

<i>Project ID:</i> P035544	<i>Project Name:</i> SOLAR HOME SYSTEMS
<i>Team Leader:</i> R. Anil Cabraal	<i>TL Unit:</i> EASEG
<i>ICR Type:</i> Core ICR	<i>Report Date:</i> July 24, 2001

1. Project Data

Name: SOLAR HOME SYSTEMS *L/C/TF Number:* CPL-41320
Country/Department: INDONESIA *Region:* East Asia and Pacific Region
Sector/subsector: PP - Electric Power & Other Energy Adjustment

KEY DATES

	<i>Original</i>	<i>Revised/Actual</i>
<i>PCD:</i> 11/30/1994	<i>Effective:</i>	10/01/1997
<i>Appraisal:</i> 07/06/1996	<i>MTR:</i> 05/31/1999	09/22/2000
<i>Approval:</i> 01/28/1997	<i>Closing:</i> 04/30/2002	01/31/2001

Borrower/Implementing Agency: Government of Indonesia/DGEED; Government of Indonesia/BPPT
Other Partners: GEF

STAFF	Current	At Appraisal
<i>Vice President:</i>	Jemal-ud-din Kassum	Marianne Haug (Acting VP)
<i>Country Manager:</i>	Mark Baird	Marianne Haug
<i>Sector Manager:</i>	M. Farhandi	Peter R. Scherer
<i>Team Leader at ICR:</i>	R. Anil Cabraal	Arun P. Sanghvi
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2. Principal Performance Ratings

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HL=Highly Likely, L=Likely, UN=Unlikely, HUN=Highly Unlikely, HU=Highly Unsatisfactory, H=High, SU=Substantial, M=Modest, N=Negligible)

Outcome: U
Sustainability: L
Institutional Development Impact: H
Bank Performance: HS
Borrower Performance: S

QAG (if available) ICR
Quality at Entry: HS HS
Project at Risk at Any Time: Yes

3. Assessment of Development Objective and Design, and of Quality at Entry

3.1 Original Objective:

3.1.1 The project's development objectives, as stated in the SAR, were to: (i) provide the modern energy form of electricity to rural customers who can not be served economically or in a timely manner by conventional rural electrification; (ii) facilitate participation by the private sector in advancing renewable energy commercialization; (iii) promote environmentally sound energy resource development in Indonesia

and reduce the energy sector's dependence on fossil fuels; and (iv) strengthen Indonesia's institutional capacity to support and sustain decentralized rural electrification using solar photovoltaics. The project's global objective was to protect the global environment by mitigating emissions of CO₂ in Indonesia.

3.1.2 These objectives were clear and realistic, and reflected Indonesia's as well as the Bank's priorities for rural development and rural electrification at that time. In particular, Indonesia's Outlines of State Policy (1993) recognized the importance of meeting the country's rapidly increasing energy requirements efficiently – including through conservation and diversification of primary energy resources and their more efficient utilization – and minimizing the adverse environmental impacts of energy use. Further, the GOI viewed rural electrification as a key and integral part of rural development, and Indonesia's long-term goal was to electrify all villages and enable the basic services provided by electricity.

3.1.3 The objectives had clear links to the Bank's prevailing Country Assistance Strategy (CAS) as well as the ongoing Bank lending operations. The CAS supported energy development, including renewable energy, and highlighted: (a) achieving poverty reduction through increased funding for regional development, and a shift towards smaller and regionally oriented projects targeted at the reducing urban-rural disparities in the quality of life; and (b) striking the appropriate balance between public and private roles in energy distribution. Contemporaneous to the SHS project, the Bank also approved the Second Rural Electrification Project (which financed grid-based rural electrification), and the Renewable Energy Small Power Project (which financed grid-connected renewable energy power generation), and was preparing rural/renewable energy projects targeted at Eastern Indonesia.

3.2 Revised Objective:

3.2.1 The project objectives were not revised during project implementation.

3.3 Original Components:

3.3.1 The project's central elements were a private sector based and market conforming supply, delivery and financing mechanisms, with a key role for the Government in raising technology awareness and promoting quality equipment and performance by setting standards and certification – building upon the positive experience with solar PV in Indonesia, while taking account of the lessons learned from the past Bank and non-Bank experience with rural electrification and renewable energy operations.

3.3.2 The project consisted of two components, which were clearly linked to the project objectives.

- A credit component consisting of an IBRD loan and a GEF grant. Under the credit component, the project aimed to provide electricity to about 1 million rural people in three provinces – West Java, Lampung, and South Sulawesi – through the sale and installation of 200,000 solar PV systems for homes, and in commercial establishments such as small shops. The sales of SHS units would be undertaken by private enterprises (“SHS dealers”), who would extend credit to rural households to enable them to pay for their units in regular monthly installments. The SHS dealers would access credit, on normal commercial terms, from participating local commercial banks (“Participating Banks” – PBs), who would refinance their loans from the IBRD loan. The GEF grants would be provided to the SHS dealers on a per SHS unit basis, after a unit had been sold and installed.
- A technical assistance (TA) component, for (i) implementation support – to establish a Project Support Group (PSG) to provide assistance to SHS dealers and end-users, to monitor and

evaluate project progress and to conduct limited SHS related training to government officials and private sector organizations; (ii) policy support – to carry out and prepare a Decentralized Rural Electrification Strategy Study and SHS Action Plan; and (iii) institutional development – to assist GOI in building Indonesia’s institutional capabilities for the dissemination of solar PV technology.

3.4 Revised Components:

3.4.1 While the original basic components were retained during project implementation, soon after the project became effective (October 1997), it became clear that some realignments would be needed in response to the deterioration in the general economic situation in Indonesia.

- **Bank loan closed ahead of schedule, while GEF grant reduced and extended:** As only less than \$0.1 million of the Bank loan was utilized and none was expected to be utilized in the future, the IBRD loan was closed on January 31, 2001, fifteen months ahead of the original schedule. The project was reconfigured as a stand-alone GEF-funded project, with the GEF grant reduced from \$24.3 million to \$11 million, and the project closing extended by two years to April 30, 2004.
- **Sales targets reduced:** from the original level of 200,000 units of minimum 50 Wp to 70,000 units of minimum 30 Wp, and performance indicators were revised accordingly.
- **TA study changed:** The TA for a *Decentralized Rural Electrification Study and the Solar Home System Action Plan* was replaced by a *Renewable Energy for Rural Transformation Study and Action Plan*. This change, arising from the increasing focus in Indonesia and the Bank on poverty reduction, will focus the study and plan on utilizing renewable energy for social and economic development of rural communities.

The Grant Agreement amendment reflecting the above changes became effective on June 12, 2001.

3.5 Quality at Entry:

3.5.1 Quality at Entry is rated satisfactory, based on the strength of: (a) consistency of objectives with priorities of the Government and Bank CAS; (b) successful experience and lessons learned from Bank operations and international experience; and (c) innovative project design with private sector participation on a commercially oriented basis, with performance linked subsidies. The essential elements of this project design have since been incorporated, with appropriate changes and refinements, in a number of Bank/GEF-financed solar PV projects in Asia (Sri Lanka and China) and Africa (Uganda).

3.5.2 A QAG assessment carried out in 1998 (it was the QAG’s first such assessment) rated the project’s Quality at Entry as "Good". Out of the eight areas defined by QAG for assessment, the project received "Good" ratings in five areas, namely, project concept, objectives and approach; technical, economic and financial aspects; environmental aspects; social and stakeholder aspects; and Bank inputs and processes. Based on this review, the project team was honored for Excellence in Quality by the Bank senior management in 1998.

4. Achievement of Objective and Outputs

4.1 Outcome/achievement of objective:

4.1.1 The achievement of project objectives has been mixed.

4.1.2 On the physical side, the achievement has not been satisfactory. The project became effective in October 1997, just as the economic crisis hit Indonesia. In the macro-economic environment of high inflation, high interest rates, falling incomes, and uncertainty about the future, it was virtually impossible to start new businesses that would introduce, on credit terms, a new consumer good into the rural areas. Further, the country's financial sector was basically paralyzed, and the participating banks were unable to provide any credit to the SHS dealers, as envisaged in the project design. Details are discussed in the section below for Major Factors Affecting Implementation and Outcome.

4.1.3 Consequently, the project implementation has been very slow. As of end 2000, a total of 1,349 SHS units were installed. All the installations were carried out by one dealer, instead of the 5-6 qualified dealers identified at the appraisal; further, only one of the four top-rated participating commercial banks has been able to provide financing, and that too of a very limited amount.

4.1.4 The supporting TA component of the project, particularly the implementation support and institutional development activities, has been implemented satisfactorily. As a result, the foundations for the Indonesia SHS project were successfully built, and this has provided the basis for continuing it as a stand-alone GEF project. In addition to establishing strict technical criteria and procedures for testing and certification of SHS units, the project has also helped develop domestic testing and certification capabilities within the Technical Implementation Unit and Energy Technology Laboratory (LSDE) of the Indonesian Agency for Assessment and Application of Technology (BPPT). The project has also established an effective Project Support Group (PSG) staffed with qualified personnel who carry out field audits and other monitoring responsibilities, provide capacity building technical assistance and training to various participants in the project. With gradual picking up of SHS sales, the project should be able to benefit fully from these gains.

4.1.5 Although improvement of quality of life was mentioned in the SAR as an outcome, it was not a performance indicator and the monitoring & evaluation system was not designed to collect data for this purpose. However, beginning in 2001, the PSG will conduct baseline and impact surveys to improve the understanding of the changes resulting from the use of SHS. These surveys are expected to generate insights into economic and social benefits of the SHS.

4.1.6 Overall, in spite of the very slow rate of implementation of SHS sales, the project has had many beneficial effects that go beyond the project itself. *First*, the relatively ambitious scale of the project and the Bank/GEF's continued support for the project in difficult economic times has sent a clear signal to solar PV promoters (client country governments, multilateral/bilateral agencies, NGOs) and potential solar PV providers (international and local) that the Bank and GEF are seriously committed to solar PV in particular and renewable energy in general. This has facilitated the preparation and implementation of similar projects in other countries.

4.1.7 *Second*, some of the innovative design features of the project have since been utilized in other Bank/GEF-financed projects. These include a transparent and simple to administer system of calculation and payment of GEF grants to dealers, linked to market based sales performance within a commercial and competitive framework, with a project scale that enabled a clear commercial exit strategy. This system also provided for end-user audits to verify and monitor dealer performance. In contrast, prior to this project, most solar PV projects used a government procurement approach, even in situations of widespread recognition that governance structures were weak and corrupt; further, most projects had a small scale and a technology demonstration orientation, which could not lead to a self-sustaining commercial solar PV

market. Other features include reducing commercial risks by the provision of business development services to potential dealers to assist them in formulating their plans, and to obtain training in direct sales, financial management, inventory controls and other good business practices.

4.1.8 *Third*, project-supported activities (along with the devaluation of the rupiah) have led to a significant decline in the international prices of some of the locally manufactured key components used in SHS – the so-called the “balance of systems” excluding the solar PV panels. The project encouraged local Indonesian firms to manufacture these components, had them tested on a grant basis at international laboratories to check whether they met the project’s technical specifications, and arranged for technical support from interested international organization to improve their quality. Two companies who were assisted with component design and testing have, partially in response to the collapse of Indonesian markets in 1998-99, developed export market sales. One of these companies, while still relatively small, is now the leading international exporter of integrated balance of system components for SHS, contributing, for example, to sales in Sri Lanka under the World Bank supported Energy Services Delivery Project and to commercial sales in Kenya, and has received offers of second stage financing from IFC/GEF-supported Solar Development Capital. Another company whose development has been supported has sold systems in rural areas under the Kecamatan Development Project and other provincial and local government-supported rural energy programs.

4.1.9 *Fourth*, the technical standards formulated for this project are now being used, with adaptations, in a number of other countries (Sri Lanka, China and Uganda). Further, these standards also formed a base for the activities of an international NGO, Photovoltaic Global Approval Program, which is developing a widely accepted Seal and Mark of quality.

4.1.10 *Fifth*, technical assistance provided through the project has enabled the Photovoltaic Testing Laboratory of BPPT to obtain ISO 25 accreditation for PV components testing. This denotes that the laboratory has achieved international standing for testing and certifying balance of system components. The laboratory has tested and certified products from the USA and the Netherlands that have been accepted for use under the SHS project.

4.2 Outputs by components:

Credit Component:

4.2.1 The single participating dealer has sold:

- 92 SH units in 1999
- 1,257 SHS units in 2000
- 150 SHS units during January and February 2001.

The dealer has continued to expand its rural distribution in South Sulawesi and Lampung market areas, and now has two branch offices, 13 village level site offices and 32 marketing representatives in rural locations. Most (90%) of its sales under the project are of 40 Wp systems sold with two-year loans from the dealer at a retail price equivalent to approximately \$7.7 per Wp. A company wide training program in direct selling methods and product knowledge was held during January 2001 with PSG assistance.

4.2.2 The results of the PSG’s end-user audits of this dealer’s sales have been satisfactory. The 1,168 audits completed as of early 2001 have found consistently high consumer satisfaction levels, with the main qualification being the desire for larger systems capable of powering color televisions.

Table – 2000 End-user Audits by SHS Unit Size and Market Area

	32 Wp	40 Wp	42 Wp	50 Wp	53 Wp	Total
South Sulawesi	9	629	256	-	-	894
Lampung	-	196	20	-	41	257
West Java	-	-	-	1	16	17
Total	9	825	276	1	57	1168

4.2.3 A second dealer submitted its business plan for approval in January 2001, and two other dealers are in the process of preparing their business plans. An international PV marketing company is making exploratory market entry investigations.

Technical Assistance Component:

4.2.4 Technical assistance components of the project, particularly the implementation support and institutional development sub-components, have been successfully carried out in spite of the adverse macroeconomic situation in Indonesia. In terms of implementation support, the PSG has successfully setup an effective system for approving dealers, monitoring the actual performance of SHS, auditing sales data for GEF grant release and extending technical assistance to banks and dealers (particularly on market and business development matters).

4.2.5 In addition to establishing strict technical criteria and procedures for testing and certification of SHS components, the project has also developed excellent in-country testing and certification capabilities within the BPPT-LSDE. State of the art testing facilities have been installed at the BPPT-LSDE facilities and all staff training activities have been completed on schedule. Data-loggers have also been procured for installation in the field to monitor system performance. LSDE received ISO 25 accreditation in June 2001.

4.2.6 Under the policy support sub-component, the planned decentralized rural electrification strategy study and SHS action plan has not been undertaken at the request of the Government in light of changes anticipated from the ongoing power sector reform. Instead, a “Renewable Energy for Rural Transformation Study” will be carried out. The change in title and corresponding scope of work reflects a greater recognition by the Government of the critical role of modern energy in meeting the developmental needs of rural communities. The objective of the study will be to prepare an action-oriented plan for enhancing social and economic development of rural communities by ensuring that essential energy needs are met using renewable energy, where appropriate.

4.3 Net Present Value/Economic rate of return:

4.3.1 The SAR showed an IERR of 12% without and 39% with GEF payments being included as benefits. The total costs were measured by the capital and replacement costs over the lifetime of the PV systems, while the benefits were measured by the (i) customer payments to SHS dealers – consisting of the down payments and the monthly installment payments needed to finance the loan over a period of four years; and (ii) customer expenses incurred to maintain the systems. The SAR noted that the estimates of benefits were biased downwards because of the exclusion of the consumer’s surplus from the benefits.

4.3.2 The calculation of the IERR for the target of sales of 200,000 SHS units was based on the standard approach that there would be:

- Initial net negative benefits – costs exceed revenues – arising from investment costs in SHS units, while revenues from down payments would be relatively small.
- Later net positive benefits – revenues exceed costs – as investment costs reduce while revenues from monthly installment payments increase.

4.3.3 During the project, the total sales were of only about 1,349 units. However, this did not have the expected effect of depressing the IERR for two reasons. First, unlike conventional power projects where investments often need to be of a significantly large minimum size – investments are “lumpy” – in SHS, the investments are modular, and SHS dealers can reduce their investment costs in response to an anticipated slowdown in sales. Second, in the case of this project, the macroeconomic crisis hit Indonesia in 1997 just as the project became effective, so that the dealers were able to avoid undertaking investments in SHS units until economic conditions improved.

4.3.4 When economic conditions did improve in mid 1999, the solitary participating dealer focused on the least risky segment, i.e., the “upper end”, of the potential market – where it was possible to recoup the investments quickly, and there were good prospects of significant profits. In the uncertain economic environment prevailing at that time, and given the novelty of SHS sales in the selected provinces, this was a prudent strategy that gave the dealer a workable entry point into the SHS business, even though it did limit the total SHS sales that could be achieved.

4.3.5 The outcome of this strategy was that, on an annual basis, there was no negative cash flow in either of the two years in which SHS sales took place – the dealer made good profits which has encouraged him to expand the business, and also attracted other potential dealers into the business. Given the positive cash flow in each year, i.e., in the absence of an initial negative cash flow, it is not possible to calculate an IERR for the few sales that actually took place.

4.4 Financial rate of return:

Not applicable.

4.5 Institutional development impact:

4.5.1. The project’s institutional development impact is substantial. The project has successfully helped strengthen BPPT-LSDE’s capability to technically certify SHS by carrying out system testing as well as product testing, and to monitor systems in the field. The testing and certification facility at BPPT-LSDE has been successfully installed and is currently operational. All proposed training activities for staff of BPPT-LSDE have also been successfully carried out. As noted above, as a direct result of the project’s support, LSDE was awarded ISO 25 accreditation in June 2001 – which goes beyond the original TA that required only a plan to be prepared for obtaining accreditation.

4.5.2 In addition, institutional strengthening services have also been extended by PSG to other stakeholders such as participating banks and dealers/suppliers. For participating banks, the focus has been to familiarize them with the SHS technology, the market being targeted and how to handle loans for SHS vendors and isolated rural end-users. For SHS dealers/suppliers, particular attention has been given on market and business development, e.g., business model development, business plan elaboration, training of marketing, technical and credit staff, developing linkages with financial sources).

5. Major Factors Affecting Implementation and Outcome

5.1 Factors outside the control of government or implementing agency:

5.1.1 **Banking sector crisis blocked entry of dealers into project.** In late 1997, when the project became effective, Indonesia was engulfed in a deepening economic and political crisis. The near total paralysis of the financial sector largely blocked implementation of the credit component up to mid-2000. The entry of SHS dealers into the project requires a credit agreement with a participating bank (PB). Two of the expected PBs were prevented by their financial situations from participating, while the other two PBs were not able to issue fresh credits until their recapitalization were completed in May and June 2000. A condition of a cash deposit equivalent to 100% of the face value of the credit was the basis of the two PBs to offer credits to SHS dealers. Only one dealer was able to accept such offer.

5.1.2 **Market collapse, depreciation, and other factors reduced the affordability of SHS, sales plummeted, the one successful dealer went out of business.** With SHS dealers unable to borrow from the banks, the dealers were unable to offer any significant credit to their customers, which was a main strategy of the project to increase affordability. At the same time, sharp depreciation of the Rupiah contributed to a significant increase in the retail prices of SHS units. At appraisal in September 1996, the Indonesian Rupiah was valued at Rp. 2,341/US\$; by January 1998, it had declined to Rp. 17,000/US\$. The SHS retail price rose from Rp. 1.0 million at appraisal to more than Rp. 4.0 million in mid 1998. Consumers willingness and ability to pay were reduced by increase in prices of many essentials. During 1998, there were no reported commercial sales of SHS units; the only dealer whose established SHS business had been based on consumer credit was out of business in end 1998. The fall in the Rupiah value had cut the dollar value of the one PV dealer's some 5,000 customer accounts by more than 75%. This company subsequently went out of business.

5.1.3 **Proactive actions by project team have kept the project going.** To some extent, the above adverse impacts on PV market and the project were offset by the effective and proactive supervision approach of the Bank project team and the PSG, which has resulted in a realignment of the project. *QAG found the overall quality of Bank supervision effort to be highly satisfactory:* "The performance of the Bank supervision team was notable in its commitment to focus on ultimate development effectiveness and not merely the mechanical implementation of the project as initially designed." Without these efforts, the project would most likely have been ended as a matter of routine portfolio adjustment in response to the macroeconomic crisis, which would result in a loss of the market momentum that is currently building and also a loss of the benefits that have accrued in the technical and institutional capacity that has been built up in the country.

5.2 Factors generally subject to government control:

5.2.1 **Continuing subsidies for kerosene and diesel lowered the competitiveness of SHS.** The competitiveness of SHS versus kerosene (e.g., for lighting using a petromax) and versus diesel for operating a small genset, and versus battery charging by a grid-connected station or at an isolated diesel has weakened, as fuel and electricity tariff subsidies have been maintained. In comparison with the 400% increase (in rupiah terms) in the price of an SHS, by the end of 1999, the retail prices of kerosene and diesel, which were Rp. 250 and Rp. 380 per liter in 1997, had risen to Rp. 280 and Rp. 600, or 12% and 58% higher respectively.

5.3 Factors generally subject to implementing agency control:

5.3.1 **A Project Support Group (PSG) has been established** and it is providing effective business development services, conducting end user verifications and ensuring transparent grant releases.

5.4 *Costs and financing:*

5.4.1 The estimated total project cost at appraisal was US\$118.1 million, including the IBRD loan (\$20 million), the GEF grant (\$24.3 million), and the local counterpart funding from GOI/BPPT (\$1.5 million), the participating banks (5.0 million), the subborrowers (dealers) and end-users (\$67.3 million).

5.4.2 The actual/latest estimate up to the Bank loan closure shows that the project cost was \$3.4 million, only 2.9% of the original estimate. This is in line with the much delayed project implementation and very low level of the Bank loan/GEF fund utilization. This \$3.4 million total cost consists of: \$0.1 million of the Bank loan, \$2.3 million of GEF grant, \$0.3 million of GOI/BPPT contribution, \$0.1 million from the participating banks, and \$0.6 million from dealers/endusers.

5.4.3 Out of the Bank loan, two partial loan proceeds cancellations were made, one in August 1998 with an amount of \$2.5 million and the other in December 1999 in the amount of \$17.0 million, which reduced the loan amount from the original \$20 million to \$0.5 million. Out of the net loan amount, \$0.08 million have been disbursed, and the balance (\$0.42 million) has been canceled upon closure of the loan account. The two partial loan proceeds cancellations were part of a broader restructuring of the IBRD loan portfolio for Indonesia in responding to the economic crisis and no commercial bank demand of the IBRD loan. The local funds mobilization rate of the banks is 10.6-12.7%, while the refinancing rate of the IBRD loan funds, which is linked to the rate for the three-month SBI, is 13.6% (September 2000). Also, there is less demand for commercial bank credit by the SHS dealers, as they have shifted strategies to lower their exposure to currency and inflation risks, namely by using longer deferred payment trade credit from suppliers, a higher rate of self financing, revised consumer credit arrangements (based on a higher percentage down payment and terms of 12 - 24 months rather than 48 months), sales of smaller size, more affordable units, and a larger proportion of cash sales.

5.4.4 As a result of the project realignment in early 2001, the GEF grant has been reduced from the original amount of \$24.3 million to \$11.0 million, of which, \$5.7 million as grants to dealers and \$5.3 million to fund various technical assistance activities. As of the Bank loan closure, \$2.3 million of GEF grant has been disbursed.

6. Sustainability

6.1 *Rationale for sustainability rating:*

6.1.1 In spite of the past slow implementation rate, and the continuing economic uncertainties in Indonesia, the project sustainability is rated as likely for a number of reasons. *First*, as a result of the GEF support, considerable capacity has been developed and a solid base for future SHS development has been established. Significant commercial sales of SHS were recorded in 2000, and the momentum is expected to continue in 2001 and thereafter. *Second*, the need and increasing demand for SHS in target markets is clear. The increased demand stems from two main causes: (a) greater realization by unelectrified consumers that PLN is unlikely to provide grid electricity services in the foreseeable future; (b) increased rupiah income of farmers growing export crops in Lampung and South Sulawesi. The pace of household grid-based rural electrification has slowed in Indonesia from 1.8 million consumers/year to about one tenth this rate, thus effectively reducing the competition from potential grid extension in the future.

6.1.2 *Third*, one dealer aggressively entered the market and its success during 2000 has had high example-setting value for market development, encouraging other companies to enter in 2001. *Fourth*, participating commercial banks have showed a renewed interest in providing credit for SHS sales. Adjustments made to the project design in response to market conditions have maintained affordability and increased the interest of dealers and banks. *Fifth*, national quality standards and certification procedures, domestic testing and certification capabilities to ISO 25 standards have been established, and quality certified products from several local suppliers at internationally competitive prices are available. One of the qualified suppliers has become a major exporter of SHS lights and controllers on the basis of support provided and quality certifications awarded under the project.

6.1.3 Nonetheless, this is a market-based project, and sustainability will be largely determined by market conditions and the overall business environment, including improvements in the frameworks for enforcing contracts and for transparency in official transactions, which affect the willingness to invest.

6.2 Transition arrangement to regular operations:

6.2.1 With continued GEF support to April 2004, it is anticipated that enough dealers and banks would participate, dealer distribution infrastructure investments would continue to grow to support market expansion and consumer service. The PSG will continue the business capacity building and quality and service compliance monitoring, which is important to building the confidence of the banks and consumers.

6.2.2 During the extended GEF support, it is expected that appropriate transition arrangements to the post-project phase would be provided. Specifically, support will be given to strengthen dealers' internal controls, marketing, business and technical capabilities. The support will assist companies link with commercial investors and funding sources, including the Solar Development Capital which is currently discussing investments in three of the companies that have participated in the project. Under the restructured project, the grant levels will scale down over the balance period of implementation, and this is expected to contribute to the companies' transitions to fully commercial operation.

7. Bank and Borrower Performance

Bank

7.1 Lending:

7.1.1 Bank performance can be rated as highly satisfactory. As mentioned earlier, the project was rated "Good" by QAG at its first assessment of Quality-at-Entry in 1998. The project design was creative with private sector participation mechanism. The risks were properly identified and relevant.

7.2 Supervision:

7.2.1 Bank performance for project supervision can be rated as highly satisfactory. The project supervision was rated "Superior" by QAG in its Second Rapid Supervision Assessment (RSA2) which assessed the quality of Bank's supervision in FY98. RSA2 sampled 200 projects across the Bank. SHS was among the 27 projects (of which 6 were in EAP) identified as having been particularly well supervised in FY98. The project supervision was rated "Highly Satisfactory" by QAG in its QSA4 in FY2000.

7.2.2 The Bank team paid particular attention to project sustainability, not merely the mechanical

implementation of the project as initially designed. During mid-2000, the Bank and GOI assessed progress and prospects to achieve the project's development objectives in light of the financial/banking crisis, and concluded that prospects were limited. The Bank team then recommended to management to agree to canceling nearly all the line of credit and advancing the closing date for the loan and GEF grant to January 2001. The Bank team then initiated an orderly closing down of the project with concurrence of Bank management. However, the Bank team kept in close contact with the SHS dealers and the PSG which kept on working towards the institutional and market development goals. By the time of October 2000 mission, market conditions appeared to have improved significantly and, new, independent assessments suggested that there are good prospects for meeting GEF development objectives, even if there is little interest in drawing down the Bank loan. Finally, the Bank agreed to the client's request to keep the GEF grant open as originally scheduled, while closing the Bank loan on January 31, 2001, fifteen months ahead of the original closing date (April 30, 2002). The project has subsequently been realigned as a free-standing GEF operation with a new closing date of April 30, 2004.

7.2.3 Procurement of SHS units was handled under commercial practices which has resulted in lowest unit price in the area, an example of best practice. The Bank team has enjoyed continuity, an appropriate skill mix to suit the nature of the project. The supervision reporting has been complete and candid in all aspects. The supervision record indicated that the client clearly benefited from Bank technical assistance under supervision, and the relationship with the client is open and effective.

7.3 Overall Bank performance:

7.3.1 Overall Bank performance during the project cycle can be rated as highly satisfactory.

Borrower

7.4 Preparation:

7.4.1 The Borrower's performance in lending is assessed as satisfactory. There was close cooperation at the time of preparation between the Government and the Bank, and the leadership and vision provided by the main counterparts in GOI ensured that the project was appropriate to Indonesia's needs. Representatives from all the counterpart agencies and private sector were involved in the preparation of the project.

7.5 Government implementation performance:

7.5.1 The performance of BPPT, the government implementing agency and main recipient of the technical assistance of the project is deemed satisfactory, as it was able to successfully meet (even exceed) the objectives it was directly responsible for. The performance of DGEEU, another government implementing agency, is also deemed as satisfactory, notwithstanding the protracted delay in carrying out a policy study. In light of the anticipated power sector reform, agreement has been reached with DGEEU to conduct the study under a new title and with corresponding changed scope of work. Such change reflects a greater recognition by DEGGU of the critical role of modern energy in meeting the development needs of rural communities.

7.6 Implementing Agency:

7.6.1 The performance of the private sector participants (dealers, banks) is considered unsatisfactory because of the slow progress of the SHS sales, weak investment in rural distribution networks and inability of the banks to make loans to SHS dealers, although such was caused mainly by factors beyond their

control, including the collapse of the banking sector, civil unrest and the sharp depreciation of Rupiah.

7.6.2 On the other hand, the performance of PSG is highly satisfactory. It has provided high quality services to various participants under the project as noted previously.

7.7 Overall Borrower performance:

7.7.1 The overall borrower performance is deemed satisfactory.

8. Lessons Learned

8.1 **Market-based projects should provide broad scope for companies to adjust product lines and business models to meet changing market signals.** The thrust of the changes and the eventual realignment of the project were to increase the scope and time for companies to adjust products and business models in response to changing market conditions. The dealers responded with product lines that maintained affordability and a variety of revised business models in line with local capabilities and opportunities.

8.2 **Significant market entry support for firms as well as performance based grants that scale down over time are necessary.** While the project design did provide for upstream business planning and promotion assistance, the emphasis was on performance-based grants to companies after the sales and installations of systems. In practice, the support for business planning and market development has been greater than anticipated, given the steep learning curve and high market entry costs. This type of upstream, cost-shared support is necessary to assist induce the market entry of dealers and assist them to develop distribution operations in remote areas. Also, the performance-based grant initially was to remain at the same level for the life of the project. This was insufficient to induce companies to develop sales in the early years, and would likely be an insufficient basis for them to transition to a fully commercial operation at the end of the project. The project realignment provides for a scaling down of the grant level over time, with some flexibility linked to the pace of market development.

8.3 **A convincing end-user audit program and transparent grant releases encourages dealers to participate in the project and follow the consumer protection requirements.** The SHS project has a strong, independent end-user audit facility and assists the dealer with the processing of their performance based grants. The end-user audit facility, in addition to ensuring compliance with consumer protection requirements, assures that there will be fair competition among the companies. The arrangements for transparent grant releases minimize the time and transactions costs of the companies, encouraging them to focus their learning and marketing efforts on rural consumers, rather than on processing paperwork for grant payments.

8.4 **Upstream and monitoring support to financial organizations is necessary to increase their knowledge of the sector.** The high costs of market entry that confront dealers are mirrored by the costs that confront organizations that would finance them, especially the high costs of information about the market and dealer performance in remote rural areas beyond the reach of the branch networks of Indonesia's financial institutions. Facilitating initial field visits and providing information on dealers and sales performance, much of which is generated as a by-product of the end-user audits, reduces the transaction costs of financial institutions, thus partially lowering a barrier to their financing of SHS dealers.

8.5 **A cross sectoral approach focused on both the consumer and institutional PV markets provides greater potential for sustainability and development impacts.** The main emphasis originally

was on sales of SHS to rural households. While the evidence for this lesson is not yet significant, the realigned project, with its shift to a per Wp grant basis, provides the basis for sales to community based projects of varying scale. With the community driven development approaches, this is an opportunity for dealers to increase sales volumes in areas in which they have sales and service networks. It is also an opportunity to spread the development benefits to families that may not be able to afford to purchase an individual household unit. Weak procurement methods and the application of other subsidies, often bilateral, for PV through institutional channels have often had negative impacts on market development. But with competitive arrangements and community driven approaches, there is scope for institutional/community sales to contribute to the development of a sustainable PV market.

9. Partner Comments

(a) Borrower/implementing agency:

As the Project is continuing under the GEF financing, Borrower comments were not sought at this time, nor was the Borrower invited to prepare its own separate evaluation. When the project is fully completed in 2004, a more comprehensive ICR will be prepared, with comments from the borrower, implementing agencies, local participating banks, private dealers, and end-users. Borrower will also be invited to prepare its own evaluation report at that time.

(b) Cofinanciers:

See para. (a) above.

(c) Other partners (NGOs/private sector):

See para. (a) above.

10. Additional Information

None.

Annex 1. Key Performance Indicators/Log Frame Matrix

Project Objective	Performance Indicators	Baseline Year (SAR – 1996)	ICR		Full Impact	
			SAR (2001)	Actual (2000)	SAR (2005)	ICR (2004)
A. Provide modern energy form in an environmentally sustainable manner, to rural customers who cannot be served economically or in a timely manner by conventional rural electrification	Outcome Indicators					
	- Number of units sold per year on credit	4000	About 55,000	1257	110,000	About 34,000
	- Cumulative number of SHS units sold under Project	Not applicable	200,000	1370	Not applicable	70,000
	- Customer timely payment rates	Not applicable	About 95%	100%	About 95%	About 95%
	Impact Indicators					
	- Cumulative number of people served by SHS Project	Not applicable	880,000	6000	-	350,000
- Cumulative environmental benefits ('000 tons CO2 emissions abated)*	Not applicable	1,334	9	2,204	450	
- Cumulative fossil fuel conserved (kilo-liters)*	Not applicable	546,720	3707	903,277	180,000	
B. Establish private sector-based efficient and sustainable delivery, financing, and loan collection mechanism for providing solar PV products to rural customers	Outcome Indicators					
	- Installed SHS Price: Java (constant 1996) dollars	\$550-\$650	About \$425	\$425	About \$400	About \$8-10/Wp without GEF grant
	- Off-Java (constant 1996 dollars)	\$700-\$800	About \$500 with GEF Grant	\$425	About \$450	
	- Dealers with "problem loans"	Not applicable	2 or less	0	-	
	Impact Indicators					
- Number of dealers selling to households on credit basis	2	5 or more	1	8 or more	4 to 6	
C. Capacity building of key sector institutions	Outcome Indicators					
	- Decentralized rural electrification strategy study	Not applicable		Not started, replace with RERT study	Completed	Completed
	- Procurement of equipment for BPPT's laboratory	Not applicable		Completed	Completed	Completed
	- Attainment of ISO 25 status for BPPT's laboratory	Not applicable	Action plan adopted	Completed	Completed	Completed
	Impact Indicator					
- GOI adoption of decentralized rural electrification strategy and action plan	Not applicable	Completed	Study not started	Plan adopted	Plan adopted	

Note: * Over 15 years.
 ** Although IBRD loan was closed early on 1/31/2001, the project continues with a reduced GEF grant until 04/30/2004.

Annex 2. Project Costs and Financing

Project Cost by Component (in US\$ million equivalent)

Project Cost By Component	Appraisal Estimate US\$ million	Actual/Latest Estimate US\$ million	Percentage of Appraisal
Credit Component	92.10	0.70	0.8
Technical Assistance Component			
Implementation Support	4.10	2.00	48.8
Policy Support	1.20	0.00	0
Institutional Development	1.00	0.60	60
Duties and Taxes	9.80	0.10	1
Total Baseline Cost	108.20	3.40	
Price Contingencies	9.90	0.00	0
Total Project Costs	118.10	3.40	
Total Financing Required	118.10	3.40	

Note: Although the IBRD loan was closed early on 1/31/2001, the project continues with a reduced GEF grant until 4/30/2004.

Project Cost by Procurement Arrangement at Appraisal (US\$ million)

	Procurement Method		Total
	Other a/	NBF b/	
A. Credit Component	101.9	0.0	101.9
	(20.0)		(20.0)
	[20.0]		[20.0]
Tax	0.0	9.8	9.8
Subtotal	101.9	9.8	111.8
	(20.0)	(0.0)	(20.0)
	[20.0]	[20.0]	[20.0]
B. Technical Assistance			
Implementation	4.1	0.0	4.1
Support			
	[3.1]		[3.1]
Policy Support	1.2	0.0	1.2
	[0.7]		[0.7]
Institutional Development	1.0	0.0	1.0
	[0.5]		[0.5]
Subtotal	6.3	0.0	6.3
	(0.0)		(0.0)
	[4.3]		[4.3]
Total	108.2	9.8	118.1
	(20.0)	(0.0)	(20.0)
	[24.3]	[0.0]	[24.3]

Note: Terms in () and [] are amounts financed by IBRD and GEF, respectively;
a/ Goods and services to be procured by limited international bidding
or established commercial practice;
b/ NBF - Not Bank Financed.

Project Cost by Procurement Arrangement – Actual/Latest (US\$ million)

	Procurement Method		Total
	Other a/	NBF b/	
A. Credit Component	0.7	0.0	0.7
	(0.1)		(0.1)
	[0.1]		[0.1]
Tax	0.0	0.1	0.1
Subtotal	0.7	0.1	0.8
	(0.1)	(0.0)	(0.1)
	[0.1]	[0.0]	[0.1]
B. Technical Assistance			
Implementation	2.0	0.0	2.0
Support			
	[1.7]		[1.7]
Policy Support	0.0	0.0	0.0
Institutional	0.6	0.0	0.6
Development			
	[0.5]		[0.5]
Subtotal	2.6	0.0	2.6
	(0.0)		(0.0)
	[2.2]		[2.2]
Total	3.3	0.1	3.4
	(0.1)	(0.0)	(0.1)
	[2.3]	[0.0]	[2.3]

Note: Terms in () and [] are amounts financed by IBRD and GEF, respectively;
a/ Goods and services procured by limited international bidding or established commercial practice;
b/ NBF - Not Bank Financed.

Project Financing by Component (US\$ million)

Project Cost by Component	Appraisal Estimate US\$ Million	Actual/Latest Estimate US\$ Million	Percent of Appraisal %
1. Credit Component			
• IBRD	20.0	0.08	0.4
• GEF	20.0	0.14	0.7
• Participating Banks	5.0	0.06	1.2
• Subborrowers/ Endusers	66.8	0.52	0.8
Subtotal	111.8	0.80	0.7
2. Technical Assistance			
Implementation Support			
• GEF	3.1	1.7	54.8
• GOI/BPPT	0.5	0.2	40.0
• Subborrowers/Endusers	0.5	0.1	20.0
Subtotal	4.1	2.0	48.8
Policy Support			
• GEF	0.7	0.0	0.0
• GOI/DGEED	0.5	0.0	0.0
Subtotal	1.2	0.0	0.0
Institutional Development			
• GEF	0.5	0.5	100.0
• GOI/BPPT	0.5	0.1	20.0
Subtotal	1.0	0.6	60.0
TOTAL	118.1	3.4	3.0
IBRD	20.0	0.1	0.5
GEF	24.3	2.3	9.5
GOI/BPPT	1.5	0.3	46.7
Participating Banks	5.0	0.1	2.0
Subborrowers/End-users	67.3	0.6	0.9

Note: Subborrowers are dealers, providing equity and reinvested profits;
Endusers are households, providing the downpayments.

Although the IBRD loan was closed early on 1/31/2001, the project continues with a reduced GEF grant until 4/30/2004.

Annex 3. Economic Costs and Benefits

INDONESIA
SOLAR HOME SYSTEMS PROJECT
Economic Cost Benefit Analysis

Year	COSTS (US\$ mill)				BENEFITS (US\$ mill)						NET BENEFIT (US\$ mill)		
	Invest. Costs	Repl. Costs	O&M Costs	TOTAL COST	Consumer Expenditures					Invest. Grant	TOTAL BENEFIT	Incl. GEF Grant	Excl. GEF Grant
					Down Pmt	Mthly Pmt	Repl. Exp.	O&M Exp.	Subtotal Subtotal				
1	0.05	0.00	0.0001	0.05	0.01	0.13	0.00	0.0001	0.14	0.01	0.15	0.11	0.10
2	0.76	0.0002	0.002	0.76	0.17	2.65	0.0002	0.002	2.83	0.13	2.95	2.19	2.06
3		0.0026	0.002	0.00		0.39	0.0026	0.002	0.39		0.39	0.39	0.39
4		0.0067	0.002	0.01			0.0067	0.002	0.01		0.01	0.00	0.00
5		0.0594	0.002	0.06			0.0594	0.002	0.06		0.06	0.00	0.00
6		0.0088	0.002	0.01			0.0088	0.002	0.01		0.01	0.00	0.00
7		0.0932	0.002	0.09			0.0932	0.002	0.09		0.09	0.00	0.00
8		0.0594	0.002	0.06			0.0594	0.002	0.06		0.06	0.00	0.00
9		0.0026	0.002	0.00			0.0026	0.002	0.00		0.00	0.00	0.00
10		0.0067	0.002	0.01			0.0067	0.002	0.01		0.01	0.00	0.00
11		0.0656	0.002	0.07			0.0656	0.002	0.07		0.07	0.00	0.00
12		0.0892	0.002	0.09			0.0892	0.002	0.09		0.09	0.00	0.00
13		0.0067	0.002	0.01			0.0067	0.002	0.01		0.01	0.00	0.00
14		0.0594	0.002	0.06			0.0594	0.002	0.06		0.06	0.00	0.00
15		0.0026	0.002	0.00			0.0026	0.002	0.00		0.00	0.00	0.00
16		0.0024	0.002	0.00			0.0024	0.002	0.00		0.00	0.00	0.00
PV@10%	\$0.67	\$0.20	\$0.01	\$0.88	\$0.15	\$2.60	\$0.20	\$0.01	\$2.96	\$0.11	\$3.08	\$2.20	\$2.09
IERR												#DIV/0!	#DIV/0!

Note: Since there was no negative cash flow, on an annual basis, in any of the years for the limited number of SHS units sold, it is not possible to calculate an IERR. See text for details.

Annex 4. Bank Inputs

(a) Missions:

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating		
	Month/Year	Count	Specialty	Implementation Progress	Development Objective
Identification/Preparation	10/95	2	Economists		
		2	Energy Specialists		
Appraisal/Negotiation	02/96	2	Economists		
		2	Energy Specialist		
Supervision	05/96	2	Economists		
		3	Energy Specialists		
		1	Resettlement Specialist		
		1	Environmental Specialist		
	11/97	2	Economists	S	S
		1	Energy Specialist		
	03/98	2	Economists	U	U
		1	Energy Specialist		
	06/98	2	Economists	U	U
		1	Energy Specialist		
	12/98	2	Economists	U	U
		1	Energy Specialist		
	05/99	1	Economist	S	S
		2	Energy Specialists		
	12/99	1	Economist	U	S
		1	Energy Specialist		
	02/00	2	Energy Specialists	U	S
		1	Energy Specialist	S	S
ICR	03/01	1	Energy Specialist	S	S
		1	Economist		
		1	FMS		
		1	Lawyer		

Note: Given that the project continues under GEF grant financing, no formal ICR mission was fielded for the cancelled and earlier closed IBRD loan. However, the 03/01 supervision mission did discuss with

borrower the ICR requirements for the closed IBRD loan and initiated data collection process.

(b) Staff:

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US\$ ('000)
Identification/Preparation	147.2	707
Appraisal/Negotiation	47.8	238
Supervision	85.2	522
ICR	*	*
Total	280.2	1,467**

Note: * As the project continues under the GEF financing, no formal ICR code was created in the system. The staff time and cost for preparation of the ICR are included in the "Supervision".

** Of the total cost, Bank Budget contributed \$838,930 or 54%, while the GEF Budget contributed \$728,940 or 46%.

Expenditures in FY 1994-2000 marked up by 25% to convert direct costs to full costs, affecting 93% of total costs

Annex 5. Ratings for Achievement of Objectives/Outputs of Components

(H=High, SU=Substantial, M=Modest, N=Negligible, NA=Not Applicable)

	<i>Rating</i>				
<input type="checkbox"/> <i>Macro policies</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Sector Policies</i>	<input type="radio"/> H	<input type="radio"/> SU	<input checked="" type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Physical</i>	<input type="radio"/> H	<input type="radio"/> SU	<input checked="" type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Financial</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Institutional Development</i>	<input checked="" type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Environmental</i>	<input type="radio"/> H	<input type="radio"/> SU	<input checked="" type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<i>Social</i>					
<input type="checkbox"/> <i>Poverty Reduction</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Gender</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Other (Please specify)</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Private sector development</i>	<input checked="" type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input type="checkbox"/> <i>Public sector management</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input type="checkbox"/> <i>Other (Please specify)</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA

Annex 6. Ratings of Bank and Borrower Performance

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory)

6.1 Bank performance

Rating

- | | | | | |
|---|-------------------------------------|-------------------------|-------------------------|--------------------------|
| <input checked="" type="checkbox"/> Lending | <input checked="" type="radio"/> HS | <input type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input checked="" type="checkbox"/> Supervision | <input checked="" type="radio"/> HS | <input type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input checked="" type="checkbox"/> Overall | <input checked="" type="radio"/> HS | <input type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |

6.2 Borrower performance

Rating

- | | | | | |
|---|--------------------------|------------------------------------|------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> Preparation | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input checked="" type="checkbox"/> Government implementation performance | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |
| <input checked="" type="checkbox"/> Implementation agency performance | <input type="radio"/> HS | <input type="radio"/> S | <input checked="" type="radio"/> U | <input type="radio"/> HU |
| <input checked="" type="checkbox"/> Overall | <input type="radio"/> HS | <input checked="" type="radio"/> S | <input type="radio"/> U | <input type="radio"/> HU |

Annex 7. List of Supporting Documents

- Bank Supervision Mission Aide Memoires
- PSG Progress Reports
- QAG Memo on "Quality At Entry in CY97 - A QAG Assessment" dated March 10, 1998
- EASEG Memo on "Restructuring Indonesia Solar Home Systems Project" dated July 9, 1998
- GEF Executive Coordinator Memo on "Indonesia: Solar Home Systems Project -- Proposed Phaseout" dated January 12, 2000
- Memo of Consultant (Alternative Energy Development Inc) on "Assessment of Indonesia Solar Home Systems Project" dated September 2000
- QAG Email on "Indonesia Solar Home Systems -- Quality of Supervision Assessment (QSA4): Final Assessment" dated November 20, 2000
- GEF Memo on "Proposed Realignment and Downsizing of the Indonesia Solar Home systems Project" dated January 24, 2001
- Indonesia Country Director's Letter to GOI (MOF Director of External Funds) on "Realignment of SHS Project" dated January 31, 2001

