higher lighting values without the smoke and fire risk associated with traditional lighting sources (e.g., kerosene lanterns, candles). Non-rural users -- commercial and private -- will have expanded options to receive reliable power. PVMTI will also help offset requirements for rural grid connections, freeing the power sector to concentrate on more profitable core activities.

### **Likely Projects and Participants**

48. PVMTI will invest up to \$25 million in GEF funds in PV projects designed by private sector companies or consortia and submitted in response to a request for proposals distributed by the EMA in all three countries. Of the GEF funds, \$15 million is allocated for project financing in India, with \$5 million each allocated for Kenya and Morocco. The remaining \$5 million will be used for administration, implementation and supervision of PVMTI. Approximately 4 to 7 projects are expected in each country and funds placed in individual projects are expected to range from \$500,000 to \$5 million. Additional co-financing of \$60-90 million by project sponsors and other sources (including commercial banks) is expected to result in total project costs of \$85-115 million

49. Project approaches could include expansion of existing sales and distribution networks or entry into new markets, distribution partnering with manufacturers and integrators of complementary equipment (such as BoS components, pumps, diesel generators, and other consumer products). Projects may include companies organized as mini-utilities and providing PV services through system leases rather than sales or development of franchise territories under arrangement with country utilities. Participants are expected to include manufacturers, distributors, system and service integrators, as well as financial institutions participating directly in projects or on-lending to smaller projects.

50. Off-grid PV projects could aggregate large markets now in very early stages of development, including individual households, farmers, individual entrepreneurs/micro enterprises, commercial enterprises, and community facilities (e.g. schools, clinics, etc.) in

regions unlikely to be served by the grid. Major applications include SHS in the 20-500 Wp range; agricultural water pumping to reduce reliance on diesel pumpsets or erratic grid supplies and/or increase crop yield; and small power plants serving commercial end users, municipalities and villages, in the 10 kW to 500 kW range and potentially operating in a hybrid configuration (with wind, diesel, or other power sources).

51. PVMTI will likely provide some financing for projects that include grid inter-connection, such as rooftop installations for peri-urban housing or commercial captive power applications to provide reliable power and/or relieve peak loads. Such projects could augment grid power, and in some cases could include contractual arrangements for feeding excess power to the grid in exchange for payment, for priority dispatch, or other arrangements. However, grid-connected PV power stations -- which would have to compete economically with conventional power sources -- are not considered to offer realistic commercial opportunities at current PV prices and would be ineligible unless they could demonstrate significant "value added" over alternative sources of grid power.

52. PVMTI will consider financing of manufacturing, BoS and systems integration, and PV-related ventures including battery companies. However, financing of free-standing PV manufacturing efforts not explicitly tied to a parallel market development effort will be considered outside the scope of PVMTI.

### **Type of Financing**

53. PVMTI investments will be oriented toward reducing risk and providing financing not available in local markets and will not be provided for restructuring of a company's balance sheet. Financing is expected to be primarily low-cost debt (60-70% of funds). Debt is required by wholesale distributors of PV systems to overcome cash flow constraints and high costs or poor terms of credit currently available. Funds could be used for downstream credit mechanisms for customers or as working capital for development and expansion of sales and distribution systems. The use of partial guarantees (10-20% of funds) and/or equity (10-20%) will be considered if the specific obstacle or risk to be addressed calls for these types of investments and justifies the additional complexity. Equity could be used to capitalize new ventures or expand existing activities to a scale sufficient to sustain profitable operations and attract commercial debt financing. Partial funding of guarantees may be required to secure end-user credit schemes offering credit or lease financing directly to consumers, and could play an important role in mobilizing commercial capital. About 10% of the investment funds are expected to be provided as grants for technical assistance, training, development of standards, or other uses required to support individual projects or the country portfolio.

### **Investment Size and Leverage of PVMTI Funds**

54. The absorptive capacity of individual country markets estimated during appraisal provided guidance on the overall size of projects and potential for leverage. In order to maintain a scale of financing conducive to market development and to limit the transaction costs associated with selecting and managing a portfolio of projects, PVMTI will require a minimum level of PVMTI investment for each country. The proposed minima are: \$1,000,000 in India,

where PV companies are of a significant size and the deal flow is expected to be strong; and \$500,000 in Morocco and Kenya, where PV companies are smaller and less numerous. IFC may consider lowering these minima at a later stage should an adequate deal flow not be forthcoming.

55. In addition, project evaluation criteria will consider the presence of financing from other sources. Leverage of at least 1:1 will be required in all countries, and projects with additional leverage to magnify PVMTI investment and share risk will be considered more favorably. The expected leverage level for India, where many PV companies have strong balance sheets and financial institutions are relatively sophisticated, is 3:1. For Kenya and Morocco, where PV companies have weaker balance sheets and there are few financial institutions operational in the sector, the expected leverage levels are 1:1 and 2:1 respectively. Remaining funds will be provided through: (1) sponsor's own funds (or those of its partners) as equity, in-kind services, or other risk-sharing consideration; (2) commercial financing, (3) government investment, and (4) additional donor institution investment (only if required and available in a non-distorting form). IFC will consider investing its own funds on a case-by-case basis in a limited number of PVMTI projects which meet IFC's requirements for commercially viable investments.

56. As PVMTI is primarily a private sector initiative, direct government investment is expected to be minimal. However, government support of franchised projects is likely in Morocco. Similarly, donor co-financing appears less likely than originally anticipated. However, funds may be available from KfW and other donor sources through the Indian Renewable Development Agency (IREDA) as an extension of their IBRD/IDA/GEF-funded financing window for PV equipment<sup>2</sup>, and from co-financing by the Dutch Ministry for Overseas Cooperation in Morocco and Kenya. As noted above, such donor funds will only be used if needed and in a way which is consistent with the near-commercial approach adopted by PVMTI.

57. Approximately 90-95% of the \$25 million available as program funds is expected to be placed as concessional finance and only 5-10% as direct grants. Grants will be limited to activities believed important to support individual PVMTI investments or portfolio within each country. These uses could include technical/business training, technology validation or certification, public awareness, and support of policy initiatives. When possible, such use of funds will be incorporated into the project financing packages, and IFC will consider necessary changes in the financing terms to internalize the cost of such support. Should the deal flow from the initial solicitation be inadequate, additional small grants will be considered for further development of business plans

### **Project Solicitation and Selection**

58. A formal PVMTI Project Solicitation, or a request for proposals, will be used to solicit innovative private sector projects. The solicitation will be issued through normal media

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<sup>2</sup> PVMTI is expected to build on the lessons learned in implementation of this program, which primarily provides concessional funds for equipment finance. As an IFC-executed program, PVMTI will respond directly to private sector entrepreneurial requirements (including working capital, end-user credit programs, and financial guarantees) on flexible terms.

channels, industry listings, and country contacts developed during appraisal missions and other inquiries. The period for response is expected to be approximately three months.

59. Investment terms for the proposed projects will initially be suggested by project sponsors who will be invited to request investment on terms to be negotiated with IFC. Terms for financing will be flexible and are expected to include features such as below market rates and longer-than-usual grace periods. However, as IFC will be providing strategic financing from a limited pool of funds, proposers will have a natural incentive to maximize the attractiveness to IFC of the terms proposed. IFC will negotiate investment terms at a level commensurate with the risks posed in individual markets and thereby avoid windfalls to recipient companies.

60. Evaluation criteria for sub-projects are under development and have benefited from dialogue with potential private sector participants during appraisal missions. Project selection will be based on normal business plan criteria (including evaluation of the proposed project's financial and technical viability and management capability of the sponsors), as well as additional criteria to assess consistency with GEF policy objectives and to measure the project's strategic impact on transforming the PV market. These criteria will evaluate the type of financial innovation, degree of financial leverage, sustainability and replicability of projects, and the expected level of market growth. Projects will be evaluated both in absolute terms and relative to other proposals received.

61. Following financial and technical due diligence, qualifying projects will be presented for review to the IFC PVMTI Investment Committee which will consist of representatives from IFC's Environmental Projects Unit and Power Department with input solicited from the appropriate regional departments.

62. A limited number of projects received within the initial three-month proposal window are expected to offer strong business plans and relatively complete financing packages. These "priority track" projects will receive preliminary commitments of funds subject to meeting project milestones and coming to financial closure. If all funds are not committed to projects received in the initial 3-month window, PVMTI will continue to accept proposals for investing the balance of the funds on a first-come, first-served basis for up to two years. Business development and technical assistance may be provided by PVMTI to proposers submitting proposals in this "secondary track" (projects meeting the original submission deadline but not considered ready for investment in the priority track as well as projects submitted following the deadline) to develop proposals to a satisfactory level and/or attract additional co-financing.

## **VI. PVMTI ADMINISTRATION AND BUDGET**

63. To reduce internal transactions costs and benefit from additional country-specific, technical and fund management expertise, IFC management decided to implement PVMTI with the assistance of an External Management Agent (EMA). On the basis of a limited competitive solicitation, IFC selected a consortia including Impax Capital Corporation and IT Power Ltd. This team offers a broad range of experience and qualifications in business development, PV specific technical and applications skills, financial engineering and capital mobilization experience, project management abilities, and direct business experience in the target countries.

These companies have worked as lead consultants during the appraisal phase of PVMTI and are expected to be engaged as the EMA.

64. **Impax Capital Corporation Ltd.** provides fund raising and financial advisory services for environmental investments. The company has a track record of structuring and arranging finance for developers of projects in renewable energy, waste management, and wastewater treatment, and to date has secured over \$150 million for its clients. Impax is authorized by the UK Securities and Futures Authority to provide investment services.

65. **IT Power Ltd.** is a leading energy consulting firm which specialized in renewable energy engineering and related economic, financial, commercial and environmental considerations. Since its formation in 1981, IT Power has completed over 500 projects for numerous government and private sector clients in over 60 countries. The company's expertise spans market analysis, project identification and program management in a spectrum of renewable energy technologies, including PV, solar thermal, wind, biomass, small-scale hydro, tidal and wave power.

66. The EMA will implement and manage PVMTI for its duration in the three countries under close monitoring and supervision by IFC. In the initial implementation of PVMTI, the EMA will take responsibility for soliciting proposals and marketing the initiative. Thereafter, they will take primary responsibility for screening and short-listing projects, performing due diligence, and structuring and closing the PVMTI investments. For some projects, their role will include providing assistance in mobilizing additional co-finance. To administer the program, the EMA will hire a chief investment manager based in London and individual country managers on a full-time basis during the investment phase (3 years). Following this period, this investment manager will remain assigned to the program on a half time basis for the remaining 7 years. Additional technical and business consulting will be contracted as required.

67. The EMA will be closely supervised by IFC which will make all final decisions relating to investment and recovery of PVMTI funds. While the EMA will review and recommend projects to IFC, final project selection and approval will remain solely an IFC responsibility. One staff member from IFC's Environmental Projects Unit will coordinate PVMTI activities, devoting significant time during the investment phase which should decline to a smaller supervisory role in later years. The PVMTI investment committee referred to earlier will include the head of IFC's Environmental Projects Unit and one nominee from IFC's Power Department with appropriate input from the relevant Regional Investment Department. Preparation of legal documents will be performed primarily by the EMA on the basis of short forms to be developed by IFC's Legal Department. Once the projects are submitted to IFC for consideration, the Legal Department will review and approve the draft documents as well as the basic legal review of other documents and arrangements conducted by the EMA during the course of their due diligence. Environmental reviews will similarly be performed by the EMA (after initial training by IFC) and forwarded to IFC for final approval.

68. It is expected that most sub-projects will be under implementation within the first two to three years of program operation. The EMA will supervise disbursements and monitor

repayment schedules over the anticipated 8-10 year program life and provide management and technical advice to projects as necessary to assist them in meeting their business objectives.

## **VII. USE OF GEF FUNDS**

69. Table 5 below provides a breakdown of the anticipated use of GEF funds. Of the \$30 million provided by GEF, \$25 million is intended for investment in projects, with approximately 5% to 10% expected to be used as direct grants supporting individual projects or the country portfolio (as described earlier). The remaining \$5 million will be reserved for implementation and supervision costs of the EMA and IFC. An additional requirement of \$4.5 million for implementation and supervision costs will be met from funds recovered from investments.

70. Investment terms (as described earlier) are to be proposed by investee companies in response to the PVMTI Solicitation, and are subject to negotiation by the EMA and IFC. Debt is expected to include a broad range of below-market rates, and may include longer than usual terms or repayment periods; all funds, however, are expected to be recovered and will be treated as such in all loan covenants. The benefits of using equity investments would need to justify the additional complexity, and such investments would require an exit strategy acceptable to IFC. Likewise, guarantees are expected only to be approved if justified, and will be considered for risk mitigation and not as grants.

71. To stimulate and support innovative projects, PVMTI will accept average financial rates of return on its financing at below market rates. PVMTI will also operate at a level of investment that is generally too small for traditional IFC channels and in a sector that has generally not been financed by local financial institutions, and will offer a higher level of management oversight and assistance than would ordinarily be offered by a fund targeted at fully commercial investments. While both elements will increase costs above the level normally incurred by a commercial investment fund, they are considered important to enable the projects to overcome the competitive and distorting pressures created by market barriers. This flexible approach, while initially on concessional terms, is directed at transitioning PV business activities toward fully commercial status.

72. Losses: There is potential for part or all of individual investments to not be fully recovered. IFC will mitigate against this risk through appropriate due diligence and risk participation from investee companies or partners. Security mechanisms will be used as available and appropriate. In addition, as PVMTI seeks to develop PV markets that would otherwise rely on financing in the local currency, PVMTI may need to absorb the foreign exchange (forex) risk imposed by using OECD-denominated GEF funds as required.

73. EMA Compensation: The EMA will be compensated for expenses during program operation, including services of the EMA project manager, three country managers, and consulting budgets for business and technical assistance for investee companies preparing secondary track projects. Additional fees will be paid on a performance basis as incentives to place the PVMTI funds as quickly and efficiently as possible in each of the three countries; promote the growth of all recipient companies irrespective of the financial instrument used; and

meet agreed criteria on achieving strategic market acceleration goals. A significant portion of compensation will be deferred to provide incentives for good project performance, recovery of funds, and returns on the portfolio to ensure active engagement of the EMA throughout PVMTI's duration. Fees will be paid partly from PVMTI administrative funds and partly from repayments by investee companies ("reflows"). Incentive compensation for meeting performance targets will be derived exclusively from project reflows. The total cost for the EMA (*including* performance-linked compensation) is expected to be about \$7.8 million or the equivalent of about 3.1% each year of the total funds available for investment. This is comparable to the management costs charged by fund managers for smaller or more innovative fund but *excluding* incentive payments (i.e., carried interest).

**Table 5. Expected Use of GEF Funds**  
(All figures in US\$ million)

<b>GEF Funds Available</b>	<b>30.0</b>	
Investment Funds	25.0	
Debt, Equity, Guarantees (90%)		22.5 (non-grant investments)
Grants (10%)		2.5
Reserve for Implementation Costs	5.0	
<b>Expected Performance of Non-Grant Investments</b>	<b>22.5</b>	
Losses (33%)	-7.5	(non-recovery, forex, etc.)
Returns on Performing Investments (15%)	+2.25	(interest income/equity gains)
Implementation Costs Required from Reflows	<u>-4.50</u>	
<b>Expected Recovery for Repatriation to GEF</b>	<b>12.75</b>	

74. IFC's total costs (including legal, monitoring and evaluation, and independent program review) are expected to be about \$1.7 million over the ten years. These costs will be paid partly from the \$5 million reserved for implementation costs and supplemented with funds recovered from investments.

75. Reflows not directly required for EMA compensation will be held by IFC in a separate account. IFC will perform an interim program evaluation in 2003, and at that time will discuss with the GEF Secretariat options for disposition of recovered funds (e.g. repatriate funds to GEF, provide follow-on investment in existing projects or solicit new projects, or other use of funds to be mutually agreed upon with GEF). Additional information on use of GEF funds is included in Appendix A on Incremental Costs.

## VIII. MONITORING AND EVALUATION

76. The EMA will be responsible for day-to-day monitoring of PVMTI investments. Investee companies will be required to present a summary of performance quarterly and a set of audited accounts annually to the EMA, with summary reports provided to IFC. The EMA and

IFC will visit a selection of investee companies periodically to verify financial performance and status of project operations.

77. Environmental reviews will be performed by the EMA and approved by IFC. Selected investments will be reviewed periodically over the life of the investment to ensure compliance with environmental policies and guidelines of the World Bank Group.

78. A mid-term program review will be performed in 2003 and a final program review in 2008. Reviews will be contracted by IFC to an independent consultant. They will include analysis of the financial performance of the investments and the overall program, evaluation of the strategic gains of PVMTI in terms of accelerating PV dissemination, and estimation of the GHG reductions associated with the program (direct and induced).

79. Environmental impacts of PVMTI are expected to be minor and primarily related to increased use and disposal of batteries as related to individual system operation. The PVMTI Solicitation will request information on mitigation of this impact in project operations. Some emerging PV technologies, such as Cadmium Telluride, pose potential hazards in the manufacturing process but the risk from completed modules is insignificant. Few such modules are expected to be sold as a direct result of PVMTI.

## **IX. PARTICIPATION AND SUSTAINABILITY**

80. Country consultations supported by PDF Block A funds administered by the World Bank were undertaken in all three countries as described earlier. The consultations resulted in strong expressions of both government and private sector support for the initiative. During appraisal, a variety of government representatives, manufacturers, suppliers, NGOs, and foundations were also consulted by IFC in preparation of PVMTI. Their advice on market development needs and implementation options has been incorporated into program planning and documentation.

81. PVMTI's financing will respond to the business and financing needs as articulated by investee companies themselves and will benefit both the local business and financial sectors. Availability of this financing will directly stimulate applicants to stretch their technological and marketing capabilities in pursuit of profitability, which will provide the greatest possible long-term sustainability. Indirectly, end-use customers will benefit from greater variety in energy choices and an increased ability to have systems maintained by local entrepreneurs. The competitive element of project selection, combined with evaluation factors addressing both normal business criteria and strategic objectives for PV, will result in participation by market players of different sizes and offering a variety of products and services. In particular, PVMTI is expected to assist PV companies to develop a track record that will help them obtain financing at commercial terms and encourage financial institutions to provide financing services to companies and end-use customers.



## **X. LESSONS LEARNED**

82. IFC is a leading investor in private power markets through loans and equity, syndication, and participation in infrastructure funds. While much of the PV industry is not currently large or mature enough to benefit from IFC's mainstream offerings in project finance, IFC recognizes the value that PV and other small-scale renewable energy technologies hold for the future and the role these technologies have within IFC's development mandate. PVMTI is a strategic intervention directed at helping to bring PV financing to a scale and maturity where it can be provided by mainstream financial markets. IFC's investment expertise and endorsement of selected projects is seen as a key part of cultivating the commercial discipline required.

83. PVMTI builds on lessons learned from "market pull" initiatives undertaken over the last several years in North America and Europe that utilize financial incentives and private sector engagement to encourage, facilitate, and accelerate market entry of new energy and energy efficiency technologies. PVMTI was initially modeled after the "Golden Carrot" initiative, a \$30 million incentive offered by a consortia of U.S. utilities to stimulate the design and market entry of energy efficient CFC-free refrigerators. Other market pull initiatives in Northern Europe have targeted energy-efficient appliances and lighting.

84. Other World Bank projects (some with GEF support) have had successes in raising customer awareness and installations of PV systems and addressed the up-front pricing barrier by providing subsidy elements and/or equipment finance. However, in some cases, government/donor activities in PV have undermined local price competition and undermined customer ownership (reducing cost recovery required for commercial operation). World Bank procurement guidelines have also hindered the logical development of commercial supply relationships in some cases. In contrast, PVMTI will respond to private sector innovation and financing needs, provide capital for project -- not equipment -- finance, and minimize subsidies to the end user.

85. PVMTI is directly consistent with other GEF-supported IFC initiatives such as the Renewable Energy and Energy Efficiency Fund (REEF) and the Small and Medium Enterprises Program (SME). These approaches also engage the private sector to attract projects and provide additional financial intermediation to transition these activities to a more fully commercial status. REEF, now undergoing syndication and expected to begin operations in early 1998, could potentially serve some of the project pipeline addressed by PVMTI. However, REEF will focus on larger projects requiring a lower level of concessionality and management oversight, and REEF will not co-finance PVMTI projects. SME has invested in an off-grid PV project in the Dominican Republic through an Intermediary and has approved a \$750,000 investment in Grameen Shakti, a Bangladesh SHS distribution effort by an affiliate of the Grameen Bank which has had notable success in micro-credit services to very small enterprises and individuals. These projects are similar to some potential projects expected to be supported by PVMTI but are not in PVMTI countries. SME and PVMTI will not co-finance projects.

86. PVMTI will also serve as proof of concept for the proposed Solar Development Corporation (SDC), a PV business advisory and finance program being developed to operate in

all developing countries. A feasibility study for SDC has recently been completed. Depending on the success of PVMTI, SDC could introduce analogous financing and intermediation in a much broader set of countries and markets, and is likely to be presented for consideration by GEF at the appropriate stage.

## **XI. PROJECT RISKS AND ISSUES**

87. As an investment vehicle, PVMTI poses some unique risks that could potentially impede both investment performance and achievement of GEF strategic objectives.

88. **Deal Flow** -- It may prove difficult to attract an adequate number of quality projects with co-financing at the projected levels, or an unexpectedly large number of projects might fail to survive the due diligence process. While the appraisal process identified an adequate deal flow and an acceptably strong business case for PV financing, it may be necessary to extend the period for completing financing with PVMTI funds (through the expected Secondary Track review and preparation of projects) and/or reduce the required levels of leverage from other sources.

89. **Absorptive Capacity** -- Most of the market niches identified by the PVMTI appraisal process as commercial opportunities remain small and at very early stages of development. Development of PV markets will be constrained by the pace at which the new technology is adopted by customers, and how new distribution and financing networks can best be extended. Making multiple and simultaneous investments could in some circumstances result in market distortions. IFC will reduce the risk of distortions by communicating the aims and intentions of PVMTI fully to the international community and by negotiating with potential investee companies to ensure that the proposed terms are as close to market norms as possible.

90. **Management Capabilities** -- Despite having a sound business plan and stable economic fundamentals, investee companies may fail to deliver as a result of weak management. Technical staff may fail to develop adequate quality assurance systems resulting in poor quality installations. Marketing staff may fail to reach target consumer groups or convince them to make system purchases. Staff responsible for financial control may be unable to manage costs or to ensure repayment of receivables by end users. Finally, top management may be unable to nurture planned partnerships and alliances. IFC will reduce this risk by requiring adequate demonstration of management skill in proposals forwarded by the EMA, and will provide for careful monitoring and early intervention during supervision.

91. **Change in Economic Fundamentals** -- As with any investment, investee companies run multiple exogenous risks such as:

- Weakening of demand due to general inflation, poor harvests, or other factors.
  - Changes in currency devaluation or availability of foreign exchange for imports.
- Changes in fossil fuel prices or electricity tariffs.  
Retaliation by established competitors (e.g. price cutting by kerosene or diesel suppliers); or unanticipated changes in grid extension plans.

- Changes in financial fundamentals such as interest rates, taxation levels, foreign exchange rates or investment incentives.

It is difficult to mitigate these risks, although a multi-country program such as PVMTI provides certain diversification benefits against individual country risks.

**92. Increased Cost or Unavailability of Materials** -- Partly as a result of current attractive subsidy programs in Japan, Western Europe, and the U.S., as well as variations in the cost and supply of silicon related to its use by the semiconductor industry, supplies of raw silicon, wafers, and cells have become erratic and more expensive. PVMTI can reduce this risk by encouraging projects with explicit supply arrangements, but supply issues are expected to have a disproportionate effect on developing country markets for the foreseeable future.

**93. Return on Investment** -- All of these and other factors could result in PVMTI projects failing to grow at the projected pace and/or failing to earn the anticipated returns. Collectively, this set of risks will be addressed by: a) negotiating financial terms mutually acceptable to IFC and the investee company; b) requirements for risk-sharing by investee companies; c) a compensation structure for the EMA based on performance of the investment portfolio.

**94. Budget Risk** -- PVMTI relies on project reflows for up to 50% of EMA compensation. It is expected that project investments occurring within the first one to two years of program initiation will be sufficient to provide sufficient reflows to meet this obligation. Should investments take longer to close or fail to perform, a cash-flow constriction could arise. IFC expects to mitigate this risk by approving an EMA base budget spread over a period sufficient to minimize this risk. All performance compensation for the EMA will rely on reflows, creating a significant incentive for EMA to manage this risk as well.

# PHOTOVOLTAIC MARKET TRANSFORMATION INITIATIVE (PVMTI)

## Appendix A: INCREMENTAL COST ANALYSIS

### Types of Incremental Costs

1. Based on prior IFC experience with GEF private sector investment projects, eligible incremental costs for PVMTI are expected to occur both within individual projects and at the level of the financial institution providing or delivering financing. At the commercial enterprise level, incremental costs include the difficulty of attracting financing for projects and high rates charged. Businesses also face increased business risk in introducing relatively unfamiliar technologies in markets distorted by existing policy and the established advantage of conventional technologies. At the intermediary level (in the case of PVMTI, the External Management Agent), incremental costs include the higher administrative costs of identifying, processing, and supervising a unique and unfamiliar portfolio while maintaining fiduciary responsibility, and the additional technical or management services required to mobilize co-finance and ensure the performance of funds invested in unfamiliar markets.

### Broad Development Goals

2. The overall development goal is the acceleration of PV dissemination through the funding of near-commercial projects that are financially sustainable and replicable. PVMTI's underlying premise is that the private sector is better situated to identify profitable activities (as compared with "model" or "pilot" projects designed by multilateral institutions and implemented through recipient country governments) yet requires specific assistance in overcoming institutional, financing, and scale barriers. PVMTI will leverage GEF funds through private sector capital mobilization, and demonstrate non-grant financing models (loans, guarantees, quasi-equity, micro-credit, etc.) as well as alternatives to grid-connected projects. Successful projects will provide a multiplier effect by demonstrating the potential profitability of PV projects to commercial investors and lenders, hence making financing available more broadly.

3. The respective governments (India, Kenya, and Morocco) are all signatories to the FCCC, and have endorsed the PVMTI approach of providing financing directly to the private sector. PVMTI is responsive to their respective national energy policies and goals in terms of developing PV technology as part of a diverse and environmentally sound portfolio of energy sources. PVMTI will provide additional resources in addressing such national programs and help develop a private sector-based focus capable of delivering PV technology on a sustainable basis.

### Global Environmental Objectives

4. These objectives are described in paragraphs 49-50 above.

## **Baseline**

5. For the PVMTI project, the baseline situation can be gauged in terms of: (i) the level of current activities of commercial entities undertaking market development and manufacturing expansion; (ii) the failure of households and other users to utilize PV systems because of lack of information, availability of systems or service, high prices, or lack of financing, and (iii) policy and institutional actions of governments in adopting broad based programs and policy adjustments regarding renewable energy. In the absence of GEF support, the baseline scenario for PV is that market risks and obstacles will remain high, and activities by businesses to expand PV sales and markets will continue to be restrained. The resulting small scale of manufacturing, limited market aggregation, and high costs and/or unavailability of finance will continue to limit PV's potential for providing GHG reductions and large scale electrical power generation.

6. Table 4 on page 13 of the main document provides a summary of current PV sales in each of the PVMTI countries, expected sales in 5 years, and additional sales expected as a result of PVMTI investments and related activities in the marketplace. There are significant opportunities in each of the country markets that are expected to be exploited in the near term by existing private sector companies, but growth in the target countries is generally expected to remain less than the expected average annual global growth in PV equipment sales because of the market and financing risks of entering and developing significant new market niches. While all of the target countries have national energy plans that call for significant increases in renewable energy utilization, these plans generally lack the economic and financial basis to achieve goals without significant private sector innovation and capital mobilization.

## **The Alternative**

7. PVMTI is expected to have a catalyzing effect by providing capital and financing mechanisms that would otherwise be unavailable. Appraisal activities performed during PVMTI preparation assessed the flow of proposed investments and developed estimates of investment and sales believed possible under reasonable growth rates. While changes in market penetration in the first few years of PVMTI operation are likely to remain small, by the end of the fifth year of program operation this additional financial assistance is expected to increase sales above the base case by 33% in Morocco and 55% in India to 66% in Kenya.

8. PVMTI as an alternative to the baseline will catalyze and invest in strategic private sector projects, mobilize additional capital for projects, and provide business development assistance both in proposal development (for Secondary Track projects) and project operation. PVMTI will provide commercial incentives to encourage innovation to benefit the global environment combined with appropriate risk management in the interests of cost-effectiveness, financial sustainability, and future replicability. While resembling a fund, PVMTI will forego some of the usual financial returns of a fund in exchange for achieving strategic growth in PV markets.

9. Based on the significant barriers to commercial financing of PV, a number of potential projects would be justifiable with PVMTI support on a grant basis as eligible incremental costs. However, to lessen local market distortions, increase investment leverage, and make project

outcomes more replicable on a commercial basis, PVMTI will instead provide financing on a concessional but (mostly) cost recoverable basis.

10. PVMTI activities will be similar in all three country markets, but the individual project approaches will be unique to each country. In India, PVMTI will stimulate investments and activities in new commercial (not government driven) sectors. In Kenya, it is expected to provide working capital and end-user financing to a market that is thriving but constrained by cash-flows. In Morocco, there is particular potential to demonstrate private franchise models and possibly guarantee facilities (with national utility support) as alternatives to government grid-extension.

### **Incremental Cost Estimates**

11. The total incremental costs associated with PVMTI include all funds of the initial \$30 million GEF grant that are not recovered for repatriation to GEF. Including expected net investment recovery and all IFC costs and EMA fees and performance compensation, these incremental costs are projected under a base case analysis to total \$17.25 million. Actual incremental costs will depend on the reflow of funds generated by the companies in which PVMTI invests and hence on the performance of those companies. These costs are described in more detail below.

12. Incremental costs are expected to occur at the project level and at the level of the EMA (whose roles include those of a fund manager and financial intermediary). There is no firm basis to state a priori the total amount of incremental cost to be met by the GEF funds under the program. For PVMTI, this is due to the fact that a) the projects themselves are not yet known, b) the actual level of risk (both that inherent in the marketplace and that agreed to by IFC in the proposed investments) remain unknown and subject to negotiation, and c) a portion of incremental costs are for EMA compensation and are a function of project performance.

13. Estimates of incremental costs at the project level (in the form of grants, losses, and foreign exchange costs) and at the IFC and EMA level (in direct administrative costs and additional performance compensation for the EMA) are summarized in Table A1 below. More refined estimates of incremental costs will be possible at a) the point of project selection (within 1-2 years after implementation begins); and, at the point of final repayment or exit from investments (up to 10 years).

### **Project Incremental Costs**

14. The PVMTI solicitation for innovative, near-commercial projects to receive financing from a limited pool of funds creates a competitive aspect which should help to align the use of GEF funding with the project's incremental costs and risks. Sponsors will be free to propose (within limits) a PVMTI investment type more closely correlated to the opportunities and business realities in their selected target market. This approach should minimize grant requests and provide an incentive to sponsors to propose activities that maximize financial returns to PVMTI. Sponsors will be encouraged to stretch beyond their baseline activities in order to receive financing, but will not deliberately exceed their perceived incremental risk. The

concession required to support the resulting portfolio of projects provides a proxy for the incremental costs.

15. The PVMTI Solicitation will request information from potential sponsors on their current level and types of activities, the specific barriers faced in expanding these activities, and the level and/or types of activities that they would engage in absent these barriers. These inputs will be compared against market trends and national development plans, and will be used to further define market barriers that are actually faced in each country marketplace and describe the commercial context. In order to address these barriers and the additional risk of investing in PV projects, IFC will apply investment criteria developed for PVMTI which are less stringent than those usually used in evaluating IFC investments, but which include values for the strategic benefits of projects in accelerating PV dissemination. In this analysis, IFC will negotiate financing terms commensurate with this project risk to avoid windfalls to sponsors and thus ensure that PVMTI investments do not exceed the “financing gap”, i.e. the additional costs of addressing risk that are not obtainable from commercial sources.

16. **Grants** -- Grants will be reserved for extraordinary cases requiring one-time interventions or financing, such as broad-based training, technology validation, or other activities required on a per-project basis or to support a country-wide portfolio. Grant allocations will be at the discretion of the EMA with IFC approval; expenditures are anticipated to be no more than 10% (\$2.5 million) of the investment funds.

17. **Losses** -- PVMTI debt and equity investments will be made in good faith and after appropriate due diligence, and are expected to be recovered under the terms of the financing. Losses in this context are the manifestation of the risk faced in the project and are considered to be incremental costs. If a project hinges on a guarantee mechanisms, the amount that is ultimately called provides the proxy for the incremental cost. Of the expected \$22.5 million in invested funds (non-grant), losses of approximately 22% or \$5 million are anticipated. Actual losses could be significantly higher or lower.

18. **Foreign exchange risk** -- The foreign exchange risk that project sponsors estimate they face in borrowing dollar-denominated funds ranges from 8% p.a. (India, Morocco) to over 15% p.a. (Kenya). Providing OECD-denominated funds thus imposes a significant unintended consequence that is not relevant in the local financial markets PVMTI seeks to foster, and project sponsors borrowing dollars instead of local currency would necessarily adjust their proposed financing terms. Project sponsors will thus be given the option of borrowing funds in OECD funds, whereby there will be no coverage offered for forex risk, or in local currency, whereby PVMTI will absorb the forex risk during repayment. Project sponsors will continue to face their usual commercial risk affects of foreign exchange fluctuation, including costs of imported material. Of the expected \$25 million in investment funds, losses of approximately 10% or \$2.5 million are anticipated for forex. Actual forex costs could be significantly higher or lower and will depend on the currency values at the time of re-conversion.

19. **Gains** -- Most PVMTI investments are expected to include below market interest rates, but some returns are anticipated which will in part offset losses and forex charges. The expected case is that gains on the performing portfolio (non-grant projects) will total at least \$2.25 million

over the life of the project. Competition for PVMTI funds and/or strong performance in equity investments could result in significantly higher returns.

20. In a worst case scenario, the PVMTI portfolio would show a total loss of the \$25 million placed in projects. A best case scenario would be full reflow of all invested funds with interest and/or equity gains (less amounts for grants); such an outcome might indicate that PVMTI had taken on insufficient risk. Including gains, the expected case is that of the \$25 million in investment funds (less grants), approximately 70% or \$17.25 million will be recovered. The remaining 30% or \$7.75 million (expected losses and forex absorption) is the estimated incremental cost at the project level.

### **Administrative Incremental Costs**

21. The incremental costs at the EMA level include elements of both a fund manager and a financial intermediary. These include:

- the extra effort (and cost) of achieving the GEF objective. In addition to stimulating non-grant, near-commercial financing modalities, PVMTI's EMA support will include business plan development assistance, financial matchmaking, potential co-financing or mobilization of capital. In its long term supervision of projects, it will include a heightened level of engagement on monitoring and management intervention to ensure project success.
- the extra risk entailed in achieving the PVMTI strategic objective, compensated for by success incentives. While the EMA will not be operating with its own funds, its risks remain in the form of failing to achieve compensation above their costs.

22. EMA compensation is in several areas: A fixed fee of \$4 million for core costs will be allocated from the \$5 million reserved for implementation. Additional compensation will be linked to performance indicators (including rapid approval of investments in acceptable projects, degree of leverage attained, achievement of PVMTI strategic aims, and long-term investment performance). Formulas for determining performance compensation are being negotiated with the EMA candidate organizations.

23. The total expected \$7.8 million cost for EMA services and risk is equivalent to 3.1% p.a. of invested funds for each of the ten years of program life. This figure is comparable to the management costs charged by private fund managers for smaller or more innovative funds but *excluding* incentive payments (i.e. carried interest). In a mature industry sector, risks would be more well known and these incremental costs would be more likely to be absorbed by the fund manager as a normal business expense and/or balanced across a portfolio.

24. Total IFC administrative costs (including legal) total approximately \$1.6 million over the life of the program; \$1 million of this will be provide from the \$5 million reserved for implementation, with all remaining expenses to come from project reflows.



## Total Incremental Costs

25. The initial GEF grant of \$30 million, less the total net costs of \$7.75 million incurred through losses and foreign exchange (but including gains), and the total \$9.5 million for administration, gives an estimated incremental cost for PVMTI of \$17.25 million. These costs are summarized in Table A-1 below.

<b>GEF Funds Available</b>	<b>30.0</b>	
Investment Funds	25.0	
Debt, Equity, Guarantees (90%)		22.5 (non-grant investments)
Grants (10%)		2.5
Reserve for Implementation Costs	5.0	
<b>Expected Recovery for Repatriation to GEF</b>		
Non-Grant Investments	22.5	
Losses (33%)	-7.5	(non-recovery, forex, etc.)
Returns on Performing Investments (15%)	+2.25	(interest income/equity gains)
Implementation Costs Required from Reflows	<u>-4.50</u>	
	<b>12.75</b>	
<b>Net Program Incremental Cost</b>	<b>17.25</b>	

## Global Environmental Benefits

26. As the exact nature of PVMTI market development projects is not yet known, it is only possible to speculate on the amount and cost of reducing carbon emissions. Because markets for PV systems are currently small and immature, the real benefit of PVMTI is the reduction of market barriers and financing obstacles that hinder the development of these markets. In addition to this long term impact, a direct benefit of PVMTI is the reduction in carbon and other GHG emissions resulting from the installation of a significant number of PV systems.

27. A proxy for these avoided emissions and the cost per ton can be estimated by assuming that all PVMTI installations will be SHS. For a typical 50 Wp PV system, total potential offset of carbon emissions is estimated at 1.83 tons of carbon (based on expected substitution for kerosene (70%), diesel-based battery charging (20%), and other zero-emission sources (10%)). For purposes of this calculation, only half of these potential savings are credited to PVMTI, as many consumers will likely utilize the PV system in part for additional lighting and entertainment purposes and will not eliminate kerosene use entirely. Approximately 66 MWp of PV capacity (above baseline sales) are expected to occur as a direct result of PVMTI installations over the 10-year life of the program, or the equivalent of 1,320,000 systems 50Wp systems. Total carbon emissions avoided would on this basis be 1,207,800 tons. Dividing the

\$17,250,000 million in expected incremental costs by the carbon emissions avoided results in a price per ton of \$14.30.

28. Compared to previous GEF investment, the cost per ton is low, in part as a result of PVMTI's non-grant approach to investments that are expected to show approximately a 50% net funds recovery. The actual mix of systems would be different than described above. The cost per ton could be substantially higher if the projected installation rates are not attained, or less likely, if consumers failed to use the PV systems to offset current kerosene and diesel use.

## Appendix B

### SUMMARY OF DISBURSEMENT ARRANGEMENTS

The GEF grant of up to \$30 million will be made available to IFC from the GEF Trust Fund through the World Bank's Trust Fund Division. Disbursements are expected to be made as follows:

**Investments:** up to \$25 million will be disbursed to investee companies according to the terms of financing approved by IFC. It is expected that most funds will be invested within two years after program initiation, and the remainder invested within three years. IFC will be the lender of record on behalf of GEF.

**Administration Costs:** \$5 million will be paid over the expected 10 year life of the program according to: a) IFC's administrative requirements to be drawn down as required (up to \$1 million); and b) EMA fees to be paid periodically through IFC to the EMA for services rendered according to their contract with IFC (up to \$4 million). EMA budgets will be reviewed and approved annually.

Loan repayments will be held in an IFC account until the interim program review in 2003. It is expected that \$5 million of recovered funds will be utilized for additional fees and performance compensation for the EMA according to their contract with IFC. Disposition of remaining funds will be subject to negotiation with GEF.

## Appendix C

### TIMETABLE OF KEY PROJECT EVENTS

Time taken to prepare the project	2.5 years
IFC management approval granted to project concept	August 1996
GEF Council Endorsement	October 1996
Selection of External Management Agent Candidate	<b>April 1997</b>
Country Appraisals	June-August 1997
Management Approval	February 1998 (expected)
Project Implementation Initiated	February 1998 (expected)