ANNEX III
TECHNICAL REVIEW
BENIN
DECENTRALIZED RURAL ENERGY PROJECT

Response to STAP Reviewer Comments:

The World Bank-GEF Project Concept Document is an upstream presentation of a project under preparation and also limited in length and detail. As such, a number of the STAP reviewer comments relate to elements of the project which exist or will be further developed during advanced project preparation and detailed in final project documentation. Specifically: administrative, coordination and communication details will be provided in a project implementation plan and an annex which summarizes social analysis and agreed participatory approach as it relates to the GEF policy on public involvement.

The following responses relate directly to STAP Reviewer comments – and have been largely incorporated into the revised project text.

Community and NGO participation. Participation and role of communities and NGOs will be further detailed during planned project preparation activities. A workshop is planned in the course of this FY to gather national stakeholders/PV entrepreneurs in order to collect their inputs about design and implementation aspects. Findings will be incorporated into a participatory approach document which will detail procedures relating to transparency and inclusion of communities and NGOs. Project design is strongly participatory in that participation of communities is based on self selection preceded by extensive information and awareness campaigns.

Training and information dissemination. Cross-fertilization would be carried out in part through the Bank thematic groups activities. The Bank's Thematic Leader for Renewable and Rural Energy, will be consulted for the organization of the "small meeting, potentially in conjunction with Village Power '98, for project participants from not only the Benin Decentralized Rural Energy Project, but also other similar efforts elsewhere (e.g. the Togo Decentralized Rural Energy Project, the PV projects in Mexico, Indonesia, and Zimbabwe, and with PVMTI participants)." Some project funds would also be allocated to address the suggestion of a study tour as provided in the comments: "...a fact-finding trip to East Africa, or a reciprocal visit by members of the PV industry there (Kenital, Kenya Solar, Total Solar, etc.) could be a cost effective and important investment." Additional mechanisms for sharing and dissemination of data will also be explored during project preparation as part of the technical assistance components.

Training and information programs are programmed in the following areas: (a) accreditation for PV technicians (see Table 6 of Annex 1); (b) Multi-media consumer awareness programs (see Table 6 of Annex 1); and (c) project team training in project management and utility regulations. The main idea is to train the project team how to assess the performance of private operators and in enforcement relating to the PV Code of Practice and the agreements of the lease contract signed by the private

operators. Additional training needs and information dissemination mechanisms will be explored during project preparation as part of the information campaigns and training component.

Option to lease. The project proposal is consistent with the STAP Reviewer's emphasis on the importance of option to lease systems.

Lanterns vs. solar home systems. Surveys undertaken during project preparation determined the type and size of the systems in which the target markets were strongly interested: 20 and 50 Wp SHS were preferred because of the possibility to have at least 2 to 4 lighting points and/or a radio and television. However, it was agreed that there was a potential market for lanterns in the poorer section of the target zone. To deal with this situation, the project will be designed so as to assist private operator to have a 20 and 50 Wp customer base large enough to allow him to carry lanterns. In this manner, private operators can develop the lanterns market on their own and provide the servicing without any additional support.

Quantification of health benefits. An economic analysis, which will look at as many parameters as possible, will be carried out as part of the advanced project preparation

Grid electrification costs. Grid electrification is not a cost-effective option for remote, low populated areas such as those considered. Experience in Benin suggests costs of line extension of about $0.54-0.60 per kWh and kilometer for small communities (500 kWh monthly consumption). This would result in monthly bills in the order of $90 for only 10 kilometers of distance for each household.

Other projects. The GEF projects, Zimbabwe Photovoltaics for Households and Community Use (UNDP-GEF) and the Regional Photovoltaic Market Transformation Initiative (World Bank-GEF) were reviewed as part of project preparation and have been noted.

Selection of targeted districts. Designation of specific districts for the PV electrification components were selected on the basis of market potential and suitable insolation.

Similarity between Benin and Togo systems. Available biomass and kerosene systems are roughly identical for Benin and Togo.

Comparing costs. The PV component is being submitted for consideration under OP#6, the objective of which is the promotion of renewable energy technology. As such, comparison with costs of sequestering CO2 or management of bioenergy plantations is not necessary.

Traditional energy component. The traditional energy component has been withdrawn from consideration.

Please note that the Annex 4(a) to which the STAP reviewer refers is now labeled Annex I (a). Annex 4 (b) is not relevant to the current proposal.

Review of the GEF Togo/Benin Rural Energy Project Proposal[1]

Summary:

The Togo/Benin Rural Energy Project (TBREP) documents present a compelling case why this project should be approved and implemented. The arguments provided covering the need for attention to the rural energy sector, the choice of the technologies, and the economics (including incremental costs) are generally excellent. The integration of traditional energy (kiln and biomass plantation) and rural photovoltaic energy into one proposal, however, is not justified in the proposal. Beyond the *potential* benefits of sharing data on end-user demand for energy, and assessments of the customer base, there is very little to connect these components of the program together beyond the overall theme of rural energy. The potential for administrative difficulties and communication gaps is therefore significant.

This reviewer recommends that the project be approved pending some planning for how to coordinate the traditional and PV components of this energy proposal, and also resolution of the more concrete concerns and issues raised below.

The project team needs to address a variety of issues, including: (1) meaningful inclusion and project direction and input by *indigenous* NGO and private sector participants; (2) resource allocation for training and for data collection and dissemination; (3) integration of this project with wider efforts to support entrepreneurial renewable energy activities in sub-Saharan Africa.

Meaningful Definitions of Project Costs and Benefits:

The incremental cost calculations for both the Benin and Togo project components are clear and compelling. It is also clear that without external support, many of the project objectives of improved forest resource management, reduced GHG emissions, and the accelerated development of a photovoltaic renewables private sector would be unlikely to occur.

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[1] Note: in the review page numbers are listed as 'Benin, page X' to indicate the source in either of the two primary resource documents. The Togo project document does not have page numbers, so explicit reference to sections of the Togo document are done by section. A number of sections of the two proposals duplicate each other, so in those cases reference to only the Benin proposal was listed. The majority of comments apply to both documents.

As discussed below, an additional calculation of the direct and indirect health benefits should also be undertaken. For the health benefits as well as the greenhouse gas abatement costs, an active program of data collection *and public dissemination* need to be explicitly included in the project plan (by contrast, the deliverable project documents are all internal reviews and consultant reports primarily for internal Bank use). This effort is important if the project is to meet the design objective of global impact that would result if the results from Togo and Benin are used to stimulate other parallel efforts elsewhere.

The Togo and Benin project is locally significant in terms of the impact on traditional and renewable energy in these nations, but is small compared to investments in the energy sectors overall, and in terms of global greenhouse gas emissions (A loan package of ~ $19 million, and 26,000 tons of CO_2 offset in Benin and Togo). Thus, the largest *global* impact of this project will be through the successful development and demonstration of policies to foster sustainable traditional energy management and photovoltaic market promotion.

To meet the project goals, data and interim results from the project must be made generally available in publications that go beyond the internal project documents and status reports listed for the Benin and Togo components in Annex 1.

Provision could be made for representatives from similar projects elsewhere (e.g. from PVMTI, and the renewable energy programs from a range of nations) to either visit the Benin and Togo programs, or for there to be practical workshops planned to bring these individuals and institutions together[2]. In this respect, the proposal pays insufficient attention to the lessons of past and ongoing PV renewable energy projects (e.g. Zimbabwe, Kenya) and to the evaluation methodologies developed in those efforts (e.g. Acker and Kammen, 1996; Andersen, 1997, Cabraal , 1995; EDRC, 1992; Inversin, 1996; Hankins, Omondi, and Scherpenzeel, 1997).

The 3-prong 'market support' project definition is problematic, or at least not well described. Significant questions of who gets the data (local companies, start-ups, foreign firms ...?) as well as the dissemination of information on the opportunities in both community forestry and commercial ventures in the PV sector are not clearly described.

Benin page 5: option to lease systems (listed briefly on Benin page 6, and implied on page 10, and simolarly listed in the Togo report) should be emphasized. Leasing is an excellent arrangement for the market described in the proposal. Leasing may do several important things at once: (1) build system flexibility and ease of alteration if the systems are not optimal for the region; (2) builds vendor accountability; (3) increases competition as margins are likely to be smaller and thus more local companies may compete.

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2 The World Bank and NREL sponsored *Village Power* meetings provide one, general, framework, for these types of sessions, but regional meetings and more detailed information exchange and critiquing

The training budget (B.1) and the description on page 8 is not sufficiently described, nor are resources allocated for the full range of skills necessary. Given those needs, the amount allocated may be too small. The goal is to develop *both* an informed customer base, and an entrepreneurial community to provide the PV services. The budget lists various *Technical Assistance* allocations, but equal attention is also needed to present and them to demonstrate through practical sessions system function and maintenance, and system financing.

Developing a Local PV Industry:

For application in both Benin and Togo, Solar PV Lantern, 20W and 50W systems are analyzed in terms of incremental costs. Prior to that calculation, however, a broader discussion of the differences in promoting lanterns vs. full solar home systems (SHSs) is necessary. This impacts both the types of entrepreneurs, as well as the tariffs and importation or local manufacture arrangements needed to support the PV industry in each nation. A number of national examples (e.g. Kenya and Mexico) exist that provide data on the potential profits, need and type of training for the private sector and for end-users, when a PV market is dominate by lanterns vs. full solar home systems. An evaluation of that dichotomy is important for Benin and Togo, and would most logically be conducted as a series of informative meetings, discussions, and planning sessions that includes the full range of actors in the anticipated PV industry.

The project proposal makes reference to 'another project to address tariff and other issues'. The financial sustainability of this project makes the analysis and potential reform of the national tariff structures of paramount importance. If this work is taking place in another project, it should be both referenced explicitly, and the linkages (in data exchange and implementation) between the two projects should be detailed. This is an example of an opportunity for both greater global significance, and greater transparency.

Coordination and Collaboration with the NGO and Private Sector(s):

The degree of coordination and cooperation with the NGO sector and with private sectors are not sufficiently developed (c.f. Benin page 9). A number of past rural energy projects have failed badly because extensive rural initiatives were planned, but many of the groups best able to facilitate rural outreach and training (NGO's) were not included as partners. Similarly, the program goal to create a sustainable renewable energy infrastructure demands that more explicit attention be given to the needs of the private sector that could take on the business of PV system assembly, installation, and maintenance. One means to address these needs would be with a series of initial meetings with both the NGO and *indigenous* private sector entrepreneurs involved in, or interested in, working or entering the traditional energy and the electronics/energy supply sector.

The project document includes the admonition that, "The innovative nature of the project and the inherent dispersion of project activities requires and intensive Bank supervision and a close monitoring of project performance" (Benin, page 9). It is certainly true that

the degree of decentralized activities requires careful planning, project oversight, and evaluation, but not necessarily micro-management[3]. It is particularly important for a project designed to build sustainable infrastructure that the local actors be provided sufficient resources, clear goals, but considerable freedom in implementation. In China, for example, clear design targets, standards of participation and clear incentives were provided to local entrepreneurs and cooperatives for the performance of improved cookstoves (Smith, *et al.*, 1993). The details of the implementation process, however, were not dictated to the local groups. Also successful was the South African program to develop a comprehensive and locally tested resource manual, the *Remote Area Power Supply Design Manual* (EDRC, 1992)[4] for rural PV systems but to then remain largely peripheral from the details of the system implementation.

One important resource that the World Bank could provide would be to support the adaptation of a version of the *Remote Area Power Supply Design Manual* for Togo and Benin, and then for use in West Africa generally.

Local Profits and Benefits:

In the traditional energy project, increases in the use, as well as local (community) profits are listed as an objective (e.g. Benin, page 19). There is an extensive literature on rural forestry and biomass resource management in West Africa that indicates that with increased attention and formalization of the means of production (kilns) and market access (infrastructure and markets) that profits tend to concentrate in the hands of local and distant elites, not with the local community or with women. This project document presents no compelling reasons why this will not take place here as well. At minimum, a profit-sharing plan should be developed.

Renewable Energy and Health:

In both the Benin (P. 8) and Togo proposals, improvements in rural health are listed as project goals. This is a frequently overlooked, but important component of many rural energy projects. For example, the project team should undertake a calculation of potential health impact of the 125 kWp of capacity planned for each nation based on the

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[3] Among a number of potentially troubling examples, in the Benin document (page 17) it is implied that the PV systems to be installed in the program must be approved and selected by the Bank team. This is a mistake. Guidelines and performance standards are reasonable, but freedom in system selection as well as in the types of systems available must be left to a set of local entrepeneurs (and, specifially, *not* to the international team nor to large multinational companies that might view the GEF grant and the embryonic market as an invitation to dominate local competitors).

[4] It is instructive that in Kenya, where the PV industry has been largely successful in reaching the more affluent rural community, just as is proposed for Togo and Benin, that the vendors, manufacturers and assemblers of PV systems uniformly complained of the lack of such a *Remote Area Power Supply Design Manual* type resource.

anticipated household uses for lighting, food preservation, and other applications. This reviewer's back-of-the envelope estimate of benefits on a per DALY basis are considerable, potentially far larger than those listed in the project document. A natural benchmark is to compare this estimate with the cost-effectiveness calculation for health interventions in Figure 3-2 of the 1993 *World Development Report, Investing in Health.*

The inclusion of health as an explicit project benefit is entirely sensible, but requires a concrete commitment to action. Collection of data on the actual usage of PV systems, including socioeconomic, health, and security impacts is vital if this project is to meet the design objectives of global impact and cost effectiveness listed for project evaluation and ranking.

Acker and Kammen, 1996; ASTAE, 1995; Hankins, Omondi and Scherpenzeel, 1997, have all utilized and made available rural PV survey information and questionnaires that could be used and adapted for data collection efforts that should be included in this project.

Traditional Energy Project:

The rural energy combustion (kiln) component of the proposal makes reference to the low overall efficiency of charcoal kilns in West Africa (typically 12%). This is often true, although there is considerable variation. Included in this review as **Appendix A** is a table summarizing the efficiencies of charcoal kilns that Dr. D. J. Lew and D. M. Kammen collected for publication. In light of the lack of data on kiln operation and efficiency in Benin and Togo, however, the incremental cost calculations in each proposal are quite reasonable. Important work on kiln and plantation management in Zambia should also be consulted (Chidumayo, 1994).

Summary - Transparency and Inclusion:

A central theme in the comments of this reviewer have been that the Benin and Togo project documents both acknowledge the need for transparency, and equity in supporting and including local NGO and for-profit enterprises. Statements such as the following are common in the proposals:

> The selection of NGO and private sector enterprises to participate in the different activities of the traditional energy component will be done on the basis of capacity through transparent mechanisms (Benin, page 10).

Consistently, however, the documents fail to define procedures, safeguards, and grievance procedures to ensure that this takes place. The experience with the Zimbabwe GEF project, where tremendous animosity developed between the project team and the local entrepreneurial and NGO communities (Maboyi, 1995), is a poignant reminder that goals stated in initial project documents (GEF, 1993) do not guarantee success in long-term implementation. Regardless of who was at fault in the Zimbabwe case, clearer

attention to process and more explicit inclusion of local actors in roles with real power to shape the process, is an important lesson for the current project.

Specific or Minor Comments:

For both Benin and Togo, it would be useful to have grid-extension electrification costs listed. This would facilitate verification of incremental and alternative cost calculations.

Benin page 6: rural infrastructure plan is good, but training courses could be added.

Benin page 11 - 12: A number of important renewable and traditional energy projects that are relevant to the design, implementation, and evaluation of the TBREP are not listed. Examples include PVMTI, and the GEF Zimbabwe PV project.

Benin page 14: a broader argument on the economies of scale for PV system price reductions can be made based on the evolution of the PV industries in Kenya and the available data on experience curves for demand-side management (Acker and Kammen, 1996; Hankins *et al.*, 1997; Duke and Kammen, 1998) and in Nepal (Inversin, 1996), and in China (Byrne, *et al.*, 1996a,b). This calculation would also be beneficial in addressing the Cost effectiveness requirement (Benin, page 14).

Benin Annex 4A: The PV electrification component of the project has been designated for two Nord Benin districts and the Zone des Pêcheries, based partially on the 'opportunities for private sector operation". It is important to describe these features in greater detail to demonstrate that there is a viable entrepreneurial base to support this industry. Are there, for example, sufficient trained but under-employed electricians, or groups that could take on the combined installation, maintenance, and financing issues involved in building a sustainable PV industry in the region?

Annex 4A - Benin and Togo Proposals: The incremental cost calculations for both nations are identical. While this may be a reasonable estimate of the costs of the 20W and 50 W PV systems, is it really true that the costs for currently available biomass and kerosene systems are identical?

Benin Traditional Energy Incremental Costs: page 2 - 3: The lack of data on which to base the incremental cost calculation (and thus the use of values for Senegal) highlights the need to integrate data collection and dissemination as part of the project.

Togo: Section D.1: An important additional piece of information is the estimate cost to sequester CO_2 in forests, or to manage bioenergy plantations in the region. The project staff should provide a best estimate for comparison with the costs listed for PV GHG mitigation and community plantations.

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