

## PROJECT BRIEF

Project Number: 502227  
Project Name: Solar development Corporation (SDC)  
Duration: 5-8 years  
Implementing Agency: World Bank  
Executing Agency: International Finance Corporation (IFC)  
Requesting Country or Countries: All GEF-eligible countries  
Eligibility: All countries under consideration must be ratified signatories of UN FCCC  
GEF Focal Area: Climate Change  
GEF Programming Framework: Operational Program #6

---

2. Summary: The SDC concept originates from a unique partnership between the World Bank Group and a number of U.S. charitable foundations as a response to the gap between the enormous potential demand for electricity in off-grid markets and the very limited supply to date of off-grid power from photovoltaic (PV) systems – despite PV’s apparent ability to produce reliable and relatively cost-effective power in off-grid applications. The objective of SDC is to increase the delivery of solar home systems (SHS) and thus bring environmentally clean electricity to rural households in developing countries. Specifically, it aims to overcome the key barriers to accelerated growth of PV in the off-grid segment -- including lack of medium-term funding to enable customers to repay the high initial cost of PV systems over time, lack of understanding of PV by conventional financial intermediaries (FIs), and weak capitalization of many indigenous PV companies through the provision of both financing and business advisory services (BAS). SDC has a target capitalization of US\$50 million, with approximately \$32 million of investment capital devoted to an Investment Fund and \$18 million of grant funds devoted to BAS. SDC will: (i) invest in private sector companies involved in rural, commercially sustainable PV activities, including the distribution, sale, lease-hire, or financing of PV solar home systems and other productive use PV systems for electricity generation, and (ii) provide financing to local FIs who will service such companies. The combination of finance and business advisory components is needed in order to overcome persistent market barriers and accelerate the growth of the market.

---

### 3. Costs and Financing (Million US):

<b>GEF:</b>	-Project	USD\$ 10.0
	-PDF	USD\$ 0.0
	-Subtotal GEF:	USD\$ 10.0
<b>Co-financing:</b>	-IA:	USD\$ 6.0 - IFC (est.)
		USD\$ 7.5 - World Bank (est.)
	-Co-Financing	USD\$ 5.0 - U.S. Charitable Foundations (est.)
		USD\$ 21.5 - Private Sector, Bilaterals (est.)
<b>Total Project Cost:</b>		<b>USD\$ 50.0</b>

---

### 4. Associated Financing (Mn US\$)

USD\$ 98.0 – 128.0 million (estimated)\*

\*Assumes \$32 million of SDC Investment Fund financing is leveraged by \$98 – \$128 million in financing from non-Fund sources, for a total of approximately \$130-\$160 million of PV investment project costs

### 5. Operational Focal Point endorsement:

Endorsement from any GEF eligible country to be obtained by IFC prior to SDC in-country operations or investment activity

### 6. IA Contacts:

Richard Spencer, World Bank  
Tel: (202) 473-9963; Fax: (202) 522-3483  
Email: [rspencer@worldbank.org](mailto:rspencer@worldbank.org)  
Dana R. Younger, IFC  
Tel: (202) 473-4779; Fax: (202) 974-4349  
Email: [dyounger@ifc.org](mailto:dyounger@ifc.org)



## **I. BACKGROUND AND CONTEXT**

1. The Solar Development Corporation (SDC) concept originates from the gap between the enormous *potential* demand for electricity in off-grid markets and the very limited supply to date of off-grid power from photovoltaic (PV) systems -- despite PV's apparent ability to produce environmentally clean, reliable and relatively cost-effective power in off-grid applications. Although PV system prices have dropped steadily in recent years, PV is not yet competitive with conventional grid technologies. However, in comparison with the cost (including transport) of kerosene and other fuels widely used in off-grid locations, PV can often provide cheaper power -- on a life cycle basis -- and higher quality services (e.g., electric lights are superior to kerosene lanterns). However, specific market barriers help to keep this technically feasible technology beyond the reach of most middle and upper income rural families.

2. According to industry estimates and the World Bank's "Rural Energy and Development: Improving Energy Supplies for Two Billion People," very low levels of market penetration by PV have been observed to date, at best 1% and in aggregate 0.1% of the potential off-grid market. This is far less than might be expected even after discounting a large proportion of the market which cannot yet afford PV. The main barriers include a lack of medium term funding to enable customers to repay the high first cost of PV systems over time, lack of understanding of PV by conventional financial intermediaries and weak capitalization of many PV companies. Although a number of existing projects and programs are focusing on off-grid PV applications in one or several countries, there is no single organization with a global scope dedicated solely to the rapid development of the market. Absent the creation of an organization such as SDC or its equivalents elsewhere, this market is likely to continue to be characterized by these conditions of slow and uneven growth relative to the latent potential demand.

3. Based on the GEF's interest in institutional learning, the SDC concept reflects many of the key lessons being learned from: the World Bank Group/GEF PV financing to date; IFC's diverse experiences with investment funds, project development facilities, and small enterprise investment; and the dynamic condition of the global PV market. SDC's focus on PV entrepreneurs and firms, their managerial and finance capacity and their ultimate customers is reinforced by institutional learning coming from many other bilateral donor, foundation and industry assessments as well.

### **Technology and Market**

4. PV technology involves converting sunlight into electricity through the use of PV cells assembled in panels or modules. The PV panels produce electricity, and other devices carry, regulate, store and deliver the electricity produced. A typical PV solar home system (SHS) used in a developing country consists of one or several panels, usually 20-100 peak Watts (Wp), mounted on a roof or external support and linked to an appropriately sized 50-100 Ampere-hour battery. PV technology is progressing and has become increasingly mature and robust in recent years. While significant advances are still being made in manufacturing which should continue to result in lower cell and module costs, the developments required to bring PV to a more commercial status include growth in financing, marketing and infrastructure, support for entrepreneurs, and building consumer awareness through market conditioning and promotional activities.

5. Rural and off-grid applications (where grid connections are unavailable or unlikely to be available within the next few decades) currently represent over 50% of the global installed PV base and are its fastest growing segment. While massive efforts to electrify rural areas in developing

markets have resulted in an increase of rural electric coverage from 18% in 1970 to about 33% in 1990, the estimated number of unelectrified people in developing markets, in absolute terms, remains constant at about 1.7 billion (300-400 million households). This translates into a potential market of 9,000 - 12,000 peak Megawatts (MWp) shipped or installed (assuming each household would demand a 30 Wp SHS).

6. While the SHS market in developing countries is potentially large, concrete data on annual installation of systems is hard to obtain. Installation of SHS in developing markets has been estimated between 4-13 MWp in 1996, with most industry experts using the lower end of this range, from 4-6 MWp. This translates into approximately 100,000 – 200,000 SHS installed in developing countries annually, and is less than 0.1% of the SHS market demand estimated above. This is consistent with very low levels of penetration observed in the most active markets (at best around 1-2% of the potential market in countries such as the Dominican Republic and Morocco).

7. A SHS costs between \$200 - \$1,500 for a 20 Wp to 50 Wp system, with typical costs in SDC target countries ranging from \$500 - \$1000 for a 50 Wp SHS. Due to the dispersed nature of rural populations and their relatively low electrical consumption, such PV systems can often provide electrical service at lower cost than through grid extension, providing a viable alternative for utilities struggling with the difficulties and costs of rapid growth. However, it is important to note that the cost effectiveness of a SHS is heavily influenced by government and utility rural electrification policy, import duty and tariff levels, grid accessibility/reliability and village/household density. SDC must assess these factors in each of its markets to ensure that the specific policy framework and demographics will enable SHS to be a cost-effective solution for the target market.

8. As part of the concept validation and business planning exercise, nine sample country markets were studied in greater depth. These countries (Brazil, Dominican Republic, India, Indonesia, Kenya, Morocco, Philippines, South Africa, and Vietnam) were selected because they have large off-grid populations which are unlikely to be served by grid connection in the medium term, and their climate and geography is potentially well suited for PV. From these nine markets, a project financing pipeline of approximately \$50 million in PV investment suitable for SDC was identified. This pipeline and other market data from other GEF-eligible countries confirm the shift in underlying market dynamics from a technology, producer-led position towards a consumer-oriented service.

9. SDC also incorporates and builds on the major lessons learned from previous World Bank Group/GEF PV projects and several charitable foundations' experiences with PV financing. Specifically, the World Bank Group PV financing strategy has evolved through lessons learned in the "first generation" India Alternate Energy project (which included a PV finance component) which started in 1992 and the "second generation" Indonesia Solar Home Systems (SHS) project which began its implementation in 1997. It also builds on IFC's experiences in making small PV investments through the IFC/GEF SME Program and what was learned during the project design and appraisal of the IFC/GEF PV Market Transformation Initiative (PVMTI), which is just beginning its implementation. Such lessons include: (i) the importance to small PV businesses of business advisory support in addition to capital; (ii) the need to train entrepreneurs and their staff in PV engineering *and* management skills; (iii) the importance of identifying and enabling in-country commercial financing partners that are willing to on-lend to PV entrepreneurs; and (iv) the need for working capital for consumer credit *and* market infrastructure investment. These lessons have led the Bank Group to support a strategy of attracting, nurturing, and financing PV entrepreneurs and

their enterprises in order to support the spread of off-grid applications of PV technology, which is the goal of SDC.

### **Market Barriers**

10. There are a number of specific barriers which are limiting the development of the rural, off-grid SHS market. They include: (i) lack of medium term financing available to enable consumers to repay the high initial cost of PV systems over time; (ii) lack of availability / supply of PV products and systems to rural customers, which is due to weak capitalization of PV companies, risk averse financial institutions, and weak payment collection networks; (iii) unrealistic expectations regarding the future availability of the grid or the relative cost of PV power; (iv) very limited consumer awareness of the benefits of SHS among non-users, and a lack of managerial and technical skills among many companies selling and installing PV systems; (v) policy barriers such as market distortions in electricity tariffs, subsidies for conventional fuels, and high import taxes and duties on PV modules, materials, and auxiliary components which remain widespread and create an uneven playing field for PV and other renewable energy technologies.

## **II. RATIONALE AND OBJECTIVES**

11. The World Bank Group, including the World Bank and the International Finance Corporation (IFC), together with several U.S. charitable foundations, developed the concept for establishment of the Solar Development Corporation (SDC). SDC's objective is to accelerate growth of PV systems in the rural, off-grid market of a number of GEF-eligible countries. Specifically, SDC aims to overcome the key barriers to accelerated growth of PV in the off-grid segment -- including lack of medium-term funding to enable customers to repay the high initial cost of PV systems over time, lack of understanding of PV by conventional financial intermediaries, and weak capitalization of many PV companies -- through the provision of both financing and business advisory services (BAS). SDC has a target capitalization of \$50 million, with up to \$32 million devoted to an SDC Investment Fund for the financing of PV-related businesses, and up to \$18 million of grant funds devoted to the provision of the business advisory services or BAS, which includes technical assistance for potential investee companies as well as more general PV awareness and capacity building services for the market.

12. In addition to the direct and indirect impact of SDC on expanding the PV market, the formation of SDC may help catalyze a rationalization of multilateral and bilateral assistance for the sector. To date, the vast majority of PV programs supported by development assistance have been implemented with, or at least through, government agencies and have often involved heavy subsidies. In many cases, this has actually had a damaging effect on private entrepreneurs who have been crowded out of the sector, at least for the duration of these programs, or seen their sales decline in anticipation of or in response to such programs. SDC will seek to concentrate its activities in GEF-eligible countries where such distortions are minimized. It will also use the influence of the World Bank as a founding investor through its existing policy dialogue process to attempt to remove import duties and other tariffs or taxes that unfairly penalize imports of PV modules and related equipment as compared to competing energy sources. In addition to this policy linkage, which may further support SDC's efforts, the Bank will work with bilateral donors and other key market participants through establishment of an international consultative group on PV market development in developing countries (to include key bilateral donors, PV manufacturers, and other interested parties). This 'consultative group' would seek to better coordinate and direct donor assistance

programs to activities that enlarge the total PV market in developing countries, while minimizing distortions in the business climate for private companies.

### **Global Environmental Objectives and Benefits**

13. The overall objective of SDC is to accelerate significantly the development of the rural, off-grid PV market in developing countries by reducing market development barriers. If successful, SDC will increase the delivery of SHS and substantially strengthen markets for SHS in the rural, off-grid segment. Development of the SHS market in developing countries offers economic and environmental benefits including: (i) avoided capital costs for grid extension/new power and transmission/distribution capacity; (ii) reduced foreign exchange costs for fossil fuel imports; (iii) cost-effective reductions in greenhouse gas (GHG) emissions and local pollutants associated with alternative fuel substitution by PV. While global GHG emission mitigation can only be estimated within an approximate range, the probable GHG emission reductions of the project are estimated to be between 1.1 and 1.3 million tons of carbon. This translates into \$7.70 to \$9.10 per ton of carbon, for the expected \$10 million GEF participation in SDC (Please see Incremental Cost Analysis in Annex 1 for more details).

14. SDC will seek to establish and nurture stronger markets for rural, off-grid PV systems in host countries and mobilize new commercial financial resources for investments in PV-related businesses. Specifically, SDC's investments and business advisory services will strengthen and train PV businesses, including financial intermediaries, which will in turn expand the impact and duration of SDC and create favorable conditions for sustainable market growth for rural, off-grid PV products. In addition, SDC's investment financing for PV-related businesses will be leveraged with additional investment capital on a deal-by-deal basis, such that GEF funds may leverage funds from bilateral, multilateral, and private sources at a ratio of as much as 1:25– 1:31, to reach approximately \$130-\$160 million in PV investment project costs. Assuming that sustainable businesses are created from SDC's investment and technical assistance, the ultimate leverage effect of the GEF funds over a 15 year period, as measured by SHS delivered, is estimated at 670,000 – 820,000 SHS (see Annex 1).

### **Rationale for GEF Funding**

#### *Proposed Funding*

15. The World Bank Group proposes that GEF provide up to \$10 million in support of SDC, provisionally allocated as follows: \$5 million for the SDC Investment Fund, and \$5 million for the BAS function. Total GEF funding is less than total Bank Group funding, which is currently estimated at \$13.5 million. Due to its direct experience with private sector investment funds, IFC will function as the executing agency for the GEF funds on behalf of the Bank Group. However, the World Bank will also provide funding as noted below and will be fully involved in the administration of GEF funds.

### Conformity with GEF Program and Policies

16. Use of GEF funds in SDC is consistent with the GEF's Operational Strategy and its Operational Programs for climate change mitigation. Specifically, SDC responds to *GEF Operational Program #6: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs*. SDC is a unique and unprecedented sector-specific directed credit and business advisory entity. It is specifically designed to overcome a variety of market barriers to the expanded commercial use of a strategically important zero emission electricity production technology (photovoltaics and related system components) in target markets in selected GEF-eligible countries.

17. In addition, SDC is a clear and compelling example of a new and innovative partnership among World Bank Group institutions and the charitable foundation community designed to mobilize significant additional capital resources from the private sector in support of one of GEF's global environmental objectives. It is thus consistent with the GEF Instrument's private capital mobilization objective and the comparative advantages of the Bank Group among GEF's implementing agencies. It also responds to the recent emphasis on mainstreaming in the findings of the GEF Overall Performance Study.

### Innovative Use of GEF Funds

18. Analysis of available deal flow for the SDC Investment Fund suggests that only a marginal level of commercial return (approximately 11%) appears likely from potential investee PV companies. Therefore, in order for the Investment Fund to attract commercial investment and provide such investors with a competitive return on their investment, a tier of investment capital requiring a subordinated return is required. A portion of the GEF funds would be allocated to this role along with a portion of the Bank Group funding. In this financial structure GEF funds would be subordinated to commercial funding, such that return of GEF's capital would occur after a specified minimum return on equity to commercial shareholders has been received. IFC would also invest in the Investment Fund on a commercial basis and proposes to mobilize additional investments from socially motivated investors such as foundations and bilateral donors, as well as strategic investors such as PV manufacturers, utilities and insurance companies.

19. Participation by GEF in this innovative capacity in the Investment Fund is important to catalyze participation of other private investors. It will allow GEF funds to be used in a manner that mitigates an important set of risks associated with the venture. This is the first proposed use of GEF funds in a subordinated return arrangement within the core capital of a private investment fund. This approach allows for the return of GEF funds after an acceptable minimum return has been met by commercial SDC investors. Thus, depending upon the performance of SDC's Investment Fund, GEF could expect to receive: (i) return of its original investment plus a return on that investment; (ii) return of all or a portion of its original investment; or, in a worst case scenario, (iii) no return of its original investment.

20. In addition to its contribution to the Investment Fund, the World Bank Group proposes that GEF grant funds be used for the provision of BAS. These GEF grant funds could demonstrate leverage of as much as 1:3, assuming the full \$18 million is raised to fund SDC's BAS functions.

### Global Approach

21. A global approach to SDC, rather than one limited to a pre-selected set of countries, is essential to maintain operational flexibility and to maximize potential financial returns to investors as well as developmental benefits. As recent experience in the Asian region demonstrates, sudden macroeconomic or political changes can eradicate the perceived attractiveness of promising PV markets within short time periods. Both as a reflection of the thinness of the total private PV market in developing countries globally and in order to manage risks and maximize return opportunities, SDC's proposed Investment Fund needs to be able to respond opportunistically to deal flow from PV companies across a broad set of GEF-eligible countries. This ability to operate opportunistically should more readily lead to successes and enable a demonstration effect to broaden subsequent market opportunities.

22. A total of 13 GEF-eligible countries with promising PV markets were analyzed and screened during the SDC feasibility study/business plan preparation exercise. A subset of six of these was studied more intensively, supplemented by the data available from the three IFC/GEF PVMTI<sup>1</sup> countries, as part of a validation of the SDC concept. The study's conclusions, as well as potential SDC deal flow that IFC and its collaborators have access to, demonstrate that SDC investment opportunities exist in a much larger set of potential GEF-eligible countries. More than 30 GEF-eligible countries have been identified by the Bank Group in which SDC activities could be promising. There is thus a compelling reason to leave SDC's geographic focus as broad as possible at this juncture to avoid artificially limiting its managers' ability to invest in local PV ventures across a variety of GEF-eligible countries.

23. Strong evidence of country ownership exists in virtually all GEF-eligible country in which PV entrepreneurs or operational companies exist and promising market conditions are present. In nearly all of the pertinent GEF-eligible countries there is also evidence of national development and environmental priorities that recognize the potential role that renewable energy can play in satisfying present and future unmet rural energy requirements. However the variety of financing tools and policy programs to effectively meet these needs, particularly through private sector channels, is generally lacking.

### Country Endorsement

24. An approach to country endorsement similar to that followed under the IFC/GEF SME Program will be followed by SDC. All GEF country focal points in eligible countries will be advised of SDC's formation by the World Bank Group. Countries will be asked to endorse SDC, on a no objection basis, with a two-month response period. All recipient countries, except those objecting, will then be potential hosts for SDC business advisory services and / or SDC investments. Thereafter, the GEF focal points from specific countries will be advised each time SDC proposes to make an investment in their country. If a country does not respond to the initial notification, and subsequently SDC is considering an investment in that country, then a specific request will be made

---

<sup>1</sup> IFC / GEF Photovoltaic Market Transformation Initiative (PVMTI), a \$30 million GEF program recently approved and under implementation in India, Kenya, and Morocco.



for endorsement. Countries that fail to provide their endorsement will be ineligible for SDC investments.

### **III. PROJECT ACTIVITIES/COMPONENTS AND EXPECTED RESULTS**

25. SDC will consist of: (i) an Investment Fund, capitalized with up to \$32 million for the financing of investee companies, and (ii) a pool of up to \$18 million in grant funding to be used for the provision of business advisory services (BAS). An outside manager (“SDC Manager”) will manage the Investment Fund and administer the BAS grant funding, and together the SDC Manager, the BAS funding, and the Investment Fund will constitute SDC. In addition, as described in paragraph 11, SDC will maintain a link with the World Bank, in order to inform the Bank’s ongoing policy dialogue process for specific countries and to advise where appropriate a newly constituted international consultative group on PV market development in developing countries in order to encourage introduction of best practices into multilateral and bilateral donor PV funding operations. The World Bank’s contribution to SDC is expected to be made from the Development Grant Facility (DGF).

26. The Investment Fund of SDC will seek to make debt and equity investments in a wide array of PV-related businesses, including local assemblers/systems integrators, distributors, retailers, energy service companies (ESCOs), and FIs such as banks, NGOs, and other non-bank FIs such as leasing companies. Market information indicates that the most significant barriers, in the form of financing gaps, are in two key areas: (i) end-user financing mechanisms and credit for rural customers; and (ii) working capital for distributors, systems integrators, and retailers. It is assumed that about 60% of the investment funds will take the form of loans to FIs for lending to PV end-users, and the remaining 40% will take the form of loans, equity or quasi-equity investments to integrators, distributors, retailers, and possibly local manufacturers<sup>2</sup>. Investment size per project will likely range from \$50,000 to \$3.0 million, and co-financing with local FIs will be encouraged. In addition to the GEF, World Bank, and IFC funding, capital for the finance window is expected to come from a number of other investors as noted previously.

27. BAS funding will be used to provide technical assistance for potential investee companies (about 70% of BAS budget) as well as more general PV awareness and capacity building services (about 30% of BAS budget). Activities will include project identification and screening, business planning, financial advice, due diligence, and technical support, as well as awareness/capacity building activities such as generic marketing and promotion, dissemination of appropriate standards, technician training, and institutional support. Both aspects of BAS are necessary in order to overcome barriers such as lack of business skills among PV entrepreneurs and to build and nurture existing deal flow while simultaneously increasing awareness of PV benefits and applications. This will in turn stimulate future deal flow for SDC’s Investment Fund or other financing sources. In addition to the GEF, World Bank, and IFC funding for the BAS entity, funds are expected to come from grant contributions from foundations and bilateral donors.

28. SDC will be managed by a competitively selected SDC Manager. The required skills for the SDC Manager include: (i) experience with direct investment in emerging markets; (ii) experience in

---

<sup>2</sup> While it is envisioned that the majority of these SDC investments will be made to assemblers, retailers and distributors, there may be circumstances where it is appropriate for SDC to invest in local manufacturers as well.

investing in and/or providing business advice to small and medium enterprises and financial institutions in developing countries; (iii) rural energy and PV expertise; and (iv) a desire to assist in the economic development of investee countries. In addition, the SDC Manager will be led by a dynamic and entrepreneurial CEO, who can champion the project and assist in completing the fund-raising process.

### Expected Results

29. SDC will seek to catalyze the growth of PV businesses serving the rural SHS market. It is expected that SDC's investment fund will directly finance approximately 50 companies/projects, and SDC's BAS will assist 75-100 companies during its first 5-8 years of operation. More broadly, SDC will be successful if it catalyzes a sustainable increase in SHS financing mechanisms to rural customers and an increase of quality companies, which target this off-grid, rural market. SDC's success is expected to occur both through its direct actions as well as its indirect and demonstration effects. For example, SDC will propagate use of proven PV business planning models, managerial training, and standards for financial underwriting of PV systems. IFC's experience with investment funds suggests that a track record of successful investments will spur imitators. The combination of direct and indirect effects should yield an increase in SHS systems being supplied and installed in SDC's selected target markets. Assuming SDC's investment funds of \$32 million are leveraged with \$98 – \$128 million (a rate of approximately 1:3 - 1:4), PV investment project costs would total approximately \$130 - \$160 million. Assuming that sustainable businesses are created from SDC's investment and technical assistance, the ultimate leverage effect of the GEF funds over a 15 year period, as measured by SHS delivered, is estimated at 670,000 – 820,000 SHS (see Annex 1).

## **IV. RISKS AND SUSTAINABILITY**

30. There are a number of specific risks associated with SDC. One of the primary risks is capitalization risk, in that it may prove difficult to attract sufficient capital to create SDC, particularly from private sector sources. However, the World Bank Group has had favorable preliminary discussions with a variety of potential investors. Moreover, selection of a competent, reputable SDC Manager, which may also contribute to SDC's capital, will help mitigate this risk.

31. Another major risk lies with the SDC Investment Fund portfolio, which is likely to have a higher risk profile than investments in more traditional sectors, and as such, default rates may be high and/or under-performance may be common. However, the SDC Manager will have experience in both equity and debt finance in emerging markets as well as specific experience in PV, which should help mitigate this risk.

32. SDC addresses sustainability in terms of seeking to address the key barriers to further market development in selected countries and to build the market, financial and professional infrastructure necessary to maintain accelerated growth of PV in a variety of country-specific rural, off-grid markets. GEF funding will be applied through private sector mechanisms to accelerate growth of these markets, and care will be taken to ensure that SDC activities are indeed market strengthening and lead to higher volumes of SHS system installations after the pilot funding of \$50 million has been fully committed. The objective is not to produce a one-time impact with SDC's activities but rather to establish or expand healthy, profitable markets for SHS in the off-grid sector, which will ensure long-term sustainability. Involvement and engagement of commercial FIs should greatly increase the availability of sustainable financing for SHS after the program ends. Thereafter replication is expected to occur through recapitalization of SDC as appropriate and through a variety

of self-sustaining conventional and innovative financing modalities including mainstream IFC-funded investment funds and financial intermediary operations. It is important to note that the off-grid PV market is inherently more risky and less certain than other “win-win” opportunities such as exist in energy efficiency finance, due to a number of factors including higher credit risks and collection risks associated with rural customers. Therefore, predictions of SDC’s ultimate sustainability are not possible at this stage.

## **V. STAKEHOLDER PARTICIPATION AND IMPLEMENTATION ARRANGEMENTS**

### *Stakeholder Participation*

33. The World Bank Group has collaborated since March 1996 with more than ten U.S. charitable foundations in the development of the SDC concept. The concept has also been reviewed and discussed with a wide variety of other bilateral donor agencies, NGOs, private companies, and financial institutions. Numerous PV companies and financing entities have been consulted in a wide variety of GEF-eligible countries. As a part of this consultation process, World Bank and IFC staff and consultants working on SDC have also met with many representatives of appropriate government agencies involved in rural and renewable energy for various GEF-eligible countries to discuss the SDC concept. From April 1996 through June 1997, the SDC concept has also been presented and discussed at more than 50 international energy conferences. (A list of these consultations is available upon request; see Annex III).

### *Complementarity*

34. As noted earlier, the Bank has several GEF-funded PV projects under implementation from which important lessons for SDC have been drawn. However, these are largely targeted at GEF-eligible countries where some form of public sector intervention is still viewed as desirable or necessary to overcome market barriers. IFC is currently the executing agency for several other innovative financing mechanisms utilizing GEF funds which involve, or potentially involve, PV. These include the IFC/GEF SME (Small and Medium Enterprise) Program (which has made three PV investments to date each of less than \$1 million and continues to see additional opportunities); the IFC/GEF Photovoltaic Market Transformation Initiative (PVMTI), which recently began implementation; and the global IFC/GEF Renewable Energy and Energy Efficiency Fund (REEF), which should become operational shortly. Like SDC, these approaches also engage the private sector to attract sub-projects and provide additional financial intermediation to transition these activities to a more fully commercial status. In addition, there are other GEF funded projects under implementation by the Bank and UNDP which involve PV. However, SDC is designed to be consistent with and complementary to these other related GEF projects under implementation by IFC, the Bank, and UNDP.

35. Specifically, the World Bank Group believes that SDC is consistent with and complementary to the other GEF-funded PV projects due to: (i) the large size of the potential market; and (ii) to SDC’s specific focus on the rural, off-grid SHS market in all potentially eligible developing countries. REEF will target all renewable energy sources and its managers currently anticipate that it will be unlikely to invest in many rural off-grid PV investments given the large volume of potential demand for grid-connected RE project financing they are already seeing. By contrast, SDC has a specific mandate to target the rural off-grid SHS market and is solely dedicated to broadening this market. In the case of PVMTI, it is limited to India, Morocco, and Kenya, and will cover a wide variety of PV applications in urban, peri-urban, and rural markets. SDC, on the other hand, will make its services available to PV entrepreneurs in all GEF-eligible markets, targeting the specifically underserved rural, off-grid market. SDC also differs in this way from the IFC/GEF SME Program, which covers a range of other biodiversity and climate change mitigation investment projects. Again, SDC has a more targeted and specific focus. The Bank Group will make an explicit requirement of the SDC Manager that they not invest in companies

that have previously received or expect to receive concessional financing from other Bank Group/GEF PV financing sources.

36. In markets where there may be *potential* overlap between SDC and other Bank Group/GEF-funded initiatives, the Bank Group will also actively manage SDC's use of GEF resources to ensure that they are used in a complementary manner so as to avoid overlap of GEF concessionary or grant funding. From contacts with World Bank and IFC task managers involved in GEF-funded PV projects, the general assessment is that SDC can be complementary to other ongoing projects. The Bank Group believes that this is also the case with other GEF PV projects including those being implemented by UNDP. The Bank Group will ensure that SDC's managers are cognizant of other GEF-funded PV projects and that provision of SDC's financing and BAS is coordinated on an ongoing basis with such projects.

37. As noted earlier, the SDC Manager will be responsible for the formation of SDC and the day to day implementation of its activities. A substantial part of the SDC Manager's compensation will be based on the performance of SDC. As SDC is designed to be a developmental entity, its performance will be measured according to several criteria, rather than being based solely on the maximization of financial returns. Specifically, three equally weighted criteria are proposed: (i) market development activities; (ii) quantity and quality of funds disbursement; and (iii) financial returns.

38. The competitive selection process for the SDC Manager will be conducted on an international basis by IFC in the Fall of 1998. The SDC Manager will then be selected by Bank Group and foundation management according to its experience and qualifications. Once selected, the SDC Manager will be expected to refine and improve the existing SDC business plan, in the process taking ownership of the concept and using it as the basis for their own operational plans as well as for raising capital. The SDC Manager will also be expected to organize itself into an appropriate legal entity which meets the requirements of SDC's primary investors. It is currently envisioned that this legal entity would have not-for-profit status, though the final legal status of SDC may need to be adjusted based on input and advice from the selected SDC Manager.

39. The original sponsors of the SDC concept -- the World Bank Group and a group of U.S. charitable foundations -- have received preliminary approval from their respective managements for funding to SDC, and will seek final management and board approval for their investments after the selection of the SDC Manager. Additional capital will be raised from a wider pool, including bilateral donors and the private sector. The SDC Manager may also make an investment

40. Precise SDC investment policy guidelines and procedures for investment approvals and implementation will be discussed and agreed among the founding investors and with the SDC Manager. Mechanisms will be put in place by the Bank Group to ensure that GEF objectives and policies are followed, and financial management is sound. In addition, mechanisms to effectively resolve potential conflicts of interest will be established.

## **VI. INCREMENTAL COSTS AND PROJECT FINANCING**

41. The proposed uses of GEF funds, in a provisioning role to support the operations of the SDC Investment Fund and to support the grant-funded Business Advisory Services (BAS) functions of SDC, are fully consistent with the interpretation of the incremental cost principle as applied to private sector operations developed collaboratively by the GEF Secretariat, the World Bank and IFC. In the first instance the proposed use of GEF funds would be designed to overcome the high level of perceived and actual risk faced by potential investors in SDC's \$32 million Investment Fund. Absent the GEF and World Bank Group concessional funds, it is unlikely that even strategically motivated investors would

place capital at risk in a fund that can only offer on average sub-commercial to marginal investment returns at best (10-11% real before tax IRRs).

42. Due to the risky nature of investment on small and medium-sized enterprises (SME) generally, the high degree of political and other risks inherent in the target markets and the relatively unproven nature of the commercial models for rural PV SHS sales (via cash sales, consumer credit, leasing and other financing approaches) there is a high degree of risk associated with this venture that requires a strong GEF financing role to help offset. Indeed, GEF's participation is considered essential to remove some of the risk in the Investment Fund. Absent the substantial GEF role being proposed, the Bank Group believes that this project concept would need to be abandoned, as SDC would not be able to attract the level of investment needed for a viable Investment Fund. There are also no likely sources of funding comparable in size and mission to GEF whose funds could be made available to play this role absent the GEF's participation.

43. The proposed GEF funds to be used in the Investment Fund would be subordinated, concessional financing, with additional subordinated concessional financing from the Bank Group. In this role, which would include the first use of GEF funds in this way within a private investment fund's core capital, the possibility exists for return of the concessional GEF and Bank Group capital and even the possibility of some additional return if the investments of the SDC Investment Fund perform extremely well. However, based on IFC's experience with high-risk SME investments in likely geographic targets of SDC's Investment Fund (such as in sub-Saharan Africa through its African Enterprise Fund) there are likely to be failed and underperforming investments associated with SDC financing efforts given its risk profile.

44. Additional grant resources from GEF to supplement the GEF contribution to the Investment Fund are also required. These grant resources will be matched by grants from multilateral foundations and other bilateral donors and will be used for barrier removal activities as described in paragraph 27.

45. The proposed financial plan for SDC is presented below. Note that amounts and allocations depicted below are presently estimates only and do not yet reflect actual commitments. Future adjustments in the financial plan may be necessary.

<b>Source of Funding</b>	<b>Investment Fund</b>	<b>BAS Funding</b>	<b>Total</b>
IFC*	\$3.0 m	\$3.0 m	\$ 6.0 m
IBRD**	\$5.0 m	\$2.5 m	\$ 7.5 m
Foundations	\$4.0 m	\$1.0 m	\$ 5.0 m
GEF	\$5.0 m	\$5.0 m	\$10.0 m
Bilateral Donors	--	\$6.5 m	\$ 6.5 m
Private Investors	<u>\$15.0 m</u>	--	<u>\$15.0 m</u>
<b>Total Funding</b>	<b><u>\$32.0 M</u></b>	<b><u>\$18.0 M</u></b>	<b><u>\$50.0 M</u></b>

\* The specific allocation of IFC's proposed \$6M contribution to the Investment Fund and BAS budget may differ from that shown above, as IFC proposes to provide \$6M, but allocated in such a way as to provide as strong a signal to the market as possible. It proposes to provide a minimum of \$1M and maximum of \$3M for the BAS budget; the remaining \$3 M - \$5M will be an investment into the Investment Fund.

\*\* It is proposed that the World Bank's \$7.5M contribution to SDC come from the Development Grant Facility ("DGF"), and be allocated over 5 years. Subject to DGF's concurrence, it is also proposed that

the World Bank divide its contribution between BAS funding and concessional funding in the Investment Fund.

## **VII. MONITORING, EVALUATION AND DISSEMINATION**

46. An SDC Monitoring, Evaluation, and Dissemination plan will be agreed between the SDC Manager and the World Bank Group and it will include adequate mechanisms to ensure compliance with the plan. Monitoring and evaluation will be performed on an ex-post basis using available guidelines for World Bank/GEF climate change mitigation projects. This will include an independent evaluation function conducted at mid-term and after the project's completion. These will be supplemented by regular Bank Group project supervision and financial controls, as well as IFC investment and developmental effectiveness evaluations of the SDC Investment Fund following its winding up. Use of market indicators will be important to substantiate achievement of pre-project conditions for SDC market entry and success over time as set out in the project logical framework (See Annex II). Recognizing the importance to GEF of early dissemination of results from these pioneering private sector financing approaches involving GEF funds, the Bank Group will report to GEF at a timely interval after the project's implementation is well underway so that Council members can evaluate SDC's experience up to that point. This report will include results of the independent mid-term evaluation of SDC.

47. This project proposal was subject to an Independent Technical Review by a qualified expert from the STAP roster, whose summary comments are attached as Annex IV. The STAP reviewer found the proposal to be technically sound and deserving of high priority by the GEF. The reviewer also noted that the timing of the initiative is appropriate given developments in the PV markets and the lessons learned from other GEF and non-GEF funded PV projects. A number of specific comments made by the STAP reviewer have been responded to in the project concept document. Notably, a more detailed description of the evolution of World Bank Group /GEF PV finance efforts and the relevant lessons for SDC was incorporated, as well as a discussion of SDC's proposed policy linkages with the World Bank. In addition, the description of BAS activities was expanded in response to the technical reviewer's request, as were the discussions of replicability and of complementarity.

## ANNEX I

### INCREMENTAL COST ANALYSIS

#### **Broad Development Goals**

The broad development goal of the Solar Development Corporation (SDC) is to accelerate the development of viable, private-sector business activity in the distribution, retail sale and financing of off-grid PV applications in developing countries. While it has been established that there exists enormous *potential* demand for electricity in off-grid markets, until now there has been very limited supply of off-grid power from photovoltaic (PV) systems in these markets, largely due to only scattered and largely ineffective attempts by usually undercapitalized entrepreneurs. Public sector interventions in this area have been limited in scope and duration and have usually relied on heavy subsidies, which, almost by definition, made them non-sustainable. These efforts have been ineffective and largely counterproductive by raising expectations that Solar Home Systems (SHS) might be made available to users at subsidized prices. SDC will systematically identify and initially support suitable entrepreneurs, supply companies and cost effective credit facilities or institutions that have the potential to supply and serve these potential markets on a self-sustaining, non-subsidized basis. These efforts, to help develop appropriate marketing and financing structures for SHS systems, will be opportunistic in the sense that SDC will focus its financing and business advisory services on those individuals, companies and institutions in each country which offer the best chance of achieving sustainable results. SDC will leverage GEF funds and World Bank Group funds through additional private sector capital mobilization. The only subsidies to be provided through SDC will be through the provision of substantive, but focused, business advisory services that will be provided on a nominal fee basis. These are considered to be absolutely essential if SDC's main objective, (i.e., the creation of an efficient SHS supply and financing network) is to be met.

For the capitalization of the supply and financing companies themselves, no grant financing will be provided. Instead, SDC will systematically use non-grant financing models (equity investments, loans, guarantees, quasi-equity, lines of credit, etc) to help provide the necessary financial base for the profit oriented SHS supply and financing firms. The successful establishment of these enterprises will result in a multiplier effect by demonstrating the potential profitability of PV projects to commercial investors and lenders, thereby broadening the capital base for SDC supported businesses as well as new and additional suppliers.

#### **Current Baseline Situation**

With very few exceptions the commercial capacities to assemble, distribute, market, install and service SHS are virtually non-existent in most GEF recipient countries, despite significant market growth in the global PV market in the last several years and identified profit potential in some local markets. The following major factors hindering sustainable market growth have been identified in consultations with private sector stakeholders in key recipient country markets:

- (i) Market distortions, such as:
  - High import duties on assembled and/or non-assembled PV and ancillary equipment;

- Low, subsidized residential tariffs from state-owned electric utility companies
  - High expectations for extension of the electrical distribution network to unserved areas prompted by politically inspired but undeliverable promises;
  - Lack of access to foreign exchange for imports of essential SHS equipment and parts as enumerated in many World Bank Group reports; and
  - Existence of donor-financed or NGO inspired, small-scale SHS demonstration projects that provide limited numbers of SHS units free of charge or at heavily subsidized prices, thereby distorting market signals and raising unrealistic expectations among potential customers of such systems.
- (ii) Under-capitalization of entrepreneurs interested in developing the SHS market, combined with:
- Limited access to venture capital sources;
  - Limited access to professional investment, financial advisory and business management expertise as specified in numerous WBG reports. Such access would enable PV firms to obtain commercial financing from existing commercial financial intermediaries in support of desired enterprise growth ;
  - Lack of business skills among potential PV entrepreneurs
- (iii) Lack of interest by larger enterprises to enter the market because of perceived risk, comparatively small market sizes and high operating costs to serve a scattered, dispersed rural market that is perceived as being inherently unprofitable;
- (iv) Lack of access to consumer financing facilities because of risk aversion and lack of experience with SHS markets by existing financial institutions.

In the absence of SDC or similar systematic efforts to develop a successful and durable private market infrastructure for SHS, it is likely that the penetration of PV systems for rural household use will continue to be slow, scattered and oftentimes accompanied by failure due to lack of adequate quality control and timely after-sales maintenance services. Such failures would be widely noted, and could negatively affect potential new customers for SHS systems. As a result, the majority of rural households will continue to rely on customary sources of light and energy, i.e. candles, kerosene lamps, dry cell batteries and portable, diesel-generator charged automotive batteries. As a result, greenhouse gas (GHG) emissions from these uses will increase at approximately the same rate as rural population increases. This baseline is tempered of course by the previously funded 26 MW in GEF PV projects that are also providing support in this fragile market.

Furthermore, the lack of regular access to electricity (except for high-cost and inefficient drycells and batteries) and the prejudices against SHS, because of observed failures of inferior SHS units, will increase the political pressure by rural populations to obtain access to network electricity. If these pressures are catered to, the economic and financial cost to national electricity companies will be burdensome and further increases in fossil fuel generated CO<sub>2</sub> emissions will result.

### **Global Environmental Objective**

The global environmental objective is to reduce GHG emissions from the use of hydrocarbon-based fuels for household lighting purposes (i.e., kerosene and candles) and the use of diesel-powered generators to recharge batteries that are used by households for radio and TV services.



The proposed SDC will help create financially viable, private sector assembly, distribution and financing companies that will be able to develop the potentially very large, but so far largely undeveloped rural markets for SHS in the developing world. The emphasis will be on the creation of successful commercial supply and financing infrastructures. It will address the undercapitalization of PV firms and the distribution and financing intermediaries as well as the lack of access to business expertise.

Approach to be Adopted:

SDC's \$32 million Investment Fund needs to be able to act opportunistically. Given the very small resource base of the Fund compared to the size of the potential markets, as well as the thinness of the PV market itself, the Fund must be able to act opportunistically by focusing on the most promising regions among GEF-eligible countries for SHS market penetration (i.e., deliberate "cherry picking"). Such an approach will minimize the risk of failures. In turn, it will maximize market penetration, rates of success and create attraction for additional capital to be invested in the sector.

This approach will require:

- (i) Identification of potentially suitable markets capable of absorbing (and paying for) SHS units;
- (ii) Identification of suitable entrepreneurs or companies that demonstrate promise to be successful; and
- (iii) Existence of appropriate framework conditions (government support, appropriate regulatory and legal structures, manageable levels of import duties and taxes on imported components, availability of foreign exchange, etc.).

The emphasis will be on commercial success of enterprises. Recipients of fund financing and business advice must become commercially successful (i.e., profitable) on a non-subsidized basis in order to survive and serve their function (i.e., increase SHS market penetration on a self-sustaining, ongoing basis). This represents a win/win outcome for PV-related enterprises and PV end-users.

Scope of the Analysis:

The scope of the analysis is limited to all GEF-eligible countries, because SDC will attempt to find and develop the most promising potential rural SHS markets (on an opportunistic and selective basis) in GEF-eligible countries throughout the world. Hence, the system boundary is the rural SHS market in GEF-eligible countries

Domestic Benefits and Savings:

Domestic benefits among PV end-users will consist of higher quality and quantity of lights, which will serve to extend the working day (especially for women), improved communications (radio, TV) connecting individuals to the economic mainstream and reduced air pollution in homes (reduced kerosene fumes). The national governments will benefit by the reduced investment and operating costs for the expansion of heavily subsidized, uneconomic rural electricity grids. The business sector will benefit from the expansion of business skills among the population, improved access to commercial and consumer credit and the demonstration-effect of profitable businesses.

Global Benefits:

Global benefits can only be estimated within an approximate range, because of the wide differences in substitutes used in different regions of the world. Based on estimates provided for other GEF-supported World Bank Group PV projects, life-time savings from average-sized SHS units may range between 4.4 tons of CO<sub>2</sub> to 14.1 tons of CO<sub>2</sub> (1.2–3.8 tons of carbon). Taking 6 tons of CO<sub>2</sub> as a reasonable average and using the projected market penetration rates of SDC-induced SHS sales over a 15-year time horizon (see illustrative calculations below), the probable carbon savings of the project are estimated to range between 1.1 and 1.3 million tons of carbon. This translates into \$3.85 to \$4.55 per ton of carbon for the proposed \$5 million GEF participation in SDC’s Investment Fund. GEF’s \$5 million grant to the BAS portion of SDC raises the cost to \$7.70 to \$9.10 per ton of carbon. This assumes, however, that all Investment Funds are used up and not returned. Costs will be lower if part or all of the GEF investment funds are recovered.

Ultimate Leverage Effect of GEF Participation on Sector Investments:

The participatory financing from non-Fund sources is estimated to range between \$98 – 128 million, for a total investment (excluding BAS) of \$130-\$160 million. The SDC’s Investment Fund gearing ratio with respect to the proposed \$5 million in GEF funds would range between 1:24 and 1:30.

Ultimate Leverage Effect of GEF Participation on SHS Sales:

This table shows that total SHS sales over a 15-year time span may range between \$499 million and \$614 million if one assumes investments of either \$130 million or \$160 million accordingly. Assuming average SHS system costs of \$750 per unit, this translates into 670,000 to 820,000 SHS units sold or leased by SDC financed SHS suppliers over a fifteen year time span. These calculations are, by necessity, illustrative only.

Investible Funds		\$130 million
Project Failure Rate	20 %	-\$26 million
Active Investment Funds		\$104 million
SHS Sales over 15 Years	10% cash sales <sup>1</sup>	\$156 million
	50 % on 3 year terms <sup>3</sup>	\$260 million
	40% leased, 7.5 yrs. depreciation <sup>4</sup>	\$83 million
	Total Sales	\$499 million
Investible Funds		\$160 million
	Total Sales	\$614 million

<sup>1</sup>Cash sales per year = \$104 million x 0.10 = \$10.4 million/year x 15 years = \$156 million

<sup>2</sup> Credit sales = \$104 million x 0.5 = \$52 million, cost recovery 3 years, 15 year sales = \$52 million x 5 = \$260 million

<sup>3</sup> Leases: \$104 million x 0.4 = \$41.6 million, depreciated over 7.5 years, 2 leasing cycles in 15 years, \$41.6 million x 2 = \$83.2 million.

## **The Main Components of Incremental Costs and Their Relation to Barrier Removal**

GEF participation in SDC is essential in order to attract additional investors to both the Investment Fund and to complete the Business Advisory Services (BAS) grant funding. This GEF participation is essential to removing barriers in private financial markets that otherwise limit the Bank Group's ability to raise SDC's Investment Fund. Direct leverage of GEF funds in SDC would be 1:4.

### Investment Fund:

GEF participation in the Investment Fund will provide incremental risk coverage. The GEF funds will be used as a subordinated return mechanism, to be repayable after minimum rates of return have been achieved by other participants in the Investment Fund. However, not all ventures supported by the Investment Fund will succeed, so therefore, it is assumed that between 40% to 100% of the risk coverage may result in actual incremental costs, i.e., from losses of investment capital that will not be fully recovered.

### Business Advisory Services:

Of the \$50 million proposed capitalization of the SDC, \$18 million is to consist of grant funds. Approximately of 70% of these grant funds are to be used for providing business advisory services and technical assistance, including training, to entrepreneurs, companies and financial institutions supported by SDC investment funds. The remaining balance of 30% is to be used for generic advertising, public awareness campaigns and similar activities that will help to familiarize potential SHS customers with the equipment and its uses. This substantial proportion of the overall funding to be used for these technical business support and public awareness building purposes (or barrier removal activities) is a reflection of the fact that SHS business development is still very much in its formative stage and requires substantial additional, external advisory and informational support in order to become successful and sustainable on its own. It is proposed that GEF contribute \$5 million to the BAS portion of SDC.

## **Project Incremental Costs**

The incremental costs of mobilizing private capital for SHS market penetration are considered to be: (a) the amount of BAS grant funding provided; and (b) the subordinate, concessional funds which are not returned to GEF from the Investment Fund. Therefore, total incremental costs to be covered by GEF are estimated to range between \$5-\$10 million, which includes the proposed \$5 million contribution to the BAS portion of SDC, and the proposed \$5 million in subordinate, concessional funding to the Investment Fund, which may be partially or wholly returned to GEF. Analysis from the SDC business model suggests that approximately \$0.80-\$4.6 million of the proposed \$5 million in concessional GEF funds would be recoverable, with \$4.6 million being the reasonable or base case scenario. (Actual results will depend on the overall performance of the Investment Fund portfolio).

## **Allocation of Incremental Cost GEF Contributions at the Project Level**

As noted earlier, GEF contributions are proposed to be allocated both to the SDC Investment Fund and to the BAS portion of SDC.

GEF's contribution to the Investment Fund is not project-specific. It basically represents a form of financial provisioning that is repayable to GEF to the extent that the funds are not ultimately

needed. The GEF contribution is needed to assure other investors that the minimum financial objectives of the Investment Fund will be met. Hence, being in the nature of a generalized capital commitment to the Investment Fund as a whole, no passthrough and linkage to the incremental costs of any one individual investment project is possible or even desirable, because only failed or seriously underperforming projects (which will be known only after a period of operation of the Fund) will in effect encroach upon the return of GEF funds.

The projected expenditures of the BAS portion is expected to be divided roughly 70% for direct business advisory services to investee companies and 30% for general PV awareness and capacity building services. It should be noted that the total BAS funding would be \$18 million. All of these are expected to be grant funds supplied by various donors, in addition to the GEF. Given the nature of business advisory services as well as public awareness campaigns, it is not possible to establish a rigid accounting framework that relates the possible GEF contribution to BAS to specific activities that BAS resources will be spent on. Of necessity, decisions about the amount and type of services to be provided and financed will depend greatly on the specifics of a particular situation.

In some cases, the identified shortcoming may be a lack of technical know-how, in another a lack of business know-how, in a third it may be the existence of unattractive framework conditions that have to be resolved in discussions with the government or the national electricity company. The scope and size of needed activities will vary greatly from one situation to another. In fact, it can be expected that in those situations in which BAS services of any kind are found to be minimal, the market success of SHS market penetration is likely to be higher than in others in which major assistance interventions (Expressed differently, incremental costs are likely to be higher in high BAS need situations than in low BAS need situations.) Given this rather wide range of possible requirements and needs, it is not possible to isolate GEF funds from the grant funds of other donors and allocate them according to a previously agreed formula. Therefore, it is suggested that the GEF grant be freely co-mingled with grant funds of other donors to be used as needed.

**Incremental Cost and Benefits Matrix**

	<b>Baseline</b>	<b>Alternative</b>	<b>Increment</b>
<b>Domestic Benefits</b>	<p>Dispersed rural households use kerosene lamps, candles, dry cells, diesel generator-charged batteries for lighting and entertainment. Limited penetration of SHS units.</p> <p>SHS costs are high, quality uneven, there are few service and maintenance facilities; system failure rates are high, system suppliers are generally undercapitalized and often unreliable.</p>	<p>Systematic penetration of selected, high potential markets by well-trained SHS distributors who received training and financing through BAS and investment arms of SDC. SHS unit costs are lowered, quality control measures are in force, after sale service is more readily available.</p>	<p>Over a 15-year period, some 670,000 to 820,000 additional SHS units are being sold or leased. They provide brighter, more comfortable lights, convenient access to radio and TV. Domestic air pollution from kerosene lamps or candles is reduced or eliminated. Service, spare and replacement parts are readily available.</p>
<b>Global Benefits</b>	<p>Emissions from domestic light sources and diesel powered battery loading stations amount to between 1.1 to 1.3 millions tons of carbon equivalent.</p>	<p>1.1 to 1.3 million tons of carbon equivalent emissions eliminated over the life expectancy of the 670,000 to 820,000 SHS units expected to be marketed and sold under SDC auspices.</p>	<p>1.1 to 1.3 million tons of carbon emissions eliminated</p>
<b>Costs</b>	<p>Depending on location, the life cycle costs of conventional fuels, appliances, etc., can be somewhat higher or lower than the costs of SHS alternatives. On average, they will probably be about the same.</p>	<p>Costs to households assumed to be equal to conventional sources of energy. Additional costs are incurred for establishing the SDC supplier network.</p> <p>Total costs for Business Advisory Services will be \$18 million. Losses from failed SHS businesses are estimated to range between \$2 and \$5 million.</p>	<p>Incremental costs of SDC establishment: BAS total : \$18 million Business Losses: \$2-5 million. Total \$20 to \$23 million</p> <p><u>GEF share of incremental costs:</u> BAS : \$5 million Business losses: \$2-5 million Total GEF: \$5.4-\$10 million Total initial GEF investment at risk: \$10 million (including BAS share)</p>



Annex II  
Logical Framework: Solar Development Corporation

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation	Critical Assumptions
<p><b>(a) Sector-Related Country Assistance Strategy (CAS) Goal</b> SDC addresses CAS goals related to environmental protection, private sector development, and extending energy supply to unserved populations.</p>	<ul style="list-style-type: none"> <li>Increases in rural electrification through renewable sources of energy.</li> </ul>	<ul style="list-style-type: none"> <li>Follow up to WB study on rural electrification.</li> </ul>	<p><b>(Goals to Bank/GEF Missions)</b> Assumes:</p> <ul style="list-style-type: none"> <li>Stable or growing national economies.</li> <li>No new significant nuclear or hydropower facilities.</li> </ul>
<p><b>(b) GEF Operational Program Goal</b> Reduce greenhouse gas emissions.</p>	<ul style="list-style-type: none"> <li>Greenhouse gas emissions avoided.</li> </ul>	<p>Same as above.</p>	<p>Same as above.</p>
<p><b>(a) Project Development Objective</b> Accelerate the development of viable, private-sector business activity in the distribution, retail and financing of off-grid PV applications in developing countries.</p>	<ul style="list-style-type: none"> <li>Aggregate growth of PV businesses supplying rural markets.</li> </ul>	<ul style="list-style-type: none"> <li>Market reports; market transformation studies (before &amp; after data on sales level, consumer awareness, and number of PV businesses targeting rural markets).</li> </ul>	<p><b>(Objective to Goal)</b> Assumes</p> <ul style="list-style-type: none"> <li>Continued core group commitment to rural electrification.</li> <li>Rural consumers respond to increased availability, consumer awareness campaigns.</li> </ul>
<p><b>(b) Project Global Objectives</b> Greenhouse gas emissions reductions via removal of barriers to purchase and use of PV applications in rural electrification.</p>	<ul style="list-style-type: none"> <li>Decrease in greenhouse gas emissions based on decrease in use of kerosene, other fuels in rural areas.</li> </ul>	<ul style="list-style-type: none"> <li>Rural electrification studies.</li> </ul>	<p>Same as above</p>
<p><b>Project Outputs</b></p> <ul style="list-style-type: none"> <li>A specialized Investment Fund which will provide equity, debt, quasi-equity for PV businesses.</li> <li>a technical assistance funding pool which will provide business advisory</li> </ul>	<ul style="list-style-type: none"> <li>Greater than 600,000 SHS installed in developing countries over life of project.</li> <li>10% increase in number of firms serving rural SHS market</li> </ul>	<ul style="list-style-type: none"> <li>SDC Management reports, externally verified.</li> <li>Market Studies</li> <li>Consumer Surveys</li> </ul>	<p><b>(Outputs to Objective)</b> Assumes</p> <ul style="list-style-type: none"> <li>Existence of private sector actors interested in pursuing PV businesses / financing for rural markets.</li> </ul>

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation	Critical Assumptions
services (BAS).	<ul style="list-style-type: none"> <li>• Decrease in prices of SHS</li> <li>• Increase in consumer awareness / satisfaction</li> </ul>		
<p><b>Project components/ Subcomponents</b> (main activities that must be undertaken in order to accomplish the results)</p> <ol style="list-style-type: none"> <li>1. SDC Manager to provide business advisory services to nascent businesses.</li> <li>2. Investment Fund provides financing to PV businesses and FIs lending to consumers.</li> <li>3. Policy consultative group to be formed to create dialogue on rationalization of PV policies which effect market.</li> </ol>	<p><b>Inputs</b> (resources provided for project activities)</p> <ul style="list-style-type: none"> <li>• BAS funding: \$18 M in grant funding (GEF/ WB / foundations/ IFC / other sources) for technical assistance, fund management costs.</li> <li>• Investment Fund: \$32 M in equity from GEF, IFC, World Bank, foundations, and other private sources.</li> </ul> <p><b>Subtotal:</b> \$50 M</p> <p><b>Total:</b> \$50 M</p>	<ul style="list-style-type: none"> <li>• audited SDC financials and other SDC Management reports.</li> <li>• disbursement reports.</li> </ul>	<p><b>(Components to Output)</b> Assumes:</p> <ul style="list-style-type: none"> <li>• BAS is effective in catalyzing new businesses.</li> <li>• Return expectations of Investment Fund are met.</li> <li>• Policy leverage is effective.</li> </ul>



**Annex III**  
**Available Reference Documents**

The following documents are available for review by contacting either Mr. Richard Spencer, World Bank or Mr. Dana Younger, IFC:

- A. SDC Concept Paper (December 1996).
- B. Executive Summary -SDC Business Plan (December, 1997), by Coopers & Lybrand, U.K.
- C. List of Conferences / Consultations where SDC Concept was Presented and Discussed
- D. The Evolution of World Bank Group/GEF Financing of Off-Grid Applications of Solar Photovoltaic Technology by Damian Miller and Bank Group staff (1998).



ANNEX IV  
MODIFICATIONS IN RESPONSE TO STAP TECHNICAL REVIEW

This project proposal was subject to an Independent Technical Review by a qualified expert from the STAP roster, whose summary comments are attached. In sum, the STAP reviewer found the proposal to be technically sound and deserving of high priority by the GEF. The reviewer also noted that the timing of the initiative is appropriate given developments in the PV markets and the lessons learned from other GEF and non-GEF funded PV projects. Note that the project proposal has been expanded and modified in response to the Technical Review, as described below.

**1. Incorporation of Experience / Lessons Learned.**

The project proposal was expanded to include a description of past World Bank / GEF and IFC / GEF photovoltaic projects, and the lessons learned from these projects and incorporated into the design of SDC.

**2. Policy Linkage.**

The STAP reviewer requested that the project document clarify the policy linkage SDC will maintain with the Bank, which will help rationalize PV markets in countries with existing distortions. The project proposal has thus been expanded to describe this aspect of SDC more fully.

**3. Barrier Removal Activities.**

The STAP reviewer requested that the project proposal include more specific details on the barrier removal activities to be undertaken by the BAS function. Thus, more specific information was included to describe the specific activities proposed for BAS.

**4. Project Funding Targets.**

The STAP reviewer recognized that a detailed budget was not appropriate at this stage, for this type of project. However, the reviewer requested that specific projections for the number of business to be assisted and number of businesses to be financed were included. The project proposal was thus amended to include these projections.

**5. Complementarity.**

The STAP reviewer requested that the section describing SDC's unique features and complementarity to on-going PV projects be expanded. Thus the project proposal now includes more details on SDC's complementarity to World Bank and other GEF-funded projects, as well as its unique features and prospects for replicability.

**TECHNICAL REVIEW**  
**SOLAR DEVELOPMENT CORPORATION (SDC)**

**1. Overall Impressions**

The project proposal is well written and there is a significant amount of good material upon which to develop a sound investment proposal. The concept is clear: i.e., investment and TA funds will be made available to develop private sector capacity to deliver SHS in GEF-eligible countries. The eventual investment program will focus on developing profitable private sector enterprises to deliver SHS on a sustainable commercial basis. There is evidence that the World Bank Group has undertaken the necessary preparatory steps to be able to develop a successful investment program.

**2. Relevance & Priority**

The project concept is relevant to the goals of the GEF. It seeks to promote the adoption of solar photovoltaic (PV) home systems by removing financial (and other) barriers -- through provision of investment capital and business advisory services. Promoting the adoption of PV is a high priority for GEF.

**3. Background and Justification**

The SDC project provides an opportunity to build on lessons learned through previous related projects during the past decade. Many of these were donor funded projects which were implemented during a period when the PV market was not sufficiently mature to support commercially viable private sector activities on a large scale. Nonetheless, it appears that the timing is right to develop an investment project focused on the private sector.

Significant private sector involvement is essential for sustained PV market growth. The SDC will provide investment capital and advisory services aimed at removing financial and other barriers that impede greater private sector activity. The proposal identifies the relevant market barriers.

**4. Scientific and Technical Soundness**

There is a great deal of experience with PV projects in GEF-eligible countries. As the proposal correctly points out, many (if not most) of these projects created market distortions. This is not necessarily negative. Many of the donor funded projects served to create PV awareness in beneficiary countries and provided PV system component sales for their donor-country companies. Even though sustainability was usually mentioned; this was more “wishful thinking” rather than an obvious output in the project design. In reality, it was unlikely that any significant sustainability of private sector PV companies would emerge. Nonetheless, while these projects were often executed under “artificial” market conditions, they did include significant private sector participation. Now there is significant experience and infrastructure upon which to build a market driven initiative such as through the SDC.

The SDC business model indicates that GEF could expect to receive a return of a portion of its original \$5 million investment. Various scenarios indicate that this financial return to GEF could be in the range of \$0.75 to \$4.6 million, depending on the success of equity investments and default rates. As an alternative to returning SDC generated profits to GEF, the GEF might consider reinvesting these profits through the SDC to further develop innovative PV financing mechanisms -- e.g., to penetrate more difficult PV markets. This would reduce the development costs of the “next generation” of SDC, if appropriate.

## **5. Objectives**

The SDC will strengthen and train PV businesses and create favorable conditions for market growth. This will be accomplished through removal of market barriers. The focus on financial intermediaries and PV distribution and service companies is particularly appropriate for commercial sustainability.

## **6. Activities**

The project has two components: i) provision of an Investment Fund for a variety of investees; and ii) grant funding for TA in the provision of business advisory services (BAS).

The anticipated investment pipeline will be a shift from the present day producer-led position towards a consumer-oriented service. This is the correct orientation to ensure market-driven success.

The SDC business model will clearly target demand-side stakeholders. This is appropriate considering the modest amount of financing that will be available for individual investments. As well, the BAS component activities also target the consumer end of the PV delivery chain. While there is provision to invest in manufacturers, the reviewer believes that the SDC will have a greater impact by focusing on the demand-side.

## **7. Participatory Aspects**

It is clear that a significant amount of discussion has gone into development of the SDC concept, including consultation with representatives of appropriate government agencies in various GEF-eligible countries.

## **8. Global Benefits**

It is inherently difficult (if not impossible) to perform an irrefutable quantitative assessment of the global environmental benefits attributable to PV projects. The GEF Alternative can be quantified based on the number of PV systems actually installed. However, it is difficult to determine a baseline (e.g. is it based on fossil-fuels or doing without)? Nonetheless, the proposal does respond to the GEF Operational Strategy because the SDC will remove barriers to the use of commercial PV technology and it will lead to reduced PV costs by significantly increasing the installed quantity of PV systems.

The anticipated volume of PV home systems to be installed during the project (670,000 to 820,000 units) will have significant global environment and development benefits. Achievement of these benefits is often constrained due to risks associated with small market size and high costs required to serve dispersed rural populations. In addition, existing local financial institutions often overstate their risk due to unfamiliarity with PV technologies. The SDC is particularly focused on removing the incremental risks which prevent private sector entrepreneurs from developing the commercial PV market.

## **9. GEF Strategies and Plans**

The project concept is consistent with GEF strategies and plans.

## **10. Replicability**

Due to the clear market potential for solar PV, there will certainly be significant scope to replicate successful private sector achievements. Involvement and engagement of commercial financing institutions should significantly increase the availability of sustainable financing for SHS after the

program ends. The replication is expected to occur through recapitalization of SDC as appropriate and through a variety of self-sustaining and innovative financial modalities.

The timely dissemination of successful private sector financing approaches developed through SDC will encourage and accelerate replication. The early presentation of lessons learned would be beneficial to other project developers to undertake parallel activities even before the SDC project is completed.

**11. Capacity Building**

There is significant scope for capacity building within this project; and this will be essential to ensure sustainability.

**12. Project Funding**

The amount of \$10 million requested from GEF is reasonable to undertake the target of 50 projects during 8 years.

**13. Time Frame**

The proposal indicates 5-8 years. Establishing a sustainable financial mechanism for private sector PV activities in most GEF eligible countries can take on the order of 2-4 years. If the SDC Investment Fund is expected to finance approx. 50 projects; then, from an operational point of view, a GEF project duration approaching 8 years appears to be realistic.