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

OFFICE MEMORANDUM

DATE: October 26, 2001

TO: Mr. Ken King, Assistant CEO, GEF Secretariat
Att: GEF PROGRAM COORDINATION

FROM: Lars Vidaeus, GEF Executive Coordinator

EXTENSION: 3-4188

SUBJECT: **CC/OP6 - Vietnam System Efficiency Improvement, Equitization and Renewable Energy Project—Renewable Energy Components (P073778)**
Work Program Inclusion – Resubmission

Please find enclosed the electronic attachment of the above mentioned final project brief for work program inclusion, which addresses comments received from the GEF Secretariat dated October 12, 2001 on the project brief submitted for Work Program inclusion on October 1, 2001. To address comments from GEFSEC, the project brief has been strengthened with the following changes:

1. The Brief now stresses that the SEER's renewables components are part of the first phase of a long-term programmatic approach to renewable energy development, as proposed in the REAP. They aim to build capacity and pilot business models (Phase 1 of the REAP) and to prepare for follow-up investments planned in the proposed Rural Energy 2 Project (Phase 2 of the REAP). A phased approach is needed to develop successful model for community-based renewable energy grids (which have high failure rate in past bilateral projects), and to build an enabling environment for private sector investment. The brief has been strengthened with respect to this issue as follows:
    - The summary mention the phased approach and follow-up project.
    - A2. Global Operational Strategy/Program objective, also mentions the follow-up project.
    - B2, d, Main sector issues and government strategy, has been strengthened with respect to the barriers to private sector investment.
    - B3, d Sector issues to be addressed by the project and strategic choices. This emphasizes the phased approach and plan for follow-up investments.
    - C1, Project description summary. Mentions planned investments in Rural Energy 2 for community-based renewable grids and renewable energy small power producers components.
    - D1, Project alternatives considered. Mentions need for a phased approach because of past failures to promote community hydro schemes.
    - D3, Lessons learned. Same as above.

2. The Brief clarifies that the proposed follow-up project, Rural Energy 2 (FY04) is expected to include significantly increased investment from the Bank, as well as private sector financing for non-utility small power generation, and other donor financing for the community-based renewable energy grids.
    - The summary discusses the prospect of expanded investments and co-financing in Rural Energy 2
    - B3, d Sector issues to be addressed by the project and strategic choices, also mentions expanded investments and co-financing expected in the Rural Energy 2 Project.
    - C1, Project description summary. Again mentions expanded investments and co-financing in Rural Energy 2 for community-based renewable grids and renewable energy small power producers components.

3. It explicitly includes social benefits and income generating activities in the monitoring and evaluation plan, and also stress productive uses promotion activities in the community-based renewable electricity grids.
    - The summary mentions emphasis on productive uses and income generation in community hydro grids component.
    - A3. Performance indicators, mentions indicators of social benefits and additional income generation.
    - C3. Benefits and target population, stresses income generating activities will be encouraged in establishing community-based utilities.
    - D3, c, Implementation arrangements. A paragraph has been added on monitoring and evaluation, including social benefits and income generating activities.
    - Annex 1, indicators have been added on social benefits and additional income generated for community renewable grids.

4. It brings out the importance of a participatory approach in building consensus.
    - The summary mentions the participatory approach to REAP.
    - E7. Participatory approach, describes the approach to building consensus on the REAP.
    - Annex 4 has been added to describe participatory approach and studies completed in preparing REAP that gave stakeholders confidence in it.

The proposal is consistent with the *Criteria for Review of GEF Projects* as presented in our earlier submission of October 1, 2001.

Please let me know if you require any additional information to complete your review prior to inclusion in the work program. Many thanks.

Distribution:

cc: Messrs./Mmes. Malhotra, Bogach, Broadfield (EAP)*;* Khanna, Johnson, Aryal (ENV); ENVGC ISC, EASEG Files

PROJECT BRIEF

1. IDENTIFIERS:

PROJECT NUMBER:	P073778
Project Name:	**Vietnam: System Efficiency Improvement, Equitization and Renewables (SEER) Project—Renewables Components**
DURATION:	2002-2005
IMPLEMENTING AGENCY:	World Bank
EXECUTING AGENCY:	Ministry of Industry, Electricity of Vietnam
REQUESTING COUNTRY OR COUNTRIES:	Vietnam
ELIGIBILITY:	Vietnam ratified FCCC on December 3, 1998
GEF FOCAL AREA:	Climate Change
GEF PROGRAMMING FRAMEWORK:	OP 6

2. SUMMARY:

This project brief covers only the renewable energy components of the proposed SEER project. A separate project brief will be submitted at a later date for the energy efficiency component.

The SEER's renewable energy components represent the first, capacity building, phase of a long-term programmatic approach to develop Vietnam's renewable energy sources. This approach is solidly based in the Renewable Energy Action Plan (REAP), adopted by MoI. The REAP was developed though a participatory process with stakeholders, MoI, EVN and the Bank (see section E7). The SEER supports Phase 1of the REAP, the capacity building phase, which aims to build awareness, institutional capacity, and to develop business models for significant investment in a follow-up project that would support Phase 2 of the REAP. The SEER's renewable energy components aim to: (a) develop the regulations/decrees, awareness creation activities and dedicated staff to administer a program at national, provincial and district level; (b) work with MoI and EVN to develop an enabling environment for non-utility and private sector renewable electricity power generation; (c) demonstrate a Remote Area Renewable Electricity Fund to finance and support commune-based renewable energy utilities, with a special emphasis on promoting productive uses; (d) develop improved local technologies, especially for family pico-hydro systems; and (e) build renewable energy markets and businesses. The Bank and GOV have agreed that Phase 2 of the REAP would be supported by the proposed Rural Energy 2 Project (FY04), which will expand renewable energy investments, including co-financing by the private sector for small power producers and other donors for the community renewable energy grids. The Rural Energy 2 Project is expected to seek further GEF support to overcome the remaining barriers.

3. **COSTS AND FINANCING (MILLION US$):**

RENEWABLES COMPONENTS:

GEF:	- Project	4.50
	- PDF	0.35
	Subtotal GEF	**4.85**

CO-FINANCING:	- IA:	8.10
	- Government	0.50
	- EVN	0.50
	- Private/other	0.40
	Subtotal Co-Financing:	**9.50**

TOTAL COMPONENT COST (WITH PDF):	**14.35**
TOTAL PHASE 1 COST (WITHOUT PDF):	**14.00**

4. ASSOCIATED FINANCING (MILLION US$) Not yet identified. Possible financing of parallel activities by SIDA and JICA.

5. OPERATIONAL FOCAL POINT ENDORSEMENT:

Pham Khoi Nguyen, Vice Minister MoSTE Date: January 5, 2001

6. IA CONTACTS:

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CURRENCY EQUIVALENTS

Currency Unit	=	Vietnamese Dong (VND)
VND 1,000	=	US$0.06
US$1		VND 14,522

UNITS OF MEASURE

GWh	=	Gigawatt-hour
Km	=	Kilometer
kV	=	Kilovolt
kVA	=	Kilovolt-ampere
kWh	=	Kilowatt-hour
MW	=	Megawatt
TWh	=	Terawatt-hour

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
DSM	Demand-side Management
EIA	Environmental Impact Assessment
EIRR	Economic internal rate of return
ESMAP	Energy Sector Management Assistance Programme
EMF	Electromagnetic force
EVN	Electricity of Vietnam
GEF	Global Environment Facility
GOV	Government of Vietnam
HCM	Ho Chi Minh
HH	Household
HV	High voltage
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IFC	International Finance Corporation
IDA	International Development Association
IPP	Independent power producer
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
LV	Low voltage
M&E	Monitoring and Evaluation Program
MoF	Ministry of Finance
MoI	Ministry of Industry
MoSTE	Ministry of Science, Technology and Environment
MPI	Ministry of Planning and Investment
MV	Medium voltage
NGO	Nongovernmental organization
ODA	Official Development Assistance
OECF	Overseas Economic Cooperation Fund
PC	Power Company
PAP	Project Affected Person
PIP	Project Implementation Plan
PPC	Provincial People's Committee
PV	Photovoltaic
RAP	Resettlement Action Plan
RARE	Remote Area Renewable Electricity
RE	Rural electrification
REAP	Renewable Energy Action Plan
SEER	System Efficiency Improvement, Equitization and Renewables Project
SIDA	Swedish International Development Agency
SPP	Small Power Producer
SPPA	Standardized Small Power Purchase Agreement
TA	Technical assistance
UNDP	United Nations Development Programme
UNFCC	United Nations Framework Convention on Climate Change
US$	U.S. dollar
VAT	Value added tax
VND	Vietnamese Dong

A: Project Development Objective

1. Project development objective and key performance indicators: (see Annex 1)

The overall objectives of the proposed project are to contribute to the Government's poverty alleviation program in the rural areas and to improve the efficiency of power system services in the country. The proposed project's main development objectives are (a) improvement of overall system efficiency and reduction of investment needs through (i) optimization of the electricity transmission system to reduce transmission losses; and ii) reduction of generation capacity increases by effective demand side management; (b) enhancement of energy access for the poor in remote areas by (i) upgrade of 110 sub-transmission and the MV distribution lines for rural electrification; (ii) rehabilitation of small hydro plants in the rural areas and (iii) development of community- based utilities to provide renewable energy to remote communes not accessible by the grid; and (c) sustained reform of the power sector through (i) separation of generation, transmission and distribution by institutionalizing transfer pricing and distribution margins; (ii) improvement of corporate governance by instituting more effective financial management and information technology; and (iii) equitization of districts and communes in north, center and southern parts of the country to develop a creditworthy distribution sector. The proposed project is expected to demonstrate an effective approach to sustainable electricity provision to about 10,000 households in the remote rural areas of Vietnam, using renewable energy, including some of the poor and remote communes identified in the government's special commune program.

2. Global objective: (see Annex 1)

The global objective of the renewable energy components is to contribute to reduced greenhouse gas (GHG) emissions by promoting the use of electricity production using renewable resources. The project intends to build institutional capacity for renewable energy, as part of a programmatic approach. It is expected to be followed by the Rural Energy 2 Project (FY04), which will expand renewable energy investment activities based on capacity developed in the SEER Project.

3. Key Performance Indicators: (see Annex 1)

It is expected that the indicators of performance will include: (i) number of additional rural households with electricity from conventional and renewable energy, as well as indicators of social benefits and income generating impact of electricity provision; (ii) additional renewable electricity use to supply isolated communities and augment supply to the grid; (iii) increased efficiency of overall power system services; (iv) progress in implementation of reforms and maintenance of financial soundness of EVN (Electricity of Vietnam) and affiliated power distribution companies; (v) development of a program for equitization and creation of a creditworthy distribution sector; and (vi) reduction of carbon emissions.

B: Strategic Context

1a. Sector-related Country Assistance Strategy (CAS) goal supported by the project (see Annex 1):

Document number: Report 18375-VN (August 28,1998) –Updated IDA/R2000-66 (May 8, 2000)
Date of latest CAS discussion: May 8, 2000
Board discussion: May 30, 2000

The project is in full compliance with the Bank's Country Assistance Strategy (Report 18375) which sees IDA's role for the power sector as filling an important niche not covered by other players in the sector and directly assisting the government in its poverty alleviation efforts. The energy sector has contributed substantially to economic growth. Its continued development is essential to sustaining industrial growth and employment generation. The report "Fueling Vietnam's Development; New Challenges for the Energy Sector " (April, 1999) identifies the key issues and lays out a strategy for the sector. First, IDA lending will shift towards extending access in rural areas. This project will help finance extension of the grid to rural and remote areas and the promotion of renewable energy. Second, the project will increase efficiency in the entire energy chain and create creditworthy institutions, as well as improve corporate governance and rationalize sector management. Third, our focus will shift towards mobilization of external financial resources for the sector to ensure the country meeting its energy demands, providing services that will facilitate private participation in the energy sector. This will include advisory services for putting in place a transparent and independent regulatory framework and for promoting private participation in distribution and renewable energy power plants.

The policies and programs that Government of Vietnam (GOV) proposes to follow in the sector are in consonance with the Bank's policy guidelines for the power sector. IDA involvement in Vietnam's power sector is intended to assist the country's staged transition to a commercial sector structure and operating environment and in the development of an efficient and equitable energy system. This involvement, which commenced under the first four power credits, is helping GOV in (a) strengthening the existing institutions including rural electrification; (b) implementing commercial management practices and structures; (c) developing a credible legal and regulatory system; and (d) facilitating the entry of private sector capital and operators in the sector. In addition, IDA's involvement is influencing the optimal utilization of scarce resources, as well as fostering energy efficiency and good environmental practices. Sustained involvement in the Vietnamese power sector, through the proposed project, would help consolidate reform efforts and institutional restructuring initiated in earlier projects.

The proposed project is consistent with the CAS focus on reduction of poverty, promoting equitable growth and raising productivity through infrastructure. The proposed project would directly address (i) inadequate rural infrastructure, by strengthening transmission and distribution systems providing electricity to the rural households; (ii) electricity for remote areas inaccessible to the national grid, by developing renewable energy based commune utilities; (iii) improving productivity of infrastructure services, by promoting transmission and distribution system efficiency; and (iv) strengthening of institutional capacity to plan and implement programs, by improving and financial and commercial management at the distribution level of the system.

1b. Global Operational Strategy/Program Objective addressed by the Project:

The renewable energy sub-components of the SEER address Global Environment Facility (GEF) Operational Program 6 on Climate Change, promotion of the adoption of renewable energy by removing barriers and reducing implementation costs. The project supports a long-term programmatic approach to strategically develop Vietnam's renewable energy sources, especially small hydro, biomass and solar, based on the Renewable Energy Action Plan (REAP), developed through a participatory process by stakeholders, EVN, Ministry of Industry (MoI) and the Bank and adopted by MoI.[1] The SEER

[1] MoI, EVN, World Bank, *Renewable Energy Action Plan*. 2001, available from the Infoshop.

components will build capacity and develop business models for renewable energy investments. A follow-up project, the proposed Rural Energy 2 Project (FY04), is expected to expand these investments, including co-financing by the private sector and other donors.

The GOV is committed to environmental sustainability, as indicated by ratification of UNFCC on 12/03/1998. As part of related efforts, the Ministry of Science, Technology and Environment (MoSTE) and the Institute of Meteorology and Hydrology prepared a least-cost Greenhouse Gas Abatement Strategy for Vietnam, which identified renewable energy as one of Vietnam's three medium term priorities. Several other projects related to environment capacity building have been financed by UNDP, Asian Development Bank (ADB) and bilateral organizations. Also, the GOV is preparing a 2001-2010 National Environment Protection Strategy, and a 2001-2005 National Environment Protection Action Plan.

2. Main sector issues and Government strategy:

Background: The energy sector can provide the essential underpinning to future economic growth in Vietnam. Today, it contributes over a quarter of total foreign exchange earnings, from oil and coal exports. Energy demand has been growing 13%, faster than GDP, during the last five years. Continued expansion in energy and electricity supply and delivery infrastructure will enable rapid growth in the agricultural and industrial sectors and sustain economic growth. It can help alleviate poverty by providing energy access to the poor and mitigate environmental degradation by encouraging the shift from traditional to commercial energy, as well as appropriate fuel choices in expanding commercial supplies.

New challenges have emerged in the energy sector requiring structural and institutional reforms that are both more difficult and more complex. First, to meet the economic growth targets, electricity supplies will need to grow to support economic growth rates. But this growth will need to be both efficient and more equitably distributed through aggressive rural energy programs, as today 79% of the rural population consumes less than 20% of total electricity. Second, although Vietnam is a resource rich country, it should strive to develop the energy sector along an environmentally sustainable path. Recent natural gas discoveries offshore provide an opportunity to make environmentally and economically beneficial energy use choices. The first offshore gas reserves will be piped ashore in 2002. Vietnam is also well endowed with renewable energy resources to generate electricity to serve rural communities. However, only a quarter of its hydro resources are developed, and few of its other resources. Third, Vietnam has to invest almost 5.3% of its GDP, twice the rate of its ASEAN neighbors, in energy infrastructure. Fundamental reform of energy tariffs, with respect to both level and structure, is required to ease financing constraints and ensure long-term efficiency in investment and resource utilization decisions throughout the economy. Since two thirds of the required investments will need to come from ODA, export credits and foreign direct investments, public financial resources and government guarantees for private investment should be selectively used. Fourth, attracting foreign private investment will require the creation of an enabling environment and legal framework. The Government needs to embark on restructuring and rationalization of the energy state owned enterprises, creating a regulatory system and developing a mechanism to coordinate policy and investment decisions in the energy sector.

The main issues are described in more detail below.

a. *Need for large sector investments and for improvement in overall system efficiency.* Over the past five years, electricity demand in Vietnam has increased at an average rate of 13-15% per annum. This increase is typical of countries which begin from very low levels of demand. The average annual per capita electricity consumption in Vietnam is equivalent to what an average American consumes in a week.

To sustain an economic growth projection of about 6-8% p.a. over the next 5 years, Vietnam needs to increase its electricity supplies at the rate of about 10-13% per annum, calling for an investment of about US$ 8.3 billion equivalent over the period 2000-2005. This investment represents about 5% of the projected GDP. Financing this increase in electricity supplies requires a strategy to first improve the efficiency of existing systems and second to maximize the inflow of external sources of capital within prudent limits, as well as increase the amount of self generated sectoral surpluses for investment. Electricity efficiency has two components: supply side and demand side efficiency. Inefficiencies in transmission and distribution include low system power factors, transformer inefficiencies, poor quality cables, lack of system optimization etc. The system losses, about 15.5% in 2000, need to be reduced to 10%. A wide ranging demand side management program would improve load management for large energy users, introduce building standards, industrial audits to improve lighting and motors and design more efficient public lighting. These measures could reduce demand by about 700 MW and save $400 million by 2010. The Government is working towards these goals by: (a) promoting energy conservation and efficiency, (b) increasing and structuring electricity tariffs to raise internally generated surpluses; (c) involving the private sector in power generation and developing natural gas supplies; and (d) promoting equitization of distribution functions.

b. *Low Rural Access to electricity:* Rural electrification is a critical element of the GOV's program to eliminate poverty and redress imbalances in development. Ambitious rural electrification targets have been established and work has commenced. About 20 million people in Vietnam, representing about 4 million households, still have no access to electricity. Electricity consumption patterns are also skewed, with urban dwellers who account for about 20% of the population accounting for over 80% of consumption. Expansion of rural electricity access is crucial for two reasons. First, electricity access will make it possible to improve overall welfare levels by providing reliable lighting sources, improved health care and services. Second, by providing alternative sources of energy for irrigation and other productive activities (e.g. weaving), the productivity and incomes of rural residents can be increased. The key issues in rural electricity delivery are: (i) securing adequate resources for investments that are economically justified but not financially viable; (ii) defining and implementing methods for rural grid management, maintenance and services that do not overextend central electricity providers and maximize local participation; (iii) designing tariff structures that recover costs without distorting price incentives for local generation and for efficiency; and (iv) providing electricity services to poor, isolated communes and villages in rural areas that cannot be served by the national grid. The Government is addressing the above issues by: (i) issuing a Rural Electrification Policy Paper and preparing national decrees for implementation of the rural electrification programs; (ii) nominating MoI to promote, coordinate and manage the renewable energy program for the country (through implementation of the REAP); (iii) working with the World Bank in designing investment projects for rural electrification that would address the issues noted above.

c. *Managerially and administratively weak sector institutions:* Institutions in Vietnam's energy sector are managerially and administratively weak. Much of this weakness results from inadequate staff and organizational systems required for an increasingly commercial environment. Moreover, Vietnamese government agencies and power enterprises have been unable to decentralize decision making to front-line staff and exercise administrative/management oversight without interfering in the process, or taking it over themselves. Consequently, there is a pervasive lack of autonomy and responsibility in most institutions in the energy sector, which results in low operating efficiency and productivity. The GOV has recognized the problem, and is making slow but steady progress: (a) it has initiated plans for the equitization of communes and districts; (b) a commune-based utility model has been commissioned, to develop local management; (c) a commune-based hydro/hybrid grid has been tested in Son La province; and (d) the government is training

staff, to upgrade skills and to familiarize senior government officials with alternative models of governance. The change process is likely to be slow, but positive steps and actions have been initiated.

d. *Barriers to Renewable Energy: Limited Recognition, Planning and Implementation Capacity for Utilizing Renewable Energy for Electricity Supply*. The cost of extending the national electricity distribution grid to the estimated 3 million households living in remote, mountainous areas exceeds the estimated economic benefits. However, decentralized electricity production from renewable energy sources can be economically viable. Support for renewable energy in Vietnam is mainly limited to grant-based solar, wind and small hydro or hybrid projects. The net result is that scale of applications is too small to obtain any significant economies of scale in production or sales or to justify establishing the necessary infrastructure to assure sustainability. Work done to prepare the Renewable Energy Action Plan (REAP) identified the following major barriers:

- Policy. Until recently, there has been little national-level commitment or integrated planning. An important start was made in MoI's Rural Electrification Policy, which states that "rural electricity supply will be based on both grid and off-grid systems" and aims to encourage diversification of ownership and private sector involvement. Nevertheless, regulations and procedures are required to allow businesses to supply renewable electricity for rural electrification and grid support on a commercial basis. For non-utility supply to the grid, agreement must be reached with EVN on a small power purchase agreement and tariff.[2] For off-grid rural electrification, a mechanism is required to channel an appropriate subsidy to rural communities.
- Awareness. There is insufficient information available about the renewable energy technologies, their costs and effectiveness, for the potential investors in grid-connected plants, community and household systems, for financing agencies, and for GOV officials at all levels.[3]
- Commercial capability. There are few commercial businesses to provide renewable electricity equipment and services. Most projects to date have been small scale demonstrations, carried out using experts at local research or technical institutes. Only Chinese made pico-hydro systems are sold and supported through a fully commercial retail network, in Northern Vietnam. Business capability and the environment for doing business in Vietnam are still developing, in the transition from the socialist economy. More transparent business licensing, regulation and procedures are needed. Discrimination against private businesses needs to be eliminated with respect to project approvals, licensing and access to bank financing. Import duties on equipment need to be reduced, e.g. for PV.
- Financing. Credit is required for many of the small and medium companies that might be renewable energy suppliers. Current financing is limited to 5-7 years. Long-term financing is needed for community mini-grids and developers of grid-connected projects. For solar PV household units, there are affordability issues because of the low income of not-to-be electrified households. Lower cost systems and consumer credit on attractive terms are needed.
- High quality technology. Pico-hydro and small hydro generators and controls are of lesser quality than systems available internationally, leading to less than optimal performance. Import of high quality equipment or the introduction of joint venture investment to improve local quality of equipment is needed to support a major program.[4]

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[2] A substantial amount of work was done on this during preparation of the Rural Energy 1 Project, but a number of outstanding issues on SPPA and tariffs remain. (See Renewable Energy Action Plan Report, Annex. 10.)

[3] A start has been made on making this information through a project called RERID (renewable energy training material to be used under the WB supported Commune-based Rural Infrastructure Project)

[4] A start has been made on this through twinning of a Swiss company with Renewable Energy Research Center

- Resource data. An important start was made in collecting data during the preparation of the Renewable Energy Action Plan described below, especially in defining communes that are not to be electrified by EVN and collecting existing data on small hydropower. Nevertheless, much remains to be done. For small hydro, a number of sites have been identified, but the level of detail of sites on the size range <1MW is not adequate for planning a detailed program. Data is scant and inconsistent for wind and solar energy.

e. *Minimizing Pollution and Environmental Degradation.* A large share of the energy consumed by Vietnam's population comprises traditional energy sources, such as, fuel wood, charcoal, coal briquettes, rice straw, etc. It is important that there is rapid shift from these traditional sources of energy to more modern sources of energy, of which electricity will be a significant component. Recent natural gas discoveries offshore provide an opportunity to make environmentally and economically beneficial energy use choices. The GOV has recognized that natural gas will play an increasingly important role in Vietnam's overall energy balance. It has signed contracts recently for the commercial development of a significant offshore gas field. The development of renewable forms of electricity supply can also play a role in minimizing pollution and environmental degradation.

f. *Lack of a Comprehensive Legal and Regulatory Framework:* Given that the structure and commercial arrangements in the power sector are evolving rapidly, and the participation of the private sector is relatively new, the legal and regulatory framework has not developed adequately to respond to these changes. The regulatory system for the power sector suffers from two drawbacks: (a) the function of government oversight and regulation is not separated from that of sector ownership and management, which have been vested in EVN's Management Board; and (b) there is no effective and credible body of sector-specific legislation and regulations. The creation of a credible regulatory entity and an enabling body of regulations for tariff, investment oversight, and rural electrification are key priorities. The Government is giving due importance to achieving developing the needed framework. With Energy Sector Management Assistance Programme (ESMAP) assistance, it is engaged in the drafting of an Electricity Law and the development of an institutional mechanism to perform the regulatory functions.

3. Sector issues to be addressed by the project and strategic choices:

The SEER is part of a program of investments in the electricity sub-sector, agreed between the GOV and the Bank, to address the above sector issues. Each of the main groups of sub-components (transmission system efficiency improvements, energy efficiency, renewable energy and general institution building) is part of a longer term program. Nevertheless, the GOV prefers to have a series of projects where different activities to be completed in the same time frame are bundled into a series of projects, rather than an APL. If appropriate policy triggers for follow-up projects are defined, this approach is similar to an APL. The project addresses main sector issues as follows:

a. *Need for large sector investments to meet electricity demand.* In providing IDA funds of $198 million, the project would help contribute in some measure to the large financing requirements of the sector. The focus on overall system efficiency improvement to reduce transmission and distribution losses will reduce the needs for new generation investments. The main thrust of the Demand Side Management (DSM) efforts would be to reduce system and network peak loads, in order to better rationalize system expansion and capacity enhancement investments, improve service quality and reliability, and improve financial performance. The DSM programs would be designed to mitigate effects to consumers from ongoing tariff reforms (e.g., tariff increases, full-scale implementation of time-of-use (TOU) metering,

potential demand charges) as well as for revenue generating activities (e.g., fee-for-service audits and consultations). The project will also review the level and structure of tariffs to improve self-financing ratios and would assist in defining and implementing tariff reforms that achieve financial and efficiency objectives. Support to distributed generation using renewable energy under SPPA could also relieve some of the investment burden on EVN.

b. *Low Rural Access to Electricity.* In line with GOV policy to increase the number of the households in the rural areas with access to power, the project will finance the strengthening of the MV systems for rural grids to enable additional rural households to connect to the national electricity grid. The project will adopt standards for implementation of RE projects to reduce system-wide losses, improve quality of power and low cost grid reticulation methods. It will also finance the development of about 20 commune-based utilities in the remote areas that are inaccessible to the grid, using renewable energy sources. The project will directly benefit about 10000 households. If successful, it will lead to an expansion of commune-based renewable electricity utilities in future projects.

c. *Managerially and Administratively Weak Sector Institutions* .The project will strengthen EVN and the power companies in financial, accounting and procurement management through installation of a modern information management system and upgrading of IT staff. It will also help EVN in planning and implementing electrification programs which are efficient. It will equitize a number of districts and communes thus helping implement a larger plan for the creation of a creditworthy distribution sector. The project will also assist MoI and the Government to improve the institutional arrangements for rural electrification in remote areas and set revenue generation policies to ensure sustainable management and operation.

d. *Limited Recognition, Planning and Implementation Capacity for Utilizing Renewable Energy for Electricity Supply*. As noted above, MoI adopted the a programmatic approach, under the Renewable Energy Action Plan (REAP), to promote sustainable energy alternatives to increase rural access to electricity. The proposed project will support MoI in implementing Phase 1 of the REAP, which will build capacity and develop business models to enable expanded investment in the planned follow-up project, Rural Energy 2. SEER aims to: (a) develop the necessary regulations/decrees, awareness creation activities, and dedicated staff to administer a program at national, provincial and district level; (b) work with MoI and EVN to create an enabling environment for non-utility and private sector renewable electricity power generation for remote areas; (c) demonstrate a Remote Area Renewable Electricity Fund to finance and support commune-based renewable energy utilities, with an emphasis on promoting productive uses; (d) develop improved local technologies, especially family pico-hydro systems; and (e) develop renewable energy markets and businesses. The SEER Project mainly supports institution building and pilot activities, to lay a foundation for expanding the activities. The proposed Rural Energy 2 Project (FY04) will support larger scale investment. The private sector and other international agencies are expected to assist in investments in the Rural Energy 2 Project, attracted by the framework demonstrated in the SEER Project. While a lot will be done in the SEER project, it is not expected to address all barriers. Barriers to efficient operation of businesses, especially private sector business, and financing issues for non-utility small power producers remain to be addressed through the opening up of the Vietnamese economy and the proposed Rural Energy 2 Project .

e. *Pollution and Environmental Degradation*. The project will not directly address issues of minimizing pollution and environmental degradation, but a major impact of the project will be on the shift from traditional to commercial energy with beneficial effects on the environment. In view of the ongoing

efforts under other Bank financed work, this project will not directly address the issue of the lack of a comprehensive legal and regulatory framework.

C: Project Description Summary

1. Project Components (see Annex 2 for a detailed description of the renewable energy sub-components)

Component 1— System Efficiency improvement:

i. Transmission system efficiency improvement. The component is designed to improve the transmission system efficiency and performance. It would include the following elements: (a) upgrading or expansion of the 500 KV and 220 kV transmission networks and associated substations to reduce transmission bottlenecks and overloads, improve system security, evacuate the HV network to ensure continuity of supply to the consumer. This includes addition of a new 500 kV transmission line from Pleiku to Danang, extension of a 500 kV substation at Danang; extension of 4 –220 kV substations at Nha Trang, Soc Son, Viet Tri, and Quang Ninh; a 220 kV line from Thai Binh to Hai Phong and the introduction of an efficient level of maintenance management system. (This component is estimated at about $ 105.1 million with IDA financing of $ 79.4 million.)

ii. Energy efficiency programs. The energy efficiency/DSM component would consist of two sub-components:

(a) *DSM Phase 2, by EVN. It is planned to continue EVN's DSM activities initiated under the SIDA-supported project.* Such work would include expanded load research by EVN and its PCs, procurement and installation of TOU meters, implementation of 3-4 large-scale DSM programs (for load management and energy conservation), and a feasibility study to establish ESCO business groups within EVN's Institute of Energy and/or the four PECCs. *(Through ongoing project work, EVN and its consultants would develop and submit a proposal to IDA for specific IDA/GEF investment activities in early 2002. It was noted that some technical assistance for the load management work may not be suitable for GEF funding, thus other grant funds would be sought by MoI and IDA.)*

(b) *Pilot commercial energy efficiency component by MoI*. While the details of the pilot program would need to be further defined under preparation work, the objective of the pilot program would be to test the market readiness of commercially-oriented energy efficiency service and investment by: (1) supporting the development of commercial energy efficiency service providers, or "project agents", that could identify and package energy efficiency investments; (2) supporting a small number of demonstration transactions; (3) determining the feasibility for developing an expanded program to support more commercially-oriented mechanisms under a future IDA/GEF operation.[5]

[5] GEF funds may be used to provide a small incentive to "project agents" and end-users for demonstration investments, support for audit and project management fees, technical assistance to the participating bank to review EE investment proposals, training to interested audit firms, dissemination of information about successful projects and mechanisms, and studies for further market expansion. Furthermore, these "project agents" would help lay the groundwork for a more sustainable framework for EE investments in the future and improve the prospects for ESCOs and other models in the future. It is expected that these funds would leverage about $5 million in commercial financing (bank lending or customer self-financing) for initial projects.

(The energy efficiency component is estimated in the range of $13 million with $ 5 million IDA financing for EVN, about $5 million from private or commercial lending, and an amount to be determined to be proposed to the GEF. A separate PDF B request to help prepare a GEF supported DSM component has been approved.)

Component 2 — Improving rural access:

i. Upgrading the 110 sub-transmission and MV[6] *distribution system for rural electrification programs*. EVN is now implementing several rural electrification projects including the recently IDA approved Rural Energy Project, which is designed to extend the national grid to 671 communes in 32 provinces, and the rural electrification project for the South of Vietnam funded by an AFD loan and other projects. As a result, there will be a rapid increase in the number of households connected to the existing grid, which will result in large increases of load for the existing subtransmission and MV distribution network. For many provinces, this additional load will put pressure on the already overloaded and poorly maintained sub-transmission and MV distribution network. This component will add or rehabilitate existing 110 kV sub-transmission lines and substations for provinces, throughout the country, where strengthening is most needed. (The total amount is estimated at $117.6 million with IDA financing of $86.51 million. IDA credits estimated for PC 1 at $40.08 million for 23 subprojects, PC 2 at $28.66 million for 18 subprojects and PC 3 at $17.78 million for 11 subprojects. EVN and the PC's will carry out the feasibility studies for the 52 subprojects identified.)

ii. Rehabilitation of existing small hydro plants. A pre-feasibility study, associated with the REAP, identified the potential for economically viable rehabilitation of 13 small hydro plants, with an aggregate capacity of 26 MW. In the project, the three PC's will rehabilitate 5 existing EVN owned mini-hydro plants with an aggregate capacity of 12.4 MW, to increase their capacity to 15.4 MW and extend the life of the facilities by 8-12 years. These are attractive investments with economic rates of return ranging from 24-111%. TA will also be provided to assist EVN with technical design, operation and management of these isolated plants. EVN will also consider equitization of these plants. (Total cost of $ 5.5 million; IDA financing of $ 4.5 million and GEF-TA: $0.5 million. Feasibility studies for these projects will be undertaken by the respective PC's.)

iii. Community based renewable energy-hybrid electricity grids. This component will pilot the operation of a Remote Area Renewable Electricity Fund. About twenty communes in 1-3 provinces, that cannot be connected to the national grid and have potential for productive activities that can generate additional income, would be supported to build and operate hydro/hybrid mini-grids to provide year round power to the community (serving about 10,000 households). At least 60% of the households would be connected to the grid. The tariff would be set to cover operation and maintenance costs plus a leasing fee to pay for major repairs and part of the costs of providing ongoing support to the community (700-1500 dong/kWh). TA would be provided to mobilize communities, train and assist community cooperative or mini-utility businesses, as well as promote income generating activities and productive activities in the communities. Capital investment would be financed by community contribution (10%) and government grant (90%). Grant-funding is needed to keep tariffs affordable. Implementation would be coordinated by MoI, and carried out at provincial level under the Provincial People's Committee (PPC), using a Remote Area Renewable Electricity (RARE) Fund. The RARE Fund would be capitalized from IDA and, in

[6] The 110 kV sub-transmission voltage level is managed by the PCs and it may be considered a distribution voltage level. Typical MV distribution levels used in Vietnam are 6 kV, 10 kV, 15 kV, 22 kV and 35 kV

future, from other international agencies (not GEF). TA would be provided at provincial and district level to support operation of the fund, mobilization of the communities and on-going technical and management support to the communities.

A feasibility study was carried out as part of the REAP, that identified about 200 communes with conditions suitable for development in 5 provinces.[7] MoI is now conducting a selection process to select those provinces that would actively contribute to such a program, and to identify appropriate institutional models for supporting the communities in operating such grids (e.g. mini-utilities, support contracted to PECCs or HPC). A pilot activity is also being carried out by PECC1 and consultants to identify an appropriate institutional model for operating a rehabilitated micro-hydro-diesel power plant, at Hau Pang.[8] MoI will supervise work by consultants to mobilize the communities, raise awareness, promote productive loads and standardize designs and bid documents. There will be training for both mini-utilities/cooperatives and for the project management support group on technology options, management, operation and maintenance, business plan preparation and assessment, etc.

If successful, investments under the RARE Fund will be expanded in the Rural Energy 2 Project (FY04). This sub-component will be coordinated with other donors, especially Japan and Sweden, that have indicated interest in joining the effort or expanding investments during the proposed Rural Energy 2 Project. (Total component cost $5.0 million with IDA financing of $3.6 million; GEF-TA: $1 million)

Component 3 — Sector reform and institutional development:

i. Improvement of information system management. The objective of this component is to build a solid background for an modern integrated information system, which provides actual linkage of EVN and all of its affiliates offices and standardization of all systems, allowing EVN management to have access to consolidated data for a wide variety of managerial tasks. The emphasis will be placed on the improving the financial and accounting management system and to strengthen and expand the activities of Technology, Environment and Computer Center to carry out the proposed IT plan. The component would serve as first stage on implementing an integrated long-term plan on development of IT system for EVN. (This component is estimated in the range of $ 11 million with $10 million IDA financing, based on the studies being carried out by ECA on transfer pricing and by ESBI on information and management technology.)

ii. Creation of District or Commune-level Joint-Stock Distribution Companies. This component would focus on creation of 3 joint stock Distribution Companies at the district level so as to start the process of creating creditworthy distribution utilities in the country. EVN agreed to identify the candidate districts in 3 regions and suggest to IDA for possible inclusion in the project. Possible districts can be Gia Lam District of Hanoi, Dien Khanh District of Khanh Hoa province (PC3) and Thu Thua district of Long An province (PC2). EVN also proposed that some 10-15 communes be considered for creation of a joint stock companies. It is agreed that the selection of candidates for this component should be based on the potential for private participation and commitment from local governments and Provincial Power Services. This

[7] Meritec. 2000a. REAP Package E: Feasibility Study of a Program to Develop and/or Rehabilitate Community- Scale Hydro-Based Mini Grids. Consultant Report for EVN, Hanoi

[8] Meritec. 200a. *Turn-key Micro Hydro-Diesel Hybrid and Battery Charging Station Pilot Project.* Consultant Report for EVN. Hanoi.

program would enable EVN to evaluate a longer term program of equitization in the distribution sector. (The component is estimated at $ 6 million of IDA financing.)

iii. Strengthening regulations, planning and implementation capacity for renewable energy projects: This will consist of three sub-components, all executed by MoI:

(a) *Support for Establishment of Renewable Energy Program.* Assistance would be provided to the MoI to establish and manage a national Renewable Energy Program, based on the REAP. This Program would aim to: (a) prepare decrees and regulations needed to encourage renewable energy rural electrification and small power producers, building on the Rural Energy Policy; (b) build awareness of renewable energy; (c) provide training and support to businesses, Power Companies and government, for planning and implementing renewable electricity projects; (d) manage implementation of the renewable energy components of the SEER project, as well as to support MoI in coordination of renewable energy activities under the REAP funded by other donors; and (e) monitor and evaluate implementation of the renewable energy components of the SEER. (Total: $2.0; GEF-TA: $1.5 million)

(b) *Renewable Energy Small Power Producers*. Technical assistance would be provided for creation of an enabling environment for non-utility small power producers. It would include: resolving remaining issues on the standard power purchase agreement and tariff with MoI and EVN; establishment of transparent and streamlined approval and contractual processes; packaging identified mini-hydro projects as SPP projects; designing award procedures and offering sites to interested developers; disseminating information and providing business development services to prospective developers, including sugar mills and rice husk producers; and identifying ways to make available long-term financing including the possible use of guarantees to extend loan terms. Investments, including private sector investments, are expected to occur in the follow-up Rural Energy 2 Project. (GEF-TA: $ 1 million)

(c) *Renewable Energy Technology/Market Development.* Technical assistance would be provided for a variety of activities related to market and technology development, including resource assessment, market assessment and technology improvement and business development of locally manufactured renewable electricity products (e.g. pico hydro). (GEF-TA: $ 0.5 million)

iv. EVN staff training program. This component will support a staff training program covering technology, commercial and management of public utilities including deputation of staff to other utilities in the region, specialized training courses etc. EVN will prepare a Training Master Plan for this purpose (IDA component of $ 3 million).

Summary of Project components (see Annex 1):

Component	Category	Indicative Costs (US$M)	% of Total	Bank-financing (US$M)	% of Bank-financing	GEF financing (US$M)
1. System Efficiency Improvement		118.1	43.9	84.4	42.6	tbd
i. Transmission system efficiency improvement (EVN)	Physical	105.1	39.1	79.4	40.1	n.a.
ii. Energy Efficiency Programs:		13.0	4.8	5	2.5	tbd*

(a) DSM Phase 2 (EVN)	Physical					
(b) Pilot Commercial Energy Efficiency (MoI)	Physical					
2. Improving rural access (including renewable)		127.1	47.3	94.6	47.8	1.5
i. Upgrade of 110 kV sub-transmission and MV systems for rural electrification (EVN)	Physical	116.6	43.4	86.5	43.7	n.a
ii. Rehabilitation of small hydro plants (EVN)		5.5	2.1	4.5		0.5
Investment	Physical	5.0		4.5	2.3	n.a.
TA	Institutional	0.5		n.a.		0.5
iii. Community-based hybrid renewable energy grids (MoI)		5.0	1.9	3.6	1.8	1.0
Investment	Physical	4.6		3.6		n.a.
TA	Institutional	1.0		n.a.		1.0
3. Institution building (including renewable).		23.5	8.8	19.0	9.5	3.0
i. Improvement of information system management.	Institutional	11.0	4.1	10.0	5.1	n.a.
ii. Creation of District/Commune Joint Stock Distribution Companies (EVN)	Institutional	6.0	2.2	6.0	3.0	n.a.
iii. Strengthening regulation, planning and implementation capacity for Renewable Energy	Institutional	3.5	3.5	n.a.		3.0
(a) Renewable Energy Program Management		2.0				1.5
(b) Small Power Producers (EVN)		1.0				1.0
(c) Technology/Market Development (MoI)		0.5				0.5
iv. EVN staff training program (EVN)		3.0	1.2	3.0	1.5	n.a.
Total		268.7	100.0	198.0	100.0	4.5

*To be proposed in a separate GEF energy efficiency project.

2. Key policy and institutional reforms supported by the project:

The project will support the increased focus on improvement in system efficiency, financial management and increased decentralization of management for effective implementation in the power sector. It will promote the pilot divestiture/equitization of districts and communes to create creditworthy distribution entities. It will encourage private participation in the distribution sector. Commune-based mini utilities will help provide sustainable energy to the remote areas. This will require increasing Power Companies operational and managerial autonomy and maintaining financial soundness of the Power Companies through appropriate pricing. This will require the development of institutional capacity and policy framework for encouraging use of renewable energy to supplement grid supply or serve isolated communities where least cost. The RARE Fund, managed by the provinces under MoI, will create sustainable mechanisms for off-grid rural electrification and promoting renewable energy development.

The principal institutional reform undertaken as part of the project will be capacity building to define and implement institutional structures for creating a creditworthy distribution sector and sustainable institutions. These structures will: (a) lead to a cost-effective rural electrification system, maintained and operated according to good international practice; (b) preserve the financial stability and health of the main power sector entities engaged in rural electricity provision; (c) support continued implementation of power sector reforms and improve incentives to reduce costs and increase efficiency. These efforts will also strengthen the Governments ability to manage the power sector and help catalyze further private investments through creation of creditworthy and well run distribution companies.

3. Benefits and target population:

Investments in the improvement of overall system efficiency and reduction of transmission and distribution losses will benefit consumers over the entire country, as it will help reduce the need for increases in power tariffs. Investment in the distribution networks in rural areas will increase access to electricity on a least cost basis in poor communes which have demonstrated potential for growth. Reinforcement of existing sub-transmission and MV distribution systems will reduce losses and improve reliability and quality and of service.

Commune-based utilities in 20 areas will provide electricity to about 10,000 households in the remote areas inaccessible to the grid, using renewable energy and encouraging income generating activities. If successful, this will be scaled up under the proposed Rural Energy 2 Project. If successful, it is expected that other interested donors, including SIDA and Japan, will further expand the scope of the community-based small hydro program. Combined with other rural development initiatives promoted by the Government of Vietnam and supported by international institutions under the frame "Electricity – Roads – School – Clinics" program, the project will promote diversification of rural and regional development and thus make an important contribution to decreasing poverty in rural areas. The renewable energy components will also lay the basis for investments in small power production, which are expected in the follow-up Rural Energy 2 Project.

4. Institutional and implementation arrangements:

a. *Implementation period:* 2002-2005

b. *Executing agencies*. The executing agencies for the project will be EVN, PC1, 2, 3 and MoI.

- EVN, the state owned enterprise responsible for electricity generation, transmission and distribution in Vietnam, will bear the overall responsibility for the project preparation and implementation, except for Components executed by MoI (Components: 1(ii) (b), 2(iii), and 3 (iii)). EVN will:
  - allocate funds required for the project preparation, particularly for the surveying works for F/S and RAPs;
  - coordinate all the activities of PCs;
  - prepare the Project Implementation Plan, based on the data supplied from PCs;
  - approve Feasibility Study for project components upon EVN mandate;
  - prepare Resettlement Action Plan and Environmental Assessment for Transmission;
  - prepare components and get approval from the Government; and
  - get approval from Government for the whole project.

  A separate steering committee, reporting to the Chief Executive of the company, will be set up to manage the project. EVN will directly implement Component 1 (except (ii)(b)); and Component 3 (except (iii)). Three Project Management Boards (PMB) within EVN will carry out the

Transmission Component. Northern, Central and Southern PMBs will implement the sub-components within their control areas. These Boards have considerable experience in implementing WB sponsored projects. Improvement of Information System Management Component will be implemented by Center for Technology, Information Technology and Environment, a dependent EVN unit in charge of IT development. For Creation of District or Commune Joint Stock Distribution Companies Component, EVN will set up a special Task Force, consisting of related EVN, PCs staff to implement it. EVN will expand and strengthen its existing DSM cells to implement its DSM phase 2 in cooperation with PCs.

- Power Companies 1, 2 and 3 (subsidiary entities under EVN in charge of distribution for their franchised areas—No.1-in the Northern provinces, No. 2 in the Southern province, and No. 3 in Central provinces) will be in charge of the preparation and implementation of the parts of the project related to rehabilitation of sub-transmission and MV distribution network and rehabilitation of selected existing small hydropower plants within the areas under the control of each PC (Components 2(i) and 2(ii)). Main responsibilities of each Power Company are:
  - Prepare feasibility study for the rehabilitation of the sub-transmission and MV distribution networks, rehabilitation of existing small hydropower plants in their areas;
  - Prepare Resettlement Action Plan and Environmental Assessment for these project sub-components;
  - Obtain approvals on the F/S, RAP and EA from relevant agencies;
  - Implement the projects sub-components (including rehabilitation of mini hydro plants) within the territory that they are in charge, such as prepare bidding documents, selection of bids and supervise construction and erection works.

- MoI will be responsible for the implementation of Components 1(ii) Pilot Energy Efficiency Programs; 2(iii) Community-based hybrid Renewable Energy Grids; and 3(iii) Strengthening Regulations, Planning, and Implementation Capacity for Renewable Energy. For Pilot Energy Efficiency Programs, MoI will utilize and strengthen the existing DSM Steering Committees and DSM Project Management Board for implementation. For the renewable energy components, MoI will set up a new Steering Committee for the overall supervision of the components, consisting of representatives from related agencies such as MPI, MoF, MoSTE, EVN, provincial authorities, et al. The Steering Committee will also be responsible for setting regulations for the Remote Area Renewable Electricity Fund (RARE) and supervising its operation. A Project Management Board in MoI will be set up to:
  - coordinate all the activities of Provincial Project Management Units and
  - prepare the Project Implementation Plan, RARE Fund operational manuals.
  - allocate funds required for the project preparation and implementation

- Local Authorities: Local authorities, mainly the Provincial Peoples Committees, will approve the resettlement and compensation policy proposed for the RAP and allocate the land required for the project. For Component 2(iii), Community-based hybrid renewable energy grids, local authorities at provincial, district and commune-level will play a major role in the planning, implementation and management of the operation of off-grid electrification fund and sub-projects in their territory. They will assist MoI in the planning and project preparation work to supply electricity to the isolated communes using renewable energy. Provincial PMU will be set up in each participating province to:
  - assist communities to prepare Feasibility Study for commune-based hydropower systems within the territory
  - prepare Resettlement Action Plan and Environmental Assessment for these subprojects

- get approvals on the F/S, RAP and EA from relevant agencies
- assist communities to implement the subprojects that they are in charge, such as prepare bidding documents, selection of bids and supervise construction and erection works.

- Line Ministries. The Ministry of Planning and Investment (MPI) and Ministry of Industry (MoI) will oversee the project preparation and implementation including necessary approvals, policy for overall program, small power purchase policy, management and tariff policy for rural areas, policy for reforming the sector. Ministry of Finance will supervise and advise EVN on the financial matters. The Office of Prime Minister will provide policy guidance to all entities.

c. Monitoring and Evaluation. Monitoring and evaluation of all renewable energy components of the SEER will be coordinated by the Project Management Board of MoI. The key performance indicators that will be monitored are defined in section A3 and Annex 1. These indicators will include both operational indicators (e.g. # of households supplied with electricity, kWh supplied) and impact indicators related to the environmental and social benefits of the provision of renewable electricity and the productive uses promotion program (e.g., emissions avoided (e.g. CO2), increased income of households and businesses, additional jobs created). Semi-annual progress reports will be prepared by the Project Management Board for review by IDA. These reports will be reviewed during supervision missions, including performance indicators.

d. Technical Assistance. Consultant services will be provided under the project to assist EVN and MoI in the planning and management of the programs; in supporting energy policy, planning and development; to the Power companies in managing and operating the rehabilitated hydro plants, and in financial system development and management.

D: Project Rationale

1. Project alternatives considered and reasons for rejection:

The investment components of the project were developed following technical, economic and financial studies that have taken into consideration environmental and social aspects as appropriate.

Improvement of overall system efficiency. The total system losses in 1999 were estimated at about 17.3% with an energy loss of 4113 GWh. Based on a number of studies, several projects were identified to reduce these losses in EVN' transmission and distribution systems. In the transmission system, by adding new lines, substations or expanding substations, through installation of capacitors in selected substations, and optimizing both reactive power dispatch and economic power dispatch through optimal power flow, in distribution systems, the installation of efficient transformers and capacitors, replacement of conductors and other measures (i.e. new lines and substations, load balancing, etc.) had payback periods of 1-3 years. An efficient maintenance management system was considered necessary in order to maintain the transmission and distribution systems in a safe and efficiently performing condition.[9]

Improving rural access. The Rural Electrification Master plan considered various alternatives for extending rural electrification, including extending the distribution grid and off grid systems. Grid extension was selected as the most attractive alternative in communes where it constitutes the least cost solution.

[9] System and Energy Efficiency Improvement study by BCEOM-Tractebel- Systems Europe.

However, the MV systems supplying power to the rural areas that are overloaded need to be upgraded to reduce losses and improve quality of power supply. Also, in areas where grid extension is not possible, a mechanism is needed to support community level independent grids. Because these grids are inaccessible, renewable energy will often be the most economical form of generation. The SEER Project will pilot a Remote Area Renewable Electricity Fund, which will support renewable energy/hybrid grids, which will be developed and managed by the communes and districts under the overall supervision of the Provincial authorities. MoI has been given responsibility to develop such grids, as part of the coordination of the Renewable Energy Action Plan (REAP). The RARE Fund will also have a productive uses promotion program, to assist communities to develop income generating activities based on electricity. A pilot phase is essential, because of past negative experiences with bilateral funded community-based grids, which failed because insufficient attention was paid to developing community management capabilities and providing ongoing support to the communities. If the model is successful, investment will be expanded in the proposed Rural Energy 2 Project (FY04). Other international development agencies, including SIDA and Japanese agencies, have indicated their interest in contributing to the RARE Fund. With respect to small power production for the grid, it was decided to focus in capacity building in the SEER Project, as the enabling environment needs to be created for non-utility investment. Investments are expected in the follow-up Rural Energy 2 Project (FY04).

Institutional development through improvement of information system management which would link EVN and all its affiliated offices and agencies would provide an integrated information system based on a coherent IT strategy. In the first phase, focus would be on financial and accounting systems and on procurement which would improve the overall efficiency of management of EVN. [10]

Promoting equitization of distribution in districts and communes will provide on the ground experience in the development of a program for the creation of creditworthy distribution sector in the country and in the more effective separation of generation, transmission and distribution elements of the power sector. This will also promote the entry of the private sector. [11]

2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned):

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
Bank-financed		IP	DO*
Improve technical, operational, management and sector efficiency.	Power Sector Rehabilitation and Expansion (CR 2724-VN) of July 1995)	S	S
Rationalize power sector institutions; Commercialize operation of sector entities; Initiate appropriate legal and regulatory frameworks; Initiate private sector participation in generation; Investigate demand-side management and energy	Power Development Project (CR 2820-VN of February 1996)	S	S

[10] Based on the Improvement Management Systems by ESB International.

[11] Based on the study on Establishment of Joint-Stock Distribution Company/Cooperative by Viet Phong Company funded by PPIAF.

conservation options; and Prepare a rural electrification program.			
Unbundle EVN's "transmission" and "generation" functions; Implement regulatory reforms; Introduce tariff reforms; Explore financing of distribution from diversified sources; and Institutional strengthening and commercialization.	Transmission, Distribution and Disaster Reconstruction (CR 3034-VN of January 1998)	S	S
Improve rural access Strategy for rural electrification Promote renewable energy development for remote areas Local management and operation of rural grids Creation of joint stock companies for distribution Institutional reform for the creation of a creditworthy distribution sector	Rural Energy credit (CR 3358-VN of November, 2000)	S	S
Access, environment	IBRD/GEF India: Renewable Resources Development Project	S	S
Access, environment	IDA/GEF Sri Lanka: Energy Services Delivery Project	S	S
Coal domination, access	IDA/GEF Lao PDR Southern Province Rural Electrification	S	U
Access	IBRD/GEF Argentina: Renewable Energy in Rural Market Project	S	S
Other Development Agencies Asian Development Bank (ADB)	- Power Distribution and Rehabilitation (LN 1368-VIE of June 1995) - Central and Southern Vietnam Power and Distribution (LN 28187-VIE of November 1997)		
Overseas Economic Cooperation of Japan (OECF)	- Construction of Phu My 1 Power Plant (January 1994) -Construction of Pha Lai 2 Power Plant (January 1994) -Construction of Ham Thuan Da Mi Power Plant (January 1994) - Construction of Da Nhim Power Plant (March 1997) - Construction of O Mon Power Plant (March 1998)		
Swedish International Aid Agency (SIDA)	- Construction of Song Hinh Power Plant (1995) - Construction of 6 transmission substations for 100 kV (1998) - Extension of transmission substations for 500 kV (1998) - Upgrading distribution network in Central Area (to be signed)		
United Nations Development Program	Nepal Power Development Project, Micro-Hydro Village Electrification Component		

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

* Ratings for power projects were downgraded from satisfactory to unsatisfactory in June 1998 due to a tariff impasse which has now been resolved.

3. Lessons learned and reflected in proposed project design:

IDA's first two operations in the power sector have been completed and two operations are under implementation. Key lessons learned (see ICR for PDP and PSREP) include the following: (i) flexibility in all aspects of project design and implementation by both the Bank, Government, and implementing agencies was critical for the successful implementation of these two projects, in light of various delays caused by approval procedures, foreign exchange shortfalls, financial difficulties of suppliers and contractors, lack of sufficient on-time information and guidelines, etc.; (ii) good load forecasting is essential to predict the loading levels of transmission and distribution lines and substations, so that their rating is selected appropriately in line with realistic load growth rates; (iii) there are no short cuts to the successful completion of a complex project: this includes above-average inputs of IDA resources and a broad skill mix during project design, appraisal, and supervision; (iv) the appointment of an Independent Monitoring Agency to oversee RAP implementation was important in minimizing problems with PAP, and identify problem areas particular on land acquisition and compensation, thus avoiding protracted disputes; and (v) a Procurement Monitoring Group to assist streamlining bidding procedures. The lessons learned from these operations have been taken into consideration in project design.

The most significant problem observed is the preparation and implementation of RAP. In earlier Bank projects, due to insufficient counterpart funds allocated for the preparation of RAP, the project could not keep to the time schedule. Early assistance and monitoring from the Bank side for preparation of RAP is needed. For quick and smooth start of the project, it is important that all the feasibility studies of the project component(s) should be approved by the relevant government agencies before negotiation of the credit.

Rural energy and development (World Bank Development in Practice, September, 1996) Five main principles are recommended to provide better access: provide for consumer choice, ensure cost reflective pricing, overcome the high first cost barrier, encourage local participation and implement good sector policies. Best practices in rural electrification of an effective implementing agency, with a high degree of operating autonomy and good leadership; clearly defined criteria for selection of priority areas; tariffs set at realistic levels and at a minimum to achieve cost recovery; reduction of costs; lowering entry barriers; will be followed in the project design.

For *renewable energy*, as well as the experience of the World Bank, GEF and other international and national agencies that support renewable energy technologies in countries of this region – Indonesia, India, Sri Lanka, Cambodia, Laos etc. – have been taken into consideration. For the community-based renewable energy grids, there were important lessons learned in the 60% failure rate of existing community hydro grids in Vietnam[12]. These lessons include:

- Need for ensuring a policy and legal framework;
- Need to first build capacity and support strong institutional set up before developing larger scale investments;

[12] See "REAP Package E: Feasibility Study of a Program to Develop (and/or Rehabilitate) Community Scale Hydro-based Mini-Grids", Meritec, December 2000.

- Need for understanding the market characteristics including willingness and capability of consumers to pay, before implementing project;
- For community based hydro, the need to first mobilize the community, build management capacity, promote productive uses, and then provide strong local support to the community for ongoing management and operation of the commune-based utility;
- Need to support development of commercial renewable energy businesses, which are the engine for implementing the projects.

For *energy efficiency programs*, Bank/GEF experience has shown the need for proper incentives for utilities to undertake DSM. Previous operations have also shown the need for strong marketing efforts by DSM units and link them to parallel commercial financing program (Thailand Promotion of Electricity Energy Efficiency and Jamaica DSM Project ICRs), the need to develop sustainable DSM institutional arrangements given ongoing restructuring plans (DSM in Thailand: A Case Study, ESMAP Technical Paper No. 8 and Operating Utility DSM Programs in a Restructuring Electricity Sector, ESMAP Workshop Proceedings), the need to include distribution utilities in DSM implementation efforts, and design of DSM programs in the local context - all which will be addressed during detailed preparation. Operational experience has also shown the need for market mechanisms to develop sustainable programs and, in particular, support for energy efficiency project developers/service providers to assist end-users to identify, design, package, mobilize financing, procure, install and commission energy efficiency projects in order to develop sustainable, commercially-oriented programs (Promoting Energy Efficiency and Renewable Energy: GEF Climate Change Projects and Impacts).

4. Indications of borrower commitment and ownership:

The Government is strongly committed to improving the efficiency of operations of EVN and the power companies and increasing rural electrification. It prepared a Rural Electrification Master Plan in September, 1997 which was approved by the National Assembly. This strong commitment is evident from its substantial borrowings for rural electrification from international donors such as OECF, ADF, IDA and ADB and from its collaboration with EVN in developing electrification targets. Very ambitious targets have been laid out, and government is trying its best to achieve these- reflected by the fact that the Government has annually allocated budgets for local authorities for RE, it allowed EVN to access IDA credit for RE, and allowed EVN to use the depreciation funds for development of RE program. MoI has been authorized to coordinate all renewable energy programs in the country and to be responsible for the community based utility program (i.e., off-grid electrification).

EVN has demonstrated its commitment and ownership of power projects in Vietnam through a successful collaboration with IDA over the past six years. It has assumed prime responsibility for preparing the proposed project by (a) setting up a high level steering committee reporting to the Director General of EVN for overseeing the SEER project; (b) preparing the feasibility studies for the SEER; (c) preparing the EIA, RAP and draft PIP using technical assistance when required; and (d) implementing the Power Sector Reform Implementation Plan; and (e) supporting the preparation of the Renewable Energy Action Plan (REAP). Within the provincial power service units and the three PCs, there are departments and units who have been charged with the planning and implementation of the project components.

MoI has reaffirmed its commitment to sector reform through its updated Policy Paper and acceptance of the Action Plan for Institutional Reform. It also accepted responsibility for coordination of the Renewable Energy Action Plan, and will borrow IDA funds to create the Remote Area Renewable Electricity Fund.

MoI has assumed prime responsibility for preparing its proposed project components by (a) setting up a high level steering committee reporting to the vice minister; (b) preparing the feasibility studies for relevant SEER project components; (c) preparing the EIA, RAP and draft PIP using technical assistance when required

Overall the ownership of and commitment by the borrowers' and the implementing agencies are assessed to be strong.

5. Value added of Bank support in this project:

The proposed project will help to improve overall system efficiency, reducing transmission and distribution losses, and reducing investment needs in generation. It will improve electrification services to the rural areas and provide the framework for providing energy to even the most remote communes in the future. It will strengthen the institutional capabilities of the Power companies to undertake complex rural electrification projects in a cost effective manner. It will help MoI to mobilize the private sector in providing electricity supplies from renewable energy sources through development of appropriate policies. It will help EVN and the government to develop an equitization program for creating creditworthy distribution utilities and in sustaining its reform program for the power sector.

In particular, with respect to renewable energy, the Bank involvement has: (a) brought the participatory process that was used to build consensus on and support for adoption of the Renewable Energy Action Plan that resulted in the project; (b) resulted in the adoption of a Rural Electrification Policy Paper, which explicitly states that it will include both grid and off-grid electrification; (c) brought experience from other countries to convince the GOV of the economic benefits from renewable development; and (d) will assist MoI in attracting and coordinating efforts by other donors in renewable energy.

E: Summary Project Analysis

1. Economic

[x] Summarize issues below (e.g., fiscal impact, pricing distortions)
[ ] To be defined (indicate how issues will be identified) [ ] None

Economic evaluation methodology:

[x] Cost benefit [x] Cost effectiveness [ ] Other (specify)

Economic justification of the project. To ensure that the project as a whole and each of its components will yield adequate economic returns, EVN and the power companies are being supported by IDA and international consultants in their efforts to undertake a thorough economic evaluation of the project. This includes assistance in: (a) evaluation of the efficiency of the present system to supply electricity to consumers; (b) undertake an economic evaluation of the project; and (c) train the staff of EVN and the power companies in economic analysis methodologies.

Selection of project subcomponents in rural areas. MoI and EVN will clearly specify the criteria and processes followed in the selection communes. It has been recommended that this criteria should include,

among others, the following principles: (i) that communes should have a potential for economic development so as to ensure that energy consumption will be sufficient to justify the investment in economic terms; (ii) that the connection of communes to the grid or off-grid systems should be the least-cost solution to supply electricity; and (iii) that the selection should be done following a process whereby local groups, i.e. local community and households, will be required to indicate ownership by active participation.

Tariff/Pricing policy. A crucial issue is GOV's commitment to a sustainable power sector through its support of the financial objectives of EVN and the PCs. The GOV's socio-economic goals for the country, its concern with balancing fiscal resources for development, consideration of the consumers' ability to pay for electricity, and competitiveness of Vietnamese industries, are important considerations. Nevertheless, meeting the sector's financing targets requires not only a rational tariff policy that ensures credit worthy power utilities and guarantees adequate returns to investors, but also one that is set on the basis of long-run marginal cost to maintain business and investment activities. In order to assess the impact of the project, EVN will need to help the Government to assess and propose a tariff policy to adequately manage the financial impact of the SEER Project on the PCs. The tariff policies for remote communes will need to balance the affordability issues with minimum tariffs necessary for covering at least the operation and maintenance costs of the system. It will be necessary to evaluate alternative mechanisms to manage the subsidy while meeting economic efficiency (minimizing impact of price distortions) and social-equity objectives. These options could include the following measures: (a) management of the subsidy through bulk tariffs designed to alleviate the financial burden to power companies facing higher costs and less attractive markets; (b) a direct transfer payment mechanism while keeping cost-based bulk tariffs; (c) financial mechanisms such as sharing of subsidized financing, if any, or equity contributions; (iv) a tariff indexation policy; and (v) at the retail level, adjustments in the social lifeline tariff.

Bulk Power Tariffs. The PCs receive power from EVN in bulk at several of their grid substations. The bulk supply tariff to the PCs as currently applied is a complicated, iterative process that takes into account the different average revenues per consumers in the various PCs and is set by EVN to allow the financial viability of the PCs at the uniform national tariff. The internal bulk power prices is inappropriate because: (a) it is not based on economic criteria; (b) it is not cost-oriented and too low to reflect the actual costs of generation and transmission; (c) lacks a strong incentive for PCs to control costs; and (d) provides the wrong signals toward manpower reduction, productivity and capital expenditures. A credit condition under the Rural Energy Project requires EVN to review its existing internal bulk supply tariff and implement, according to a time frame, suitable bulk tariffs that would reflect the true costs of supply, and if needed, a transparent subsidy mechanism.

Renewables Components. For small hydro rehabilitation, a feasibility study already completed shows economic rates of return ranging from 24-111% for the five plants selected by EVN. For the community-based hydro/hybrid grids, financial and economic evaluations were carried out for 8 representative communes, with small productive loads. The results indicate an EIRR between 10 and 17%.[13] Pre-feasibility studies of new small hydropower plants show that rates of return are critically dependent on the tariff received.[14] There are outstanding issues with EVN related to the need to reduce transaction costs by having a standard small power purchase agreement and how to establish the tariff, based on avoided

[13] Meritec, REAP Package D, Feasibility Study of Community Hydro Grids, 2000.

[14] Meritec, Vietnam Rural Energy Project Pre-Investment Study Report for Pipeline Development of New Small Hydro Projects", Consultant Report for EVN, 2000.

cost. Technical assistance will be provided as part of the SEER to resolve these and other issues, as well as to support pre-feasibility and feasibility studies by non-utility producers.

Analysis confirmed that the community-scale hydro-based systems are lower cost options than either grid extension or diesel generation. However, the analysis showed that without productive load during daytime it is not justifiable to install a hydro-based commune electricity system for a typical Vietnamese commune. Without productive load, the cost for providing electricity for would be US$610 per household on a life cycle cost basis, which is substantially higher than the US$450 per household for a solar PV system or even a diesel based commune system. If small productive loads are available, this picture changes. The hydro-based isolated system would be the least cost option (levelized life-cycle cost of US$770 compared to US$1,100 for grid extension, and US$1,310 for an isolated diesel). Remaining issues include:
Selection of communes. It is essential that MoI and EVN should specify the criteria and processes to be followed in the selection of communes. It has been recommended that the criteria should include the following principles: (i) that communes should have a potential for economic development so as to ensure that energy consumption will be sufficient to justify the investment; (ii) that the connection of communes to the grid or off-grid systems should be the least-cost solution to supply electricity; and (iii) that the selection should be done following a process whereby local groups, i.e. local community and households, be required to indicate ownership by active participation.
Tariff/Pricing policy. The tariff policies for remote communes will need to balance the affordability issues with minimum tariffs necessary for covering at least the operation and maintenance costs of the system. It will be necessary to evaluate alternative mechanisms to manage the subsidy while meeting economic efficiency (minimizing impact of price distortions) and social-equity objectives. Promotion of productive loads will be a critical element in the commune-based hydro grids sub-component.

2. Financial

[x] Summarize issues below(e.g., cost recovery, tariff policies, financial controls and accountability)
[ ] To be defined (indicate how issues will be identified) [ ] None

Power Development and Financing. The capital investment requirements of EVN and the PCs are estimated at over US$1-1.5 billion/year, which will require heavy mobilization of funds from both domestic and foreign sources. The financing gap emerging between the investment needs of the sector and possible support of the donors and lenders will require serious thinking on the part of the Government in fine-tuning its financing sector priorities and strategies.

Financial Performance of EVN and the PCs. EVN's financial performance since its creation in 1995 and until 1999 has been satisfactory largely because of high growth and rapid expansion of the economy, an increasing consumer base, and growing consumption per customer. However, demand growth is slowing, penetration rates are increasing, industrial loads are shrinking, and tariffs are lagging behind. The financial situation of the PCs is a subset of the financial realities at EVN, the PCs being common carriers that transport electricity purchased by their customers from EVN, with the PCs' financial results inextricably linked to EVN's by way of the bulk supply tariff. To ensure the financial viability of EVN and the PCs, it is essential to quantify the subsidy levels and to develop alternative mechanisms to manage the subsidy inherent in rural electrification projects, that would meet socio-economic efficiency and transparency objectives. A minimum level of cost recovery is essential, as well as a strong commitment from the GOV to mitigate the social cost and provide adequate financial support to EVN and the PCs in its pursuit of the national rural electrification objectives. The future financial performance of EVN and the PC's will therefore be critically dependant on government policies on tariffs and other financial policies.

Financial Management and Accountability. EVN has undergone a major transformation in the past few years, making fundamental changes in its organizational structure, operations and future strategy. To keep up with changes in the sector, EVN is fashioning itself after successful modern utilities in the region and is determined to modernize and improve its business systems. System reliability encompasses both hardware and software components. Refurbishing wires and cables alone, without upgrading back office support via updated technology and financial and management systems, will not improve overall system efficiency. EVN recognizes that to become a modern and efficient electric power utility, it has to invest in information technology hardware and software to: (a) automate its operation and business systems; (b) acquire capabilities to electronically link its offices and functions nationwide; (c) standardize its management reporting systems; (d) implement an IT strategic plan; and (e) train its staff. A report has been completed and a strategy defined. At issue is whether the full commitment of EVN management that is necessary for the Plan to succeed could be ensured, in terms of manpower and financial resources.

Equitization of districts and communes. It is necessary to ensure the financial viability of the newly formed equitized companies. Detailed analysis of the three companies at the district level and at the commune level would need to be carried out.

Renewables Components. Financial analysis will be completed on the small hydro-rehabilitation component, but this is expected to confirm that the investment is very attractive. The financial analysis already completed for the community-based hydro grids component showed that a subsidy of about 90% is required to reduce tariffs to an affordable level of about 1000 dong/kWh. With such a high subsidy, attention to the tariff and leasing fee required to ensure long term sustainability is an essential part of the project design. Community tariffs must be high enough to pay regular operations and maintenance costs, as well as to pay a leasing fee to finance continuing technical and management support to the community.

A Remote Area Renewable Electricity Fund is to be created under MoI, in up to 4 provinces, to provide grant funds to support the development of commune-based mini grids. Financial systems and procedures for the operation of these funds are under preparation.

3. Technical

[x] Summarize issues below (e.g., appropriate technology, costing)
[ ] To be defined (indicate how issues will be identified) [ ] None

Measures to decrease losses, improve power quality and ensure continuity of supply in the power system include reactive compensation equipment and tap substations; protection equipment and switchgear standards for the HV, MV and LV transmission and distribution systems and loading of substations to ensure that transformers are not overloaded.

Appropriate technology and specification for expansion, upgrading and repair of existing electrification networks will need to be reviewed. The analysis should take into account the present and forecasted demand in the various areas.

Reducing total costs by appropriate selection of equipment, materials etc should be a major objective in the design of the systems.

4. Institutional

[x] Summarize issues below (e.g., project management, M&E capacity, administrative regulations)
[ ] To be defined (indicate how issues will be identified) [ ] None

See section C4 for implementation arrangements. A key objective of the project is to define and establish appropriate institutional mechanisms which will facilitate (a) improved system management and efficiency; (b) the equitization of districts and communes, (c) the continued electrification of rural areas rapidly without undermining the long-term viability of the institutions involved, (d) a decentralized mechanism to implement off grid electrification for remote communes and (e) effective design and implementation of the DSM program. In developing the institutional structure that will achieve the project objectives the following aspects will be developed in detail:

Creating an appropriate institutional structure which will be responsible for managing the long-term program of equitization and rural electrification both grid connected and off grid. For equitization, a Task Force will be set up with clear demarcation of responsibility between EVN, PC's and the equitized entities. For rural electrification, a mechanism will be created to provide efficient subsidies for capital investments to meet social objectives. For remote communes, an off grid rural electrification fund will be set up at the MoI coordination will be done by the newly set up Project management board in MoI.

Defining responsibilities of MI, PPC's, EVN, and the Power companies for rural electrification and DSM components of the project.

The institutional structure for commune-based grids projects in remote areas will build on the model developed in Na Bo Village, Son La Province and the experience gained.

Financial incentives for all participants involved in the implementation, management and operation of the network to ensure that consumers are provided with a safe and reliable supply. Subsidy setting and delivery mechanism will be established that meet the criteria of: (a) preserving the incentives of all participants to reduce costs and meet program goals; (b) focusing on the ultimate objective of providing electricity service to consumers, rather than merely the build-up of physical networks; (c) ensuring that there are no unfunded mandates established based on unrealistic policy targets.

5. Social

[x] Summarize issues below (e.g., significant social risks, ability to target low income and other vulnerable groups)
[ ] To be defined (indicate how issues will be identified) [ ] None

The transmission line routes and required right-of-ways will be designed in such a way as to avoid properties and to minimize project impacts. Benefits brought by electricity distribution and compensation/rehabilitation packages, should off-set the losses incurred by the project affected persons (PAP). The linear nature of the project does not create conditions for potential community-wide social impacts. If compensation at market and substitution rates as per Bank guidelines is assured, the socio-economic impact of the project is expected to be essentially positive

The project may affect a substantial number of ethnic minority PAP's. Special provisions to carry out resettlement, rehabilitation and compensation tasks in a fashion sensitive to the cultural/linguistic

peculiarities of ethnic PAP would be included in the RAP. The Commission for Ethnic Minorities and Mountain Areas will be involved in the implementation of the RAP in provinces with ethnic minority PAP. However, considering that ethnic minority PAPs do not suffer specific impacts, and that the project will not have community-wide negative consequences, the implementation of an IPDP will not be necessary.

The community-based renewable energy grids are expected to create substantial direct social and economic benefits in poor, isolated communities (e.g. increase in productive activities and income generated) as well as indirect benefits through increased lighting for educational and leisure time activities.

6. Environmental

a. *Environmental issues:*

[x] Summarize issues below (distinguish between major issues and less important ones)
[ ] To be defined (indicate how issues will be identified) [x] None

Major: The project has no major environmental issues since except for limited HV lines, only MV and low voltage transmission and distribution lines are planned. There may, however, be some minor impacts, due to access road construction, mine clearance and very low level emf. Several actions have been proposed in the draft EA. These include: (i) For the development of access roads, contractors will employ appropriate techniques to protect the environment during construction, using prototype designs and well-tested guidelines; (ii) To protect forest, reserved land and bio-diversity, transmission routes will be selected carefully with most routes following existing roads connecting the load centers; (iii) Emf is not considered a serious problem with low and medium voltage lines, however internationally accepted standards will be applied for the development of buffer zones; (iv) Mine clearance has been carried out for many years in Vietnam and is necessary before crews begin construction; (v) The use of PCB based cooling oils for transformers is prohibited but the EA will provide further clarifications. The environmental analysis will also provide (a) an evaluation of alternatives considered for this project as well as the potential environmental benefits; (b) analysis of line's impact on habitats; and (c) impacts if any on cultural property.

b. *Environmental category*: [ ] A [x] B [ ] C

c. *Justification/Rationale for category rating*: Generally projects of this type and scope merit a B rating.

A separate EA for the transmission line components will be prepared.

d. Status of Category A assessment: NA

e. *Proposed actions*: See 'a' above.

f. *Status of any other environmental studies:*

Local consultants to be appointed in March 2001 to help EVN prepare the EIA's.

g. *Local groups and NGOs consulted: (List names):*

JICA, JBIC, ADF, Partners in Development, Vietnam Women's Union; Local people in provinces.

h. *Resettlement*

[x] Summarize issues below (e.g., resettlement planning, compensation)

[ ] To be defined (indicate how issues will be identified) [ ] None

The project design will ensure that land acquisition is limited essentially to T/L right- of- way (ROW) areas, service roads, and deposit areas. Most land impacts will be temporary and will require only compensation for crops lost as the PAP will be allowed to re-cultivate their plots after construction's end. Permanent impacts will be limited to land occupied by T/L pole foundations, to trees higher than 4 m. and to houses within the ROW. Most houses will be affected for less than 25% of their surface and should require only partial reconstruction. All house affected PAPs should in general have sufficient residential surface outside of the T/L ROW for house reconstruction.

Land and crop compensation will be delivered in cash at current market rates. Trees and house compensation will be delivered at substitution cost. Particular attention should be put in assuring that compensation amounts indicated in government tariffs have been adjusted as to actually correspond to these rates.

Resettlement tasks are very limited in scope and entail only relocation within existing residential plots. PAP who will have to reconstruct their houses will receive a special subsidy to cover livelihood losses in the house reconstruction period.

EVN and the three PC's will prepare RAP's which will set out the principles and procedures for land acquisition and which will be approved by IDA. Compensation payments will be as per existing Bank guidelines. Evaluation and monitoring systems will be set up in consultation with IDA.

For the rural components, a program framework approach will be taken and guidelines/operational manuals/procedures will be laid down which will need to be complied with before a project is approved.

The Bank's safeguard policies on social and environmental issues will be duly considered and addressed during project preparation. The RAPs including land acquisition and resettlement will be conditions for project appraisal.

i. *Borrower permission to release EA:* [x] Yes [ ] No [ ] N/A

j. *Other remarks:*

7. Participatory Approach:

a. *Primary beneficiaries and other affected groups:*

[x] Name and describe groups, how involved, and what they have influenced.

[ ] Not applicable (describe why participatory approach not applicable with these groups)

The renewable energy components are based in the Renewable Energy Action Plan, which was successful in developing a consensus on the Plan, at least partially because of the participatory process followed (see Annex 4 for details). The first step was a participatory workshop held in June, 1999, sponsored by EVN and the Bank, attended by stakeholders including the women's union, banks, renewable energy companies, research institutes, government agencies, EVN, provincial departments of industry, EVN regional subsidiaries, development agencies, and other interested parties.[15] The workshop

[15] See ESMAP Technical Paper 001, "Options for Renewable Energy in Vietnam", July 2000, for a report on the workshop.

discussed and reached consensus on the renewable energy applications with greatest potential, and the barriers to their use in Vietnam. Based on the results of this workshop, a series of consulting studies was designed and carried, supervised by an EVN and Bank team.

After the studies were completed, the Bank team drafted a report, which was reviewed by EVN and then presented at a second participatory workshop. Discussion was lively among all participants, and the report was substantially revised to take into account the comments and new information received from participants. Based on the response at the meeting, including a positive response from the Ministry of Planning that controls investment decisions, MoI agreed to adopt and take responsibility to coordinate the program.

The participatory approach was considered highly successful in building a solid basis for the project by the Bank team, EVN and MoI. The approach will be expanded during project implementation. The community-based renewable energy grids will be created through a community mobilization process, that builds strong commitment by the community, similar to that used in the community hydro project by UNDP in Nepal. Selection of sites for commune-based mini grids will be selected based on demonstrated commitment of the local communities.

b. *Other key stakeholders:*

[x] Name and describe groups, how involved, and what they have influenced.
[ ] Not applicable (describe why participatory approach not applicable with these groups)

The present system of financing of rural electrification relies heavily on local participation in decision making. Individual households contribute to the construction of the low voltage lines and in addition the cost of connections to their houses are their direct responsibility. The local peoples committees represent the local communes and have considerable voice in determination of the grid expansion and payments required of them for the operation and maintenance of the system. It is presently planned that the project will require a level of local participation in the financing and operation and management of the systems in the rural areas particularly in the collection system.

8. Procurement:

a. A credited procurement staff will be part of the preparation/appraisal team and the procurement and disbursement officer in the Resident Mission will also be part of the task team.

b. A considerable amount of the expected procurement under the project will be NCB. Attention and consideration should be paid to the following issues in order to facilitate project implementation:

- A capacity assessment including a procurement plan and the setting of prior and post review thresholds will be reviewed during appraisal;
- Model bidding document for works prepared by RMV would be used for NCB under this project.

c. EVN will prepare a Project Implementation Plan as part of project preparation. This plan will include among other things, detailed procurement packaging and procedures for approval and will be discussed with the project team. The plan will be reviewed during appraisal

9. Checklist of Bank Policies

a. This project involves (check applicable items):

[ ]	Indigenous peoples (OD 4.20)			[ ]	Riparian water rights (OP 7.50)	(BP 7.50)	(GP 7.50)
[tbd]	Cultural property (OP 4.11)			[x]	Financial management (OP 10.02)		(BP 10.02)
[x]	Environmental impacts (OP 4.01)	(BP 4.01)	(GP 4.01)	[ ]	Financing of recurrent costs	(OMS 1.21)	
[tbd]	Natural habitats (OP 4.04)	(BP 4.01)	(GP 4.01)	[x]	Local cost sharing (OP 6.30)	(BP 6.30)	(GP 6.30)
[ ]	Gender issues (OP 4.20)			[ ]	Cost-sharing above country three-year average (GP 6.30)	(OP 6.30)	(BP 6.30)
[x]	Involuntary resettlement (OD 4.30)			[ ]	Retroactive financing above normal limit (OP 12.10)		
[ ]	NGO involvement (GP 14.70)			[ ]	Disputed territory (OP 7.60)	(BP 7.60)	(GP 7.60)
[tbd]	Pest Management (OP 4.09)			[ ]	Other (provide necessary details)		

b. Describe issue(s) involved, not already discussed above:

F: Sustainability and Risks

1. Sustainability:

The following key factors are critical to Project sustainability:

a. *Institutional:* Government implementation of Action Plan for power sector reform; Government approval of EVN's equitization program and MoI/PPC's ability to manage commune-based mini grids and off grid funds for promoting remote areas electrification.

b. *Financial:* Government commitment to periodically review and adjust tariffs

c. *Technical:* Choice of appropriate technologies/ maintenance management practices and procedures

d. *Environmental and social.* Consultation during project preparation and independent monitoring and evaluation during and after project implementation completion

The sustainability and replicability of the renewable energy sub-components are particularly strong because the project supports Phase 1 of the Renewable Energy Action Plan (REAP), and the GOV and the Bank have made a commitment to the implementation of the Plan. The renewable energy component under SEER will support the first Phase of REAP that will lay the foundation for scaling up the activities by a factor of about five to ten times in the second phase. The World Bank already plans to support Phase 2 of the REAP, through the proposed Rural Energy 2 Project (FY04). Other donors, especially JICA and SIDA, have already indicated interest in supporting the REAP. This long-term programmatic approach will increase the chances of sustainability, and integrate the replicability as part of the program. The overall approach of the REAP is already being replicated in preparation of the proposed Cambodia Rural Electrification Project.

Sustainability will be addressed in the design and implementation of each renewable energy component. For the commune-based hydro systems a substantial amount of experience, negative as well as positive, is available in Vietnam and other countries such as Nepal. The approach taken will build on the successes and lessons learned of these projects. The project will use a community mobilization approach that will enhance sustainability, paying particular attention to developing management capacity and financial sustainability. As part of a pilot and consultant studies these two areas have been focus of attention and will remain so during project implementation. Successful models during the first phase will be expanded on during the proposed follow-up project, Rural Energy 2, to support the second Phase of REAP.

For the grid connected projects, a standardized power purchase agreement and tariff is to be adopted by EVN. This will provide an ongoing market for electricity from independent producers. At the same time, development of non-utility projects will be supported through assistance for pre-feasibility studies and feasibility studies. Investments are expected under the follow-up Rural Energy 2 Project (FY04). In the long run, similar to the off-grid systems, further development of market forces will enhance sustainability.

A critical factor for sustainability of the community hydro-based grids sub-component is long term commitment by the provincial and district authorities to the Remote Area Renewable Electricity Fund beyond the length of the project. This is addressed in project design by: (a) requiring all provinces to submit a proposal for commune based grids after confirming their explicit support for the program; (b) use of annual leasing payments which will partly finance the operations of the Fund, as part of a contract between the commune and provincial authorities; and (c) mobilization of additional sources to capitalize the fund. Mobilization work with both communes and district authorities will be an important element of the project.

2. Critical Risks (reflecting assumptions in the fourth column of Annex 1):

Risk	Risk Rating	Risk Minimization Measure
Annex 1, cell "from Outputs to Objective"		
Non availability of counterpart funds	M	Agreement with government to provide local cost financing if required.
Cost of transmission and distribution systems higher than expected	L	Price estimates based on past experience and contingencies included
Adequate and timely availability of land acquisition and compensation payments	M	Detailed RAP and implementation procedures
EVN does not implement tariff increases and change tariff structure leading to low financial rate of return which could affect the capital mobilization for the whole program	L	Government Agreement to increase average power tariff to maintain IDA agreed financial ratios
Annex 1, cell "from Components to Outputs"		
Low management capacity of MoI, PPC and EVN in rural areas	M	Adequate training programs and provision of consultants
Lack of long term commitment of provincial and district authorities to supporting the community-based micro-hydro grids, including coordination of resettlement and compensation	M	Commitment of local authorities a prerequisite in selection of areas, use of leasing payments to support Fund

Equitization program implementation capacity	M	Consultants for project design and implementation
Schedule and cost overruns	L	Improve monitoring and supervision capacity in MoI, EVN and PCs
EVN does not adopt adequate SPPA and tariff, barriers to private investment persist	L	Technical assistance during project, support for power sector reform
Overall Risk Rating	M	

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N (Negligible or Low Risk)

3. Possible Controversial Aspects (Project Alert System):

Risk	Type of Risk	Risk Rating	Risk Minimization Measure
Government slow to follow through on reforms at national and institutional levels	G	M	Continuous dialogue with the Government and the agencies

Type of Risk – S (Social), E (Ecological), P (Pollution), G (Governance), M (Management capacity), O (Other)
Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N (Negligible or Low Risk):

ANNEX 1

Project Design Summary
Vietnam: System Efficiency Improvement and Equitization Project

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation	Critical Assumptions
a. Sector-related CAS Goal: Reduce the investment needs through alleviating power system bottlenecks and increased efficiency to maintain pace of economic development	Sector Investment Ratio of GDP to energy use Per capita electricity consumption	Statistics to be maintained by Government and EVN	(Goal to Bank Mission) Macroeconomic condition are favorable to sustain demand growth
Reduce rural poverty in Vietnam and raising productivity through expanding rural assess to electricity	Rural access to electricity Poverty rate for project areas	Community and provincial data/statistics to be maintained	Sector is able to raise the necessary fund from a mix of financing resources
Continuation of power sector reform and restructuring	Government continues to implement sector reform in accordance with 1995 Policy Sector and Strategy Internally generated cash for investments: Sector' self financing ratio	IDA monitoring based on annual reports to be maintained by EVN and PCs	Government commitment to reforms remains strong. IDA technical support is sustained and intensified
b. GEF Operational Program Promote renewable energy by removing barriers and reducing implementation costs	Government implements expanded renewable energy program through further projects to support Phase 2 of REAP		
a. Project Development Objective: 1. Improving overall system efficiency through optimization of transmission system to reduce losses and remove bottlenecks; rehabilitation of distribution network in rural economic growth centers; and reduce peak demand and electricity consumption through large scale DSM activities	1. Transmission and distribution system: Transmission losses and distribution losses Number of T/L fault (time/year/100km) for 500 kV, 220 kV and 110 kV Duration of T/L fault (min/year) for 500 kV, 220 kV and 110 kV Number of transformer faults (time/year/unit) for 500/220 kV and 220/110 kV Duration of transformer faults (min/year/unit) for 500/220 kV and 220/110 kV Energy sales/employee Reduction in peak load and electricity consumption due to DSM	Statistics to be maintained by Government and EVN Statistics to be maintained by Government and EVN	**(Objective to Goal)** Project is completed on time and thereafter well operated and maintained Government commitment to financial stability of the sector Donor /GEF support for rural electrification and renewable energy development Productive use of electricity is well promoted in newly electrified areas
2. Enhance rural access to electricity by upgrading 110 kV sub-transmission and MV distribution lines for rural electrification; rehabilitating existing mini hydro systems in rural areas; developing community based utility to remote areas,	2. Number of household electrified with renewables Number of communes electrified with renewables Number of off grid community mini systems installed	Quarterly and annual reports by PMB and PMU in MoI	Commitment of government and EVN to equitization process in larger scale

not accessible by grid 3. Sustain power sector reform and improve corporate governance through pilot divesture/equitization of distribution entities; installation of effective and streamlined financial management and information technology; and establishing a framework, mechanism and capacity for renewable energy development and decentralized off-grid rural electrification **b. Global objective** GEF objective: reduction of GHG emissions through electricity production from renewable energy	Electricity sales in commune-based hydro systems (kWh) Additional productive use of electricity and income generated (kWh and $) Other measures of social benefits (tbd) Additional electricity generated in rehabilitated small hydro plants (kWh) GOV successfully operates Remote Area Renewable Electricity (RARE) Fund 3. Financial soundness of JS Distribution companies: Self financing ratio Debt service coverage Electricity Sales Customers numbers Application of integrated financial information systems throughout EVN and PCs CO_2 Emissions reduced	Quarterly and Annual Reports to be maintained by EVN and PC Quarterly and annual reports by PMU in MoI Project reports	
Outputs: 1.(i) Transmission system efficiency increased; bottlenecks and overload are reduced. 1.(ii) (a)DSM activities are implemented in EVN and PCs level 1.(iii)(b) Pilot commercial energy efficiency programs are carried out 2.(i) Upgraded 110 kV sub-transmission and MV distribution network for Rural Electrification areas 2.(ii) Rehabilitated mini hydro grid-connected systems 2.(iii) Installation of community based mini hydro systems for remote areas	1.(i) Trans. line lengths (km): 2003 2004 2005 Transformer capacity (MVA): 2003 2004 2005 1.(ii) Capacity and energy saved due to DSM (MW and GWh) 2003 2004 2005 Number of new TOR meters installed: 2003 2004 2005 Number of project and investment in energy efficiency projects (US$) 2003 2004 2005 Number of audits performed: 2003 2004 2005 2.(i) Distribution line length (km): 2003 2004 2005 Substation capacity (MVA): 2003 2004 2005 2.(ii) Generation capacity rehabilitated (kVA): 2003 2004 2005 Renewable Electricity production: 2003 2004 2005 2.(iii) Generation capacity installed (kVA): 2003 2004 2005 Distribution lengths (km): 2003 2004 2005 Number of meters installed: 2003 2004 2005	1. Site inspection, and commissioning documentation Quarterly and Annual reports to be maintained by EVN, PC and Project Management Units	**(Outputs to Objective)** Government and EVN management is committed to deploy adequate resources for project completion Adequate and timely availability of resources for land acquisition and compensation Suitable implementation arrangements for project related procurement, contracting and construction Expeditious management decision on procurement related issues Adequate planning and training for project implementation

	Electricity consumption 2003 2004 2005 Number of households connected 2003 2004 2005		
3.(i) Installation and application of effective financial information management system for EVN and PCs 3.(ii) 3.1 Establishment of 3 JS District level distribution companies	3.(i) Establishment of JSDCs 3.(ii) Installation of software Number of personal computers networked Number of IT staff:		
3.(iii) MoI successfully managing REAP Program nation wide framework for renewable energy development; establishment and functioning of Remote Area Renewable Electricity Fund in 2-3 provinces; EVN purchasing power from renewable energy IPPs;	3.(iii) Remote Area Renewable Electricity Fund operating successfully in 2-3 provinces and commitment made to scale-up activity. XX SPPs using renewable energy to produce electricity and sell to the grid XX kWh of renewable electricity from SPPs sold to the grid.		
3. (iv)			
Project Components:	**Inputs: (budget for each component)**		**(Components to Outputs)**
1. System Efficiency Improvement (i) Transmission systems efficiency improvement	1. (i) US$ 105.1 million	- Progress reports and disbursement reports	Government commitment to borrow IDA funds and provide enough counterpart fund to implement projects
(ii) (a) DSM phase 2 by EVN (b) Pilot commercial energy efficiency programs by MoI	1.(ii) US$13 million	- Supervision mission reports	Commitment of EVN, MoI and provincial authority to project
2. Improving Rural Access: (i) Upgrading the 110 kV sub-transmission and MV distribution system for Rural Electrification Programs	2.(i) US$116.6 million		Commitment of local authority in supporting commune-based renewable energy grids, resettlement and compensation
(ii) Rehabilitation of existing small hydro plants	2.(ii) US$5.5 million		
(iii) Community-based hybrid renewable energy grids	2.(iii) US$5.0 million		
3. Institution Building (i) Improvement of information system management	3.(i) US$11 million		Deployment of adequately skilled and manned project management team by EVN, PCs and MoI
(ii) Creation of District or Commune level Joint Stock Distribution Companies	3.(ii) US$6 million		
(iii) Strengthening regulations, planning and implementation capacity for Renewable Energy projects - Renewable Energy Small Producers - Technology/Market Development - Program Management Support	3.(iii) US$3.5 million		Ability of local authorities to effectively carry out their tasks
(iv) EVN Staff training program	3.(iv) US$ 3 million		Ability and commitment of EVN and PCs to effectively implement pilot equitization

Annex 2

Incremental Cost Annex: Renewable Energy Sub-components

Context and Broad Development Goals

Context

Vietnam is well endowed with energy resources, creating the opportunity to provide local industries and households with electricity, and export electricity to neighboring countries. Nevertheless, the power sector in Vietnam is in an early stage of development, with current per capita use of electricity very low, at 309 kWh per year, or less than 26 kWh per month. In 2000, the power sector had an installed capacity of 6248 MW, of which hydro accounted for 54 percent, gas turbines 19 percent, diesel 5 percent, fuel oil 3 percent, coal 10 percent and IPPs (private power fueled by diesel) 9 percent. Power consumption has been growing rapidly over the last decade at 11.8 percent per year. Electricity consumption is expected to triple by 2010, from 26.6 TWh to 70-78 TWh, straining the ability of the power sector to finance plants. Hydro is expected to remain dominant, although its share will drop to 40 percent. Coal will play an increasing role in the north, and gas resources in the south.

The substantial rural electrification progress of EVN and its subsidiaries is a contributor to the national growth in electricity consumption. In 2000, 82 percent of the communes and 74 percent of rural households (about 9.5 million) had electricity service from the grid. GOV aims to provide electricity to 90 percent of rural households by 2005.

Even with a fast-growing power sector and an aggressive grid expansion program, more than 1100 remote or mountainous communes or villages, representing about 500,000 households and 2 million people, are outside EVN's plan for connection to the grid by 2005. There are also households in electrified communes that cannot be economically connected to the grid.

Renewable energy is poised to play a significant role in providing electricity services to rural people in Vietnam. A substantial share of households and communities outside of EVN's current electrification plans could be served at a cost similar to the current costs for grid connection ($400-500 per household), using renewable energy resources such as pico-hydro systems in the North or solar photovoltaic systems in South and Central Vietnam. Decentralized sources of electricity, especially those based on renewable energy, offer the remaining households the only opportunity to experience the benefits of modern lighting, communication, and appliances. Also, renewable electricity plants connected to the grid could cost-effectively supplement grid electricity, reducing losses and improving grid stability by providing generation at the far reaches of the grid. Table 1 summarizes Vietnam's rich renewable energy potential, which is described in more detail below.

Technical potential for small hydro power (<10 MW per site) is 800–1,400 MW.[1] The hydro resources are mainly in the north and central areas, near the border with Laos and Cambodia. About 70–75 percent of the annual runoff is generated in three to four months. There are now about 60 MW of *grid-connected mini hydro* installed at 48 sites, ranging from 100 to 7,500 kW capacity.[2] Only six out of the 48 have been reported as not in operation (13 percent) due to equipment failure. Though most of the systems are functioning, there is substantial scope to increase capacity and generation through rehabilitation. All the

[1] Estimated by Hydropower Department of the Institute of Energy.

[2] Hydro Power Center. 2000. *Package B: Collection of Basic Information and Mapping Information for Vietnam.* Consultant report to World Bank, Washington, D.C.

grid-connected systems were government financed, either directly or through international aid. There are estimated to be 400–600 MW of grid-connected mini-hydro potential (Table 1).

Table 1: Potential and Current Use of Renewable Energy in Vietnam

Resource	Potential		Current Usage		Geographical potential
	MW	Thousand hh served	MW	Thousand hh served	
Hydro power	800–1,400		110–155		North and center
- pico-hydro	90–150	200–250	30–75	100	North and center
- isolated mini-grids	300–600	300	20	n.a.	North and center
- grid connected mini hydro	400–600	n.a.	60	n.a.	North and center
Off-grid solar PV systems	2	50	0.6	5	South and center
Biomass bagasse, rice husks, and so forth	250–400	n.a.	50	n.a.	South and center
Geothermal	~50–200	n.a.	0	n.a.	Center
Wind power	TBD	TBD	0.2	1	Central coastal region
Total	1,100–1,900	500–600	160–215	106	

n.a. Not applicable.
TBD. To be determined.

More than 300 *commune based small hydro systems* have been installed. The total installed capacity of these systems is about 70 MW, with individual systems ranging from 5 to 200 kW. Most of the systems are installed in north and central Vietnam. A recent review of these systems found that about 200 of them are not operating. Most systems were installed through grant programs, which paid inadequate attention to the critical need for adequate institutional arrangements to ensure long-term sustainability. At the village level, clear lines of responsibility are needed, which includes an adequate financial motivation such as a salary for the operator and preferably also includes commercial loads which depend on the system. Small hydro-power-based grids operated as organized businesses (e. g. with paid staff) have a much lower failure rate than informally operated ones. For example, in Dong Nai, of 19 remote area installations, the 10 community-operated systems failed while nine commercially operated systems were working. According to estimates above, there are 300–600 MW of small hydropower that could be developed for community use.

A *pico-hydro system* is a small family scale generator consisting of a propeller turbine, (100–1,000 w) generator, wires and switches. It is placed in a stream or river near the home. It is estimated that about 100,000–150,000 pico-hydro systems have been sold in open markets on a commercial basis. The further potential for use of these systems is considerable.

Vietnam has good constant *solar* resources in the south and center but substantial seasonal fluctuations in the north. Solar radiation levels in the south and central regions average just below 5 kWh per m^2 and are almost constant during the year, ranging from 4.0 to 5.9 kWh per m^2. The solar regime in the north exhibits averages around 4 kWh per m^2, but has wide variation ranging from 2.4 to 5.6. Installations in the north would be more expensive as they must include extra capacity to compensate for cloudier winter months. Therefore, priority for solar development would be in the center and southern part of the country, where rural electrification is very advanced using grid extension. Vietnam has approximately 650 kW[3] or about 5,000 installed solar PV systems divided over three market segments: professional applications (50 percent), institutional systems like hospitals, community centers and battery charging centers (30 percent), and household systems (20 percent). Most of the systems installed in Vietnam are in operation and of good quality. Almost all of the panels are imported.

[3] Institute of Energy estimate.

The main *biomass* sources that can be used to generate electricity are sugarcane bagasse, cane trash, and rice husks. An estimated 2.5 million tons of bagasse (1999) and 3.8 million tons of rice husks (1996) are available.[4] Most of the 43 existing sugar mills are located from Da Nang southward. Only three sugar mills supply power to the grid. The accumulated capacity of larger industrial sugar mills (>1,000 cane tons per day) was expected to increase from 20,500 TCD in 1997 to 98,000 TCD in 2005 according to government plans. This was to be achieved by modernization and expansion of at least seven plants and construction of 12 new ones. Initial estimates show that these modern industrial mills could generate about 120 MW of excess power that could be sold to the grid (an estimated 434 million kWh). The expansion of sugar mills has halted because of a current surplus of sugar. However, even without new mills, an opportunity exists as only 3 out of 43 facilities sell electricity to EVN. There is substantial scope for updating the technology and creating excess generation. Production of electricity from rice husks is also an important but untapped resource.

With more than 3,000 km of seashore and 70 percent of the country mountainous, there is likely to be potential for *wind* power. The potential cannot be quantified as no systematic wind resource measurements are available. The limited data show averages recorded of about 5 m/s (at a 10-meter height). Potential is indicated by the results of a macro wind mapping study of the Indochina region, showing several pockets of wind speeds higher than 6 m/s, in the mountainous areas that border Laos, coastal provinces south of Da Nang and north of HCM City.[5] While there are no grid-connected wind energy systems in Vietnam, there have been government supported household scale pilot projects and research and development.

No information is available about the *geothermal* resource potential in Vietnam. One developer has estimated that about 200 MW is available in Central Vietnam. Based on their initial assessment they are pursuing a prefeasibility study for three plants generating at least 50 MW of power. Six sites have been identified with total potential capacity estimated at about 100 MW.

International Assistance for renewable electricity development has been provided to the GOV by many international agencies, which have shown strong interest in this area. The World Bank Group has supported the following activities.

- REAP. Background studies included creation of a data base on more than 1,100 communes that will not be electrified by EVN in the next five years;[6] a feasibility study for individual systems for households and institutions; a feasibility study for community isolated hydro grids; an institutional and policy background study; and a techno-economic analysis of renewable energy options, based on the site specific commune data base.
- Renewable Energy activities as part of the preparation of the Rural Energy 1 Project included a commune based micro-hydro-diesel pilot project in Son La Province; identification of an investment pipeline of 15 projects to rehabilitate grid connected hydro facilities; development of an SPPA and tariff; and a visit of Vietnamese stakeholders to village hydro, solar and grid connected renewable projects in Sri Lanka.
- Projects with support from IFC and Trust Funds including and IFC support for a commercial solar company (SELCO) that is selling PV systems; preparation of a Master Plan for Rural Electrification (Denmark); preparation of an investment pipeline for new small hydro sites (New Zealand); preparation of a macro level wind resource map for the Indochina region (Netherlands); renewable

[4] *Ibid.*

[5] Truewind Solutions. 2001. *Wind Resource Atlas of Southeast Asia.* Consultant report to World Bank.

[6] Data includes population, number of households, per capita income, village spacing, access to seasonal road, perennial road, health center, school, market, and small hydro potential.

energy training and awareness material for communes (Netherlands); investment and business plan for micro hydro manufacturing business (Switzerland).

Japan is providing assistance for renewable energy activities including a demonstration project of a hybrid system of PV micro-hydro-power through the New Energy and Industrial Technology Development Organization (NEDO); and preparation of a rural electrification plan for 17 provinces in the north through the use of renewable resources, such as micro-hydro, solar or wind energy (JICA).

Sweden (SIDA) has provided support for a Regional Research and Dissemination Program on Renewable Energy Technology for Asia to promote dissemination of technologies through adaptation to local conditions. This program is coordinated by the Asian Institute of Technology and implemented by research agencies in 6 countries. SIDA will consider rural electrification using renewable energy technologies in their assistance program during 2001–2003.

Other renewable energy research and development projects have been supported by agencies of Denmark, Finland, France, Germany, China, Japan, Netherlands, Sweden, and Switzerland. While these projects all contribute to national experience, there has been little synergy among the activities.

Barriers to Renewable Energy Development in Vietnam

Despite ongoing work, considerable barriers and challenges to developing renewable energy in Vietnam remain. The main barriers to renewable energy development are given below. [7]

- Policy. While there is interest in renewable energy, there has been little national-level commitment or integrated planning. An important start has been made in the Rural Electrification Policy adopted by MoI, which states that "rural electricity supply will be based on both grid and off-grid systems" and aims to encourage diversification of ownership and private sector involvement. Nevertheless, regulations and procedures are required to allow businesses to supply renewable electricity for rural electrification and grid support on a commercial basis. For rural electrification, a mechanism is required to channel an appropriate subsidy to rural communities.
- Awareness. There is insufficient information available about the technologies, their costs and effectiveness, for the potential investors in grid-connected plants, community and household systems, for financing agencies, and for GOV officials at all levels.[8]
- Commercial capability. There are few commercial businesses to provide renewable electricity equipment and services. Most projects to date have been small scale demonstrations, carried out using experts at local research or technical institutes. Only Chinese made pico-hydro systems are sold and supported through a fully commercial retail network, in Northern Vietnam. Business capability and the environment for doing business in Vietnam are still developing, in the transition from the socialist economy. More transparent business licensing, regulation and procedures are needed. Publicly and privately owned businesses need to be treated equally with respect to project approvals and access to financing from banks. Import duties on equipment need to be reduced, e.g. for PV.
- Financing. Credit is required for many of the small and medium companies that might be renewable energy suppliers. Long-term financing is needed for community mini-grids and developers of grid-connected projects. For solar PV household units, there are affordability issues because of the low income of not-to-be electrified households. Lower cost systems and consumer credit on attractive terms are needed.

[7] See "*Options for Renewable Energy in Vietnam*, ESMAP Technical Report 001. A report on a two day participatory workshop held during preparation of the Renewable Energy Action Plan.

[8] A start has been made on making this information through a project called RERID (renewable energy training material to be used under the WB supported Commune-based Rural Infrastructure Project)

- High quality technology. Pico-hydro and small hydro generators and controls are of lesser quality than systems available internationally, leading to less than optimal performance. Import of high quality equipment or the introduction of joint venture investment to improve local quality of equipment is needed to support a major program.[9]
- Resource data. An important start was made in collecting data during the preparation of the Renewable Energy Action Plan described below, especially in defining communes that are not to be electrified by EVN and collecting existing data on small hydropower. Nevertheless, much remains to be done. For small hydro, a number of sites have been identified, but the level of detail of sites on the size range <1MW is not adequate for planning a detailed program. Data is scant and inconsistent for wind and solar energy.

Broad Development Goals

To address these barriers, and help realize Vietnam's renewable energy potential, the Renewable Energy Action Plan (REAP) has been adopted by the Ministry of Industry (MoI), which has also taken responsibility for coordination of its implementation. The REAP, developed jointly by EVN, MoI and the World Bank, provides a framework for international assistance to scale up renewable electricity development in Vietnam for rural electrification and grid supply. It focuses on those opportunities where renewable energy is the most cost-effective—supply of electricity to remote areas. The REAP proposes a 10-year program with 2 phases: Phase 1, an institutional and capacity building phase, and Phase 2, an implementation phase.

The scale of investment activities proposed in Phase 1 is modest. Phase 1 aims to build, step by step, awareness, demand and capability. The activities would primarily demonstrate business models and create the necessary awareness, confidence and capacities to carry out a larger program in Phase 2. The proposed SEER Project will support Phase 1 of the REAP. A future project, Rural Energy 2 (FY04), is already proposed by the GOV and the Bank to support scaling up and expanding activities in Phase 2 of the REAP.

The goal of the REAP is that renewable energy will provide electricity for economic and social development in remote areas by (a) supplying isolated households and communities that cannot be reached economically by the grid; and (b) augmenting grid supply in remote areas. Private and public sector companies, as well as nongovernmental organizations (NGOs), will supply cost-effective, reliable renewable electricity equipment and services, on a commercial basis, to households and communities.

The REAP program will follow six strategic principles:

(a) *Renewable electricity will be used when it is least cost and economically viable.* There are two areas where decentralized renewable electricity systems are cost-effective in Vietnam:

- To provide electricity services to remote consumers who will not be reached by extension of the grid. These include households in communes too far away to be reached by the grid, or households in electrified communes that cannot be economically connected.
- To augment electricity supply to the grid, especially in outlying areas. This will help improve grid stability and reduce transmission losses, increasingly important considerations as the grid network expands.

(b) *Renewable electricity will be supplied on a commercial basis, by all types of businesses.* Renewable electricity equipment and services will be supplied by a variety of private and public sector

[9] A start has been made on this through twinning of a Swiss company with Renewable Energy Research Center

companies, cooperatives and NGOs, on a commercial basis. The new Company Law issued in 2000 is supportive of companies, but the program will also build on Vietnam's strong base of local community electricity units and cooperatives. The private sector will be encouraged.

(c) *Communities, individual consumers and investors will actively contribute to and participate in the program.* All stakeholders will participate actively in program design and implementation and invest their own funds in the proposed activities and installations. The government and international agencies will contribute, but there must be a concept of local community and investor cost sharing, ownership and participation in the choice of technology and management approach.

(d) *Government will act as a market enabler*. Building on the principles in MoI's Rural Electrification Policy, GOV will issue policies and establish the legislation and regulation to support commercial development of renewable electricity. Government assistance will be provided for capacity building in design, engineering, business and finance to support the renewable energy sector and management of the renewable facilities in rural communities. The Government will play an important role in assuring quality and safety, as well as increasing awareness.

(e) *Access to long-term credit will be increased to improve financial viability of businesses and affordability of services*. Financing will be needed by renewable energy businesses for investment in facilities and distribution networks and for working capital. The program will facilitate provision of credit by commercial banks, so that they gain experience with the renewable electricity business and take it on it's financing as a normal activity. REAP will facilitate access to credit for individual households to purchase systems or for communities or developers to finance larger scale plants.

(f) *Limited grant assistance will be provided in recognition of the social and environmental benefits, but will be used carefully*. Grant funding is needed to build the capacity for large-scale renewable electricity development in government, business and communities. Grant funding is also needed to buy down the costs of preinvestment activities and, and to some extent, renewable electricity facilities for rural electrification. For grid-connected investment, an effective role for subsidy or grant funds is to cover higher risk preinvestment costs, such as feasibility and prefeasibility studies, information collection, resource assessment, training and capacity building. For off-grid facilities, consideration will be given to subsidizing part of the capital costs of the facilities, as is now done with grid extension. Grants will be sought from the GEF and others for global environmental benefits, and from the GOV and international agencies for local social and environmental benefits.

Based on a series of consulting studies, and consultations (see Attachment 1), the REAP proposes five major areas of activity. The SEER Project will support four of them, as shown in the matrix below. The fifth, individual systems, will be supported in future programs, after work in the SEER has been completed to develop and demonstrate an improved pico-hydro systems, after experience is gained from SELCO's ongoing solar home system project.

Table 2: Overlap of REAP Phase 1 and SEER Renewables Component

REAP Component Supported	**SEER 2(ii) Small Hydro Rehabilitation**	**SEER 2(III) Community Hydro Grids**	**SEER 3 (iii) Strengthen Capacity for Renewable Energy**		
			Program Management	Small Power Producers	Technology/Market Development
Policy and Institutional Development			X		
Individual Household and Institutional Systems					
Community Isolated hydro		X			

grids					
Renewable Electricity for Grid Supply	X			X	
Renewable Energy Assessment and Technology Improvement					X

Support for the REAP is also being sought by MoI from other international agencies. The Japanese government and SIDA have indicated interest in financing rural electrification projects under the REAP, possibly even during Phase 1. During preparation of the REAP, several meetings were held with a broad range of donors.

Global Objective

The global objective of the proposed renewable energy components of the SEER Project is to contribute to reduction in greenhouse gas emissions by promoting the use of power generation – both grid connected and off-grid – using small scale renewable energy resources. The renewable energy sub-components of the SEER are consistent with GEF Climate Change Operational Program 6: Promoting the adoption of renewable energy by removing barriers and reducing implementation costs.

The renewable energy component of the SEER Project represents the World Bank/GEF contribution to Phase 1 of the REAP, described above. The development of the Renewable Energy Action Plan, its adoption by MoI and MoI's decision to coordinate the implementation of the Plan provide an unusually solid framework for this project. The activities would primarily demonstrate models (Remote Area Renewable Electricity Fund) and create the necessary environment, confidence and capacities to carry out a larger program. The Bank already envisages support to this larger Program in the proposed Rural Energy 2 Project (FY04). Other donors, especially Japan and SIDA have indicated interest.

Baseline and Incremental Barrier Removal Activities by Component

This section describes both the baseline case as well as the proposed GEF incremental alternative. In all cases, the Incremental GEF Alternative will be *in addition to* the baseline, so that the baseline would proceed with or without the Incremental GEF Alternative. Where appropriate in the discussion below, the Incremental GEF alternative includes a discussion of both the IDA and GEF financed activities. This format underscores the fact that the prospect of GEF investment has catalyzed IDA involvement, and that the combined GEF/IDA financing is a primary ingredient in Government's confidence that the REAP program can succeed. For this reason, the programmatic development of renewable energy as envisioned by the REAP would be very unlikely to occur without GEF support. Only the renewable energy components of the SEER Project are described here.

SEER Project Component 2 (ii) - Rehabilitation of Small Hydro Plants (Total $5.5 million; GEF-TA: $0.5 million; Investment $5 million of which IDA $4.5 million)

Baseline

In the baseline case EVN's existing small hydro facilities which currently are out of service or operating inefficiently would remain so. Moreover, currently functioning hydro stations would continue to decline from weak maintenance practices. Some small efforts to develop small-scale power purchase agreements would probably be undertaken, totaling about $0.05 million over the Phase 1 period.

A steady decline in operational renewable energy capacity, coupled with an increasing penetration of fossil fired generation, would result in an overall increase in greenhouse gas emissions from Vietnam's power sector.

GEF Incremental Alternative

The physical investment, which will be supported by IDA and EVN will consist of rehabilitation of mini-hydro facilities. A recently concluded appraisal of 30 existing, small hydro plants identified 13 plants that could be rehabilitated. Based on economic life cycle costs compared to avoided cost of conventional generation, all 13 projects have economic rates of return above the threshold of the World Bank's 10 percent hurdle rate, and a majority of these plants have EIRRs greater than 30 percent (see Table 3). The aggregate capacity of these 13 plants is estimated to be around 25 MW, and the total investment cost would be about VND 160 billion (US$11.5 million).

Under the SEER Project, EVN will rehabilitate 12.4 MW of these plants (Thac Bay, Chieng Ngam, Kon Dao, An Diem, and An Kroet) to increase their capacity to 15.4 MW, and extend the existing plant life by 8-12 years. This will result in additional lifetime generation of 752 GWh, and avoided emissions of 189,140 tonnes of carbon.

Management of these systems is particularly difficult for EVN. The sites are in remote areas and retention of staff is difficult. Therefore EVN will consider alternate management methods that give greater incentives to operators and managers to ensure that these plants do run optimally. Options include performance-based Management and Operations Contracts or some form of revenue sharing contracts. In the future, EVN may wish to divest themselves of these small plants through equitization.

Table 3: Characteristics of Grid Connected Mini-Hydro Rehabilitation Projects

Project	Province	Capacity after Rehab(kW)	Estimated Cost		EIRR (%)
			Billion VND	Million US$	
Ban Thach	Thanh Hoa	1,000	26	1.9	13.1
Thac Bay	Lai Chau	2,800	7	0.5	63.5
Chieng Ngam	Son La	2,000	22	1.6	33.2
Thac Ba	Gia Lai	300	1	0.1	33.3
Iadrang 2	Gia Lai	1,200	4	0.3	42.4
Kon Dao	Kon Tum	600	5	0.4	24.2
Phu Ninh	Quang Nam	1,760	4	0.3	47.2
Am Diem	Quang Nam	5,640	3	0.2	111.4
Nam Suu	Ha Giang	500	13	0.90	13.5
Viet Lam	Ha Giang	800	11	0.8	17.5
Nam Ma	Ha Giang	3,600	24	1.7	46.7
Thac Thuy	Ha Giang	850	13	0.9	10.8
An Kroet	Lam Dong	4,400	27	1.9	39.0
Total		25,450	160	11.5	

Source: Fichtner and Colenco 2000

Capacity building, for which GEF resources are requested, would involve retaining an international consulting firm to strengthen small hydro capabilities of local power companies under EVN. The Power Engineering and Construction Companies under EVN have adequate capacity to renovate small hydro plants. They can specify the requirements, prepare bid documents, assist EVN in tendering and in construction supervision. It would however be useful to strengthen their capabilities through hands-on training by a consulting team knowledgeable about the advances taking place in small hydro technologies; experienced in environmental and social assessment and mitigation of problems; application of new performance-based contracting methods and new construction management and supervision techniques; and small generation systems control and management. This TA would also assist EVN to equitize these plants if requested.

GEF Incremental Cost
The estimated cost for the Incremental GEF Alternative is $5.5 million of which $0.5 would be from GEF, $4.5 million from IDA, and $0.5 million from EVN.

Incremental Benefit
The domestic benefits of this activity will be the rehabilitation of about 15.4 MW of hydro capacity. The rehabilitated capacity would displace the current marginal generating capacity, which is largely composed of diesel systems. These hydro stations can be expected to displace about 752 TWh of thermal electricity and 189,140 tonnes of carbon over the lifetime of the facilities.

SEER Project Component 2 (iii) - Community Based Hybrid Renewable Energy Grids *(Total $5.0 million; GEF-TA: $1 million; Investment $4.1 million of which $3.6 million IDA; implemented by MoI)*

Baseline
In the absence of GEF support, the Government would continue to aggressively pursue its rural electrification program with World Bank support. However, despite a genuine interest on the part of Government planners to accelerate renewable energy development, this goal would remain largely un-addressed due to a severe lack of capacity for removing the barriers described above. As a result, the Government's rural electrification program would follow a "business as usual" trend, featuring conventional grid extension energized by a generation portfolio increasingly dominated by fossil-fired thermal systems. Renewable energy systems would remain largely un-developed. Most villages too far from the main grid would remain unserved in the near-term. A few 'off-grid' villages, would see 'spontaneous' electrification systems installed by enterprising residents. Such systems are generally characterized by inadequate designs with insufficient safety measures and high losses, and are based predominantly on diesel generators, owing to their significantly lower capital cost in comparison to micro-hydro. Operation of these diesel-based systems would remain problematic due to high maintenance requirements including the cost and availability of fuel and other variable cost components (oil, filters, overhauls, etc.).

However, some renewable energy activity would continue in the absence of GEF, through the continuing support of bilateral donors. This would mostly be in the form of investments for small independent grids based on renewable energy, mostly small hydro. It is assumed that investments in such schemes would total about $0.5 million over the Phase 1 period. In the past, these systems received support for the capital investments, but frequently left the ownership in question, and established inadequate arrangements for operation and maintenance. The baseline case, therefore, would continue the poor track record of these systems, which quickly fall into disrepair and are abandoned by the "beneficiary" village. The village is not only left with a failed project, but its confidence in renewable energy solutions also is seriously undermined. Efforts to systematically address the key barriers to renewable energy development described above would be minimal

GEF Incremental Alternative
EVN has already done detailed rural electrification planning, on a site specific basis, and identified more than 1000 communities that will not be electrified by the grid in the next 5 years. The vast majority of these not-to-be electrified by the grid communities are in mountainous Northern Vietnam. An economic analysis was conducted, using site specific data, to determine the most economically viable means of providing electricity to these communities.[10] The analysis showed that among the mini-grid options, only hydro, hydro/diesel hybrids and diesel community grids were economically viable.

[10] ENTEC, 2000, REAP Package C, *Techno-economic Analysis*

A feasibility study identified about 25 communes with conditions suitable for commune hydro/hybrid development in 5 provinces.[11] For the community-based hydro/hybrid grids, financial and economic evaluations were carried out for 8 representative communes, with small productive loads. The results indicate an EIRR between 10 and 17%.[12] Analysis also confirmed that the community-scale hydro-based systems are lower cost options than either grid extension or diesel generation. However, the analysis showed that without productive load during daytime it is not justifiable to install a hydro-based commune electricity system for a typical Vietnamese commune. Without productive load, the cost for providing electricity for would be US$610 per household on a life cycle cost basis, which is substantially higher than the US$450 per household for a solar PV system or even a diesel based commune system. If small productive loads are available, this picture changes. The hydro-based isolated system would be the least cost option (levelized life-cycle cost of US$770 compared to US$1,100 for grid extension, and US$1,310 for an isolated diesel).

In the SEER project, about twenty communes (in 1-4 provinces) would receive grant assistance to design, build and operate renewable energy based mini-grids (e.g. hydro or hydro/diesel hybrid) to provide year round power to the community (serving about 10,000 households in total). To be eligible, the proposed communes should be too remote to be connected to the national grid, have potential productive loads and be supported explicitly by the community and the province. Communes with existing micro-hydro grids that are not functioning may also be proposed. Assistance would be provided to design, implement, train and support the development of community cooperative or mini-utility businesses, which would operate and maintain the grids, as well as to stimulate income generating activities and productive loads in the communities, which are considered to be critical. Both the commune and the provincial leadership will be required to demonstrate their support and commitment to the project.

Implementation of the pilot project would be coordinated and supervised by Project Management Board at MoI, at national level. A Remote Area Renewable Electricity (RARE) Fund would be set up to provide grants to the 20 communes selected for the pilot project. The commune mini-grids in each province would be implemented under the Provincial People's Committee (PPC), by a RARE Project Management Unit, which will provide assistance to the communities to develop proposals to the fund, construct the facility, set up management and provide technical support.

The community would be required to form a commune committee that would assist in the feasibility study, seek local support and apply to the fund on its behalf. If successful in obtaining the grant, a commune cooperative or joint stock company would be formed to operate and maintain the facility and collect tariffs sufficient to pay the operation and maintenance expenses as well as the leasing fee for the facility. It is expected that the commune cooperative would own the facility after 20 years based on a leasing fee that it would pay to the provincial RARE fund. Electricity users would pay a tariff sufficient to cover operation and maintenance costs plus leasing fee.[13]

MoI is now conducting a selection process to identify those provinces that would actively participate in and contribute to such a program, and to identify appropriate institutional models for supporting the communities in operating such grids (e.g. mini-utilities, support contracted to PECCs or HPC). A pilot activity is also being carried out by PECC1 and consultants to identify an appropriate institutional model for

[11] Meritec. 2000a. REAP Package E: *Feasibility Study of a Program to Develop and/or Rehabilitate Community- Scale Hydro-Based Mini Grids*. Consultant Report for EVN, Hanoi

[12] See *Renewable Energy Action Plan*, section B3.

[13] It has been estimated, based on the Hua Peng project, that the electricity tariffs would range from 700-1500 dongs/kWh and the annual leasing fee may be of the order of 14-20 million dongs.

operating a rehabilitated micro-hydro-diesel power plant, at Hau Pang.[14] MoI will supervise work by consultants to assist the provinces to mobilize the communities, raise awareness, promote productive loads and standardize designs and bid documents. There will be training for both mini-utilities/ cooperatives and for the project management support group on technology options, management, operation and maintenance, business plan preparation and assessment, etc. This sub-component will be coordinated with other donors, especially Japan and Sweden, that have indicated interest in joining the effort.

The physical investments, supported by IDA and the Government, will be carried out through the following activities:
Survey, investigation, detailed design of the schemes will be carried in close consultation with each Commune Electrification Committee. Environmental, social, land acquisition and resettlement aspects will be considered. Labor and materials will be provided as a community contribution to project construction, including clearance of vegetation; excavation of trenches for the penstock pipe; building platforms for the powerhouse; poles. Procurement, construction, supervision of installation and commissioning of each scheme or system will be carried out

The TA activities, for which GEF support is being sought are:
GEF support is being sought to assist MoI, provincial and district authorities with the management of the fund, including:

Fund Management This will include development and use of transparent procedures to appraise applications for the grant, pay the grant to the community, and receive the annual leasing fund from the community Assistance will be provided to ensure that financial and fiduciary responsibilities are fully met. An important additional activity will be publicizing the program and soliciting additional funds from other donor agencies.

Community Mobilization and Support. A community mobilization program will be undertaken in likely communes, to assist the community to understand the concept and build the organizational capacity required. The communes will be offered assistance to prepare business plans, and the opportunity to bid for grant funds. The business plans will demonstrate that the proposed tariff would meet requirements for operations and maintenance, plus an annual leasing fee to be paid to the RARE Fund. It is planned that at least 60 percent of the consumers in the commune must agree in writing to take electricity supply, pay the connection charge, pay the utility for electricity consumed and provide the agreed quantities of labor and materials for project implementation.

Particular attention will be paid to defining management responsibilities at commune and provincial levels, operations and maintenance frameworks, technical and safety specifications (see O&M requirements below), and monitoring and evaluation of performance, costs and benefits. Lack of post-implementation service and support has been a common contributor to failure of micro-hydro systems in the past. Accordingly, intensive O&M training and support will be provided during commissioning (when it will be most effective). Access to management and technical advice and support will be provided during operation.

Productive Uses Promotion. A productive uses promotion program will be carried out in each commune, in conjunction with the community mobilization program. The aim of the program will be to identify and assist in the establishment of income generating uses that consume electricity during the daylight hours and do not contribute to the evening peak load. The productive uses are likely to be agricultural processing,

[14] Meritec. 200a. *Turn-key Micro Hydro-Diesel Hybrid and Battery Charging Station Pilot Project.* Consultant Report for EVN. Hanoi.

timber working, water pumping, battery charging and refrigeration, including replacement of diesel-powered processes with electric motors.

Monitoring and Evaluation (M&E). The M&E program will monitor and evaluate the social and economic benefits as well as the physical implementation, performance, O&M of the program throughout the SEER project period.

Incremental Cost
The estimated cost of the GEF Incremental Alternative is $5.0 million, of which $1 million would come from GEF, $3.6 million from IDA, and $0.4 million from the beneficiary community.

Incremental Benefit
Domestic benefits of this program are expected to be significant. These will include electrification of about 10,000 households using renewable-energy-powered grids at about 20 sites with an aggregate capacity of about 2 MW. The capacity building activities, financed with GEF support, will greatly enhance the sustainability of these investments, providing a solid basis for future expansion of the activities in Phase 2 of REAP.

Direct global benefits of this investment will be the displacement of kerosene lighting and diesel/grid charging of automotive batteries for radio and television use, as well as reduction in diesel use for commercial operation of small diesels used for rice milling, etc.. This is estimated at 19,200 – 30,000 tonnes for the program over the expected 20 year life of the mini-hydro investments.

More significant, however, are the demonstration effects that this program will have on justifying Phase 2, which is targeting service to 80-140,000 households. If the program is successful in attracting additional donor support, this could be expanded to about 350,000 households. Also, this program will provide an important model for village level renewable energy based mini-grid development, being among the first to incorporate this rural electrification approach into its rural electrification program. Therefore, the replication potential for this model should also be counted as a significant global benefit.

SEER Project Component 3(iii) Strengthening Regulation, Planning, and Implementation Capacity for Renewable Energy *(Total $3.5 million of which GEF-TA $3 million, GOV $0.5 million)*

The Policy and Institutional Development Component will provide TA to make recommendations to develop policy instruments, regulations, strengthen institutional capacity in renewable energy program development based on the REAP, and mobilize resources from donors and elsewhere, especially within the first two years of the program. It will build on recently introduced policy and regulatory measures, especially the Rural Electrification Policy.

Baseline
In the absence of GEF support, the Government would still make some efforts toward strengthening regulations, planning, and implementation capacity for renewable energy development, primarily with donor support. However, the modest level of such support, which can be expected to amount to no more than $100,000 in Government and bilateral funds over the project period, would not attract the public and private sector visibility and commitment which the proposed GEF/IDA-supported operation has. As a result, the impact that such investments might gain in terms of progress toward barrier removal would be small in the absence of GEF support, and the necessary enabling environment would not be put in place. Moreover, there would be virtually no support provided to potential non-utility producers. With regard to pico-hydro technology development, the baseline scenario would see continued reliance on poor quality Chinese turbines, with their associated safety, efficiency, and economic issues.

GEF Incremental Alternative
The proposed institution building program described below is comprised of a suite of coordinated capacity building activities, which will complement the rural access activities and lay the groundwork for the significant scale-up in Phase 2 of the REAP.

SEER Project Component 3(iii) (a) - Renewable Energy Program Management Support *(Total: $2.0 million, GEF-TA $1.5 million)*

The activities supported in this subcomponent are:

Assistance in Development of Policy Instruments, Decrees and Regulations.

The Rural Electrification Policy states MoI's intention to support development of renewable electricity for off-grid rural electrification and for grid supply. It is necessary to develop a number of instruments to implement this intention. This TA activity will assist MoI in developing the necessary instruments, which will build on activities already underway.

Government has an important role to play in creating an enabling environment, because the marketplace does not recognize fully the environmental and social benefits of renewable electricity. As with rural electrification, the government must facilitate investment in renewable electricity in a number of ways. Examples of key policy and regulatory requirements include decrees and regulations, which would set out the following:

Rural Electrification
- rights and responsibilities of national and local governments, service providers, communities, individuals with respect to rural electrification using renewable electricity;
- methodology for determining when renewable electricity is least cost;
- institutional models for community service provision and appropriate regulations developed for their operation;
- appropriate source, level, amount and mechanism for government subsidy of rural electrification with renewable electricity, for community grids and individual systems;
- appropriate design and quality standards and enforcement mechanisms for service, safety and reliability.

Nonutility Renewable Power Generation
- rights and responsibilities of governments, power companies, and project developers, owners and operators with respect to nonutility renewable electricity generation;
- regulatory review and adjudication of the SPPA and tariff, so that implementation is satisfactory to both EVN and developers;
- a procedure for setting the tariff that recognizes avoided capacity, energy and T and D costs;
- targets for purchase of nonutility renewable electricity;
- appropriate design and quality standards and enforcement mechanisms for service, safety and reliability.

Strengthening Capacity for Implementation. Since the national and provincial power development and rural electrification plans have to be approved by MoI, MoI and the PPCs will coordinate planning for grid-connected and off-grid electricity supply. For rural electrification, MoI needs to ensure that the PPCs that have responsibility for planning rural electrification consider all least cost options prior to rural electrification network planning not only grid options. Since off-grid services would not be provided by

EVN, it is important that planning be conducted in close cooperation with off-grid and isolated grid service providers. This cooperation occurred during preparation of the REAP where EVN shared data on communes to be electrified.

Assistance will be provided to MoI for the following:

- targeted awareness creation and training of government officials (including MPI, MoI and EVN), the business and financial community, and the public about renewable electricity;
- simplifying approval procedures and ensuring that private and public sector companies are treated equally; and
- helping the PPCs to carry out their task of planning renewable electricity provision as part of their rural electrification plans;
- support for a Program Management Unit to assist in implementing the REAP.

SEER Project Component 3(iii) (b) – Small Power Producers *(TA $1.0 million GEF)*

The capacity has to be built in Vietnam to facilitate development of nonutility markets for small renewable energy power generation projects. To this end, project-funded consultants will be retained to address the following issues:

- Advise EVN on purchasing power under the SPPA;
- Assist MoI in packaging identified mini-hydro and other projects as BOO projects, designing award procedures, and offering sites to interested developers;
- Help sugar production and rice milling associations, as well as the responsible government agencies, to inform and encourage their members to participate in the small power producer program;
- Facilitate contacts between potential project developers, equipment suppliers, engineering service providers, financiers, MoI and EVN and conduct information dissemination;
- Provide matching grant funding to interested renewable energy small power project developers to assist in preinvestment activities;
- Provide business development services to developers to support preparation of conceptual designs, hardware specifications, financial analysis, financing plans, environmental and social assessment and compliance reporting, business planning, and attracting the necessary financing; and
- Help developers to prepare projects for support from clean energy funds, such as the PCF or the CDM

A consultant team is expected to have significant participation of national experts. International experts would be used primarily in an advisory capacity. During the course of this assignment, the national experts will work alongside and in partnership with international experts and thereby strengthen local expertise and capabilities in small power development. When this assignment ends, there will be a substantially improved capability in-country to continue provision of small power development assistance. This approach has been proven to be effective in other countries

SEER Project Component 3(iii) (c) - Technology/Market Development *(TA GEF $0.5 million)*

Activities will be developed during preparation, but indicative activities are especially focused on the individual system market not addressed in the above sub-components:

- Technology improvement to improve quality of locally manufactured products, especially pico-hydro systems.
- Market and technology information collection and dissemination, especially for pico-hydro and solar PV systems.
- Resource measurement and assessment, especially for wind.

GEF Incremental Cost
The cost of the Incremental GEF Alternative is estimated at $1.5 million for Subcomponent 3, $1.0 million for Subcomponent 2, and $0.5 million for Subcomponent 5.

Incremental Benefits
The domestic benefits of these activities will primarily be in the establishment of a suitable environment for non-utility development of small-scale renewable energy, including the private sector. This will include establishment of an enabling policy/regulatory policy, as well as development of functional channels for resource and technology information, the local availability of expertise for developing and implementing renewable energy investments, and access to suitable financing for the investors, as well as their customers who may need to borrow in order to take full advantage of the newly available electricity. In addition, the support for pico-hydro technology development will provide a much-needed improvement in the performance of these units, which will contribute to quality of life improvements as well as potentially to economic development through cottage industries. The program seeks to create a mindset in both public and private sector that small-scale renewable energy investments can make a valuable contribution to Vietnam's least cost capacity expansion plan. Due to an inherently low variability in their operating costs, these renewable energy investments also will help to stabilize electricity generation costs. However, the current nascent state of such private participation and the long lead times needed for the initial projects suggests that there is unlikely to be any significant investment brought to financial closure during the project period. Instead, the project will seek to create a pipeline of investments for development in REAP Phase 2. Pipeline development will extend beyond mini-hydro, to include biomass and possibly also wind if exploitable resources are confirmed.

Global carbon reduction benefits will accrue as the private sector becomes active in small-scale renewable energy provision.

Sustainability
The SEER Project is expected to contribute significantly to the sustainable development and use of renewable energy in Vietnam. Critical elements of the enabling environment, as described in Table 3 below, will be established and be made functional. It should be noted however, that the SEER Project alone cannot be expected to complete the task of creating a sustainable renewable energy program in Vietnam. Some key barriers, such as improvements in the overall business environment, assuring that good projects have access to credit through local financing institutions, and EVN's full acceptance of small-scale non-utility generators, will take longer than the SEER Project duration to resolve. Therefore it is expected that a follow-on operation will be needed to solidify the gains of the SEER Project and expand the impact through significant scale-up as part of Phase 2 of the REAP.

The GOV and World Bank have already indicated their commitment to this scale-up effort, through the proposed Rural Energy 2 Project (FY04). Under this project, it is planned to expand the remote area commune-based renewable grids to cover the remaining communes (estimated up to 300), that cannot be connected by the grid to the year 2010. MoI is also tapping the interest of other donors in renewable energy, to support the REAP. SIDA and JICA have already expressed interest in supporting the framework, especially for renewable electricity for independent community systems.

The approach of the REAP, developing a longterm framework for international assistance to renewables, is considered to be very replicable to other countries. Cambodia is already following this model. The expectation of support from the GEF/IDA was an important contributor to the willingness of GOV to adopt the REAP.

Table 4: Incremental Cost of SEER Renewables Components

	Baseline	GEF Incremental Alternative	Increment

Domestic Benefits	HH in "not to be electrified" areas will remain unserved except for some isolated bilaterally funded hydro grids – these are not sustainable due to lack of sustained support to the community 26 MW of EVN-owned small hydros remain off-line or under capacity. Additional unmeasured "fragile" EVN hydro capacity goes off-line due to inadequate maintenance. Independent Power Producers begin to penetrate market, with largely fossil based systems. Renewable energy IPP's limited to the three currently connected sugar mills. Barriers to renewable energy development remain largely un-addressed	RARE Fund established to mobilize and support communities in operating community based hydro grids. Productive uses supported with associated economic benefits Existing EVN hydro capacity remains on-line, "fragile" systems restored to more robust working order, 5 mini-hydro plants, totaling 20 MW rehabilitated Groundwork laid for Independent Power Renewable Energy Production. Initial investments expected in Phase 2 period, with some possibility of Phase 1 investments. Significant progress in addressing renewable energy barrier removal	10,000 hh served through independent hydro powered grids in 20 communes Basis laid for attracting support of other donors and expansion of REAP in phase 2 Additional 20 MW of hydro capacity on-line Reliability of "fragile" capacity improved IPPs use renewable energy resources where they are least cost, helping to stabilize electricity generation costs Elements of enabling policy/regulatory framework in place Functional channel available to non-utility developers for information on renewable energy technology, resources, and market Local expertise available for developing and implementing renewable energy investments Financing channels opened for consumer, business, and developer investments in renewable energy Local manufacture of pico to small hydro equipment is improved
Global Environmental Benefits	Rural electrification relies heavily on diesel gensets for independent and off-grid applications, with marginal additions of small hydro Market for unimproved individual pico hydro plants	Increasing penetration of renewable energy usage for independent grid applications. Increased pico hydro equipment	Phase 1 target of 2MW aggregate capacity, serving 10,000 households at 20 independent grid sites. 19,200 tonnes of carbon avoided through displacement of kerosene for light and diesel for rice mills. Potential of Phase 2 scale-up established for village-based renewably-powered independent systems Potential established for replicability in other countries Higher quality equipment

	remains steady at ~40,000 per year, with high failure rate. Most customers still using kerosene for lighting and remotely-recharged automotive batteries for radio/TV. Fossil-fuel fraction of grid connected generation increases. Net reduction in rated hydro capacity on-line.	reliability and efficiency extends market as well as unit lifetime output. Pilot systems in place Net increase in rated hydro & biomass capacity on-line (at least 20 MW from EVN)	demonstrated, and market development begun. 752 GWh of fossil-fuelled generation displaced over lifetime of rehabilitated grid-connected hydro plants. 189,140 tonnes of carbon avoided
Cost by Component			
Rehabilitation of Small Hydro Plants	$0.05 million	$5.5 million	$0.5 million
Community-based Hybrid Renewable Energy Grids	$0.5 million	$5.0 million	$1.0 million
Renewable Energy Program Management	$0.1 million	$1.5 million	$1.5 million
Small Power Producers	-	$1.0 million	$1.0 million
Technology/Market Development	-	$0.5 million	$0.5 million
Total GEF Incremental Costs	$0.65 million	$14.0 million	$4.5 million
Total Carbon Avoided			208,350 – 219,140 tonnes
Average GEF Cost of Carbon Avoided			$20.50 – 21.60/tonne

Attachment 1

List of Background Studies and Activities for the Renewable Energy Action Plan

ASTAE. 2000. Options for Renewable Energy in Vietnam, a Report on the June 15-16, 1999 Two-Day Participatory Workshop, Hanoi.

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ANNEX 3

STAP Review
September 24, 2001

Vietnam System Efficiency Improvement, Equitization and Renewables (SEER)Project: Renewable Energy Sub-components

Daniel M. Kammen

Summary:

This is an ambitious project that combines traditional energy infrastructure and new, clean energy businesses, institutions, and markets. To merge these two, a clear means to integrate and foster collaboration both within the World Bank/GEF efforts, and with the many other development groups operating in Vietnam. The potential synergies are significant, such as market education and then market transformation efforts focused on solar, wind, mini/micro/pico-hydro technologies that work with the planned large scale reforms of the energy sector. The main area of concern is that sufficient indigenous alternative energy capacity can be developed in Vietnam so that these clean energy and mini-grid programs can be innovative and aggressive and not seen as the poor relative of large-scale national energy plans.

The project is recommended for support.

Major Comments:

Page 6: The commitment to local, mini-grids for rural energy services is particularly important given the large, and often remote Vietnamese population. In evaluating energy options for rural areas, a combination of quantitative (geographic and economic) evaluation criteria are important, but obviously so are the social and political forces. Rural grid analysis software, such as the HOMER and ViPOR packets developed and maintained by the U. S. National Renewable Energy Laboratory (NREL, Golden, Colorado) could be used to perform one version of this analysis. Table 1 (Incremental Cost Annex, page 2) illustrates the potential in this area, but planning and teaching tools such as the NREL software could greatly facilitate the process of exploring the wide range of hybrid energy systems that could be implemented. With so many pico-hydro systems in place, the potential exists in some areas to build mini-grids that provide greater energy security and economic opportunities for each household, and provides the basis for later integration of mini-grids with larger, regional assemblies. This second step planning for later integration can significantly change some of the technologies and grid-connection strategies selected.

Page 8: Of the deficiencies identified in the REAP for Vietnam that limit the current implementation of renewable energy technologies is commercial capacity. In several recent studies (Duke, et al, 2000; Duke, et al., 2001) the number and training of technicians, vendors, as well as importers and the more formal sector have all been shown to be critically important to the evolution of a sustainable industry. In the case of Vietnam, some small-scale importation and system sales is already taking place, but has a review been done of the current primary and secondary market human capacity? I am not aware of this having been completed. If not, it is recommended that it be added to the project appraisal plan.

Page 8 & 14ff: paragraph f. In addition to the legal and regulatory standards, consideration could be given to the potential benefits of establishing technology testing facilities to evaluate the quality and performance

of various technologies that are, and will become, available in the Vietnamese market. This need not become formal standards, but testing capacity, and an ability to make impartial assessments of systems that are both imported, and engineered and adapted locally (e.g. PV solar home systems, and micro-hydro systems) can play a major role in the quality and satisfaction with systems.

Page 12: A key feature of this planning process for scaleable energy infrastrucutre is that in a number of other nations where large-scale rural energy projects took place along side rural renewable-energy based projects, the mini-grids and other means to supply often higher quality and more reliable renewable energy were often marginalized. South Africa and Peru are both cases where large (> $100 million/year) grid extension efforts resulted in the renewable energy options being seen as 'second class' energy options even when the mini-grid/renewable energy efforts provided both secure, high quality energy and were in areas where the grid was unlikely to be extended for decades. As an example, the decades of discussion of the transmission line extension has clearly influenced regional development and infrastructure plans (England and Kammen, 1993), despite, until this project, the lack of clear resources and action to undertake this work. A number of mechanisms exist that could be relevant in the Vietnamese context, including business incubators for entrepreneurs interested in renewable energy businesses, and concessions for rural energy services.

Page 15: item (d) is particularly important. The scale of this energy sector support package for Vietnam means that a great deal will be expected in terms of improved governance and energy services in Vietnam. To make the renewable energy project component a significant component of the energy system will require a large investment in human resources and capacity. Training internships at energy companies (e.g. ELF, Shell) and in Ministries of Energy in nations where they are working well, as well at some NGOs would provide one key resource for the expansion of the energy expertise base in Vietnam to support these activities. Second, an international advisory group could play a key role in encouraging exchange with other nations and utilities undergoing similar restructuring. This group would be explicitly regional and international in contrast to the steering committee indicated on page 25.

Annex 2: Page 2: Regarding the experience with the Dong Nai community and other failed public-sector projects, it is also important to clarify the relative prices paid by families receiving services from the public and private service providers. With a loan of this magnitude, some of the problems of public projects, such as capital for system repairs and effective access to international markets, could be rectified.

Annex 2: Page 5: If economically least cost planning will be the basis of decisions on renewable energy systems it is critical that true life-cycle cost accounting will be used. The incremental cost annex does not in all cases reflect these true, life-cycle costs, without which clean energy options are placed at a financial disadvantage that benefits neither the communities or the environment.

Annex 2, page 7: megawatt hours of electricity not completed (listed as XX MWh). It is important to provide an esitmate here so that capacity factors and necessary backups (if any) can be evaluated.

Minor Comments & Clarifications:

Page 6 & 17: more efficient household lighting is not listed in paragraph (a), but should clearly be a part of the energy efficiency resources included in this package. DSM programs, such as the U. S. Green Lights initiative (Duke and Kammen, 1999) have been show to be even more effective when coupled with residential energy and lighting efficiency improvements.

Page 7 and Annex I: Performance Indicators. Energy services provided, in principle, to households often has little bearing on energy availability to poorer families, which often differentially impacts women and children. Additional means can be included to address this equity issue include special low-income grants; and targeting communities with a combination of pay-for-service as well as public-goods energy services.

Page 20: Support for renewable energy small power producers will need to also include extensive training and internship opportunities (e.g. the information base and use of the grid/hybrid simulation software mentioned above). This would need to be included in Annex 2 as well. The market development package (item 2) states this as a goal, but it was not clear on reviewing the project document or the Incremental Cost Annex where this is explicitly supported. The degree to which this fits into the Rural Energy 2 Project will be key in retaining the bestqualified individuals and groups to build the industry.

Annex 2, Page 4: with the vast array of international groups operating in Vietnam assisting in the energy sector plus this new, large program, a means to work effectively between the agencies is needed.

Annex 2, page 9: The discussion of the GEF alternative is unclear. Use of hybrid system planning tools would provide a means to estimate the savings, and thus the incremental benefit of the renewable energy GEF component.

Annex 2, page 11: the 'pump priming' or market expansion possibility of the program is not clarified. Is this through a market transformation process (e.g. Duke and Kammen, 1999) or simply a projection of sector growth?

Annex 2, Page 11: Added resources are recommended for the EER Component 3(iii) (a) Renewable Energy Program Management Support. Training courses, and seed funds for renewable energy businesses would likely have a large impact, if added to the program.

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Available online at: http://socrates.berkeley.edu/~rael/qualityshs.pdf

STAP Review

Comments and Response to STAP Review by Daniel Kammen

Summary	Response
This is an ambitious project that combines traditional energy infrastructure and new, clean energy businesses, institutions, and markets. To merge these two, a clear means to integrate and foster collaboration both within the World Bank/GEF efforts, and with the many other development groups operating in Vietnam. The potential synergies are significant, such as market education and then market transformation efforts focused on solar, wind, mini/micro/pico-hydro technologies that work with the planned large scale reforms of the energy sector. The main area of concern is that sufficient indigenous alternative energy capacity can be developed in Vietnam so that these clean energy and mini-grid programs can be innovative and aggressive and not seen as the poor relative of large-scale national energy plans.	The development of the Renewable Energy Action Plan, its adoption by MoI and MoI's decision to coordinate the implementation of the Plan provide an unusually solid framework for this project. The scale of investment activities in the project is deliberately modest. The project supports Phase 1 of the REAP, which aims to build step-by-step awareness, demand and capacity. The activities would primarily demonstrate models (Remote Area Renewable Electricity Fund) and create the necessary environment, confidence and capacities to carry out a larger program. The Bank already envisages support to this larger Program in the proposed Rural Energy 2 Project (FY04). Other donors, especially Japan and SIDA have indicated interest. However, conditions conducive to business operations are still evolving in Vietnam and it is expected that some barriers will remain to be addressed in future projects. The project and the REAP target those areas where the value of renewables is highest, which are likely to account for less than 10% of electricity consumption in future.
Major Comment	**Response**
In evaluating energy options for rural areas, a combination of quantitative (geographic and economic) evaluation criteria are important, but obviously so are the social and political forces. Rural grid analysis software, such as the HOMER and ViPOR packets developed and maintained by the U. S. National Renewable Energy Laboratory (NREL could be used to perform one version of this analysis. Planning and teaching tools such as the NREL software could greatly facilitate the process of exploring the wide range of hybrid energy systems that could be implemented. With so many pico-hydro systems in place, the potential exists in some areas to build mini-grids that provide greater energy security and economic opportunities for each household, and provides the basis for later integration of mini-grids with larger, regional assemblies. This second step, planning for later integration, can significantly change some of the technologies and grid-connection strategies selected.	EVN has already done detailed rural electrification planning, on a site specific basis, and identified more than 1000 communities that will not be electrified by the grid in the next 5 years. The vast majority of these not-to-be electrified by the grid communities are in mountainous Northern Vietnam. An economic analysis was conducted, using site specific data, to determine the most economically viable means of providing electricity to these communities. The analysis showed that among the mini-grid options, only hydro, hydro/diesel hybrids and diesel community grids were economically viable. This work would only be duplicated by using the ViPor and HOMER packages. The current pico-hydros, while widely used, are inconvenient and unsafe. Studies indicate that technical improvements are possible, and development of these will be supported under the project. The proposed community hydro/hybrid grids are expected to replace the pico-hydros, as suggested by the reviewer. The issue with the community grids is the organization and management of the grid at the community level, which has repeatedly failed in the past. The project aims to demonstrate that with appropriate business models and support, these grids can be operated sustainably. The potential for integration of the independent community hydro-grids into larger grids will be considered, but is not considered likely to change design or technology selection.
Of the deficiencies identified in the REAP for Vietnam that limit the current implementation of renewable energy technologies is commercial capacity. In several recent studies,	A review of commercial capacity for each technology was done, as part of the REAP. It showed that the only truly commercial business operation is the sale of pico-hydro equipment,

the number and training of technicians, vendors, as well as importers and the more formal sector have all been shown to be critically important to the evolution of a sustainable industry. In the case of Vietnam, some small-scale importation and system sales is already taking place, but has a review been done of the current primary and secondary market human capacity? I am not aware of this having been completed. If not, it is recommended that it be added to the project appraisal plan.	imported from China, through retail markets in Northern Vietnam. Other than this, there is some technical capacity related to each technology in a variety of research and educational institutions, and a few commercial operations such as that of SELCO in selling a small volume of solar home systems, using the Vietnamese Women's Union network. Most of the renewables projects in Vietnam have been very small scale research and demonstration projects, or studies. Commercial capability needs to be built from the ground up, in a country where there is a shortage of business capability in all sectors and an environment that is only beginning to open to private business. This is why the scale of the activities proposed is so limited. The project focuses on capacity building in the expectation of an improved business environment. Text will be added to the barrier sections of the text to clarify the current lack of commercial capability.
Consideration could be given to the potential benefits of establishing technology testing facilities to evaluate the quality and performance of various technologies that are, and will become, available in the Vietnamese market. This need not become formal standards, but testing capacity, and an ability to make impartial assessments of systems that are both imported, and engineered and adapted locally (e.g. PV solar home systems, and micro-hydro systems) can play a major role in the quality and satisfaction with systems.	Setting up testing facilities requires an adequate demand for the services, as people must be trained and equipment purchased. If there is not enough demand, testing facilities will fail and skills will fall into disuse. Given the relatively small scale of activities underway and planned (including all Vietnamese and donor agencies), it is considered better to begin by using testing facilities in the region. Development of local testing capability could be included in activities carried out as Phase 2 of the REAP, after the scale of activity has increased to justify this.
A number of mechanisms exist that could be relevant in the Vietnamese context, including business incubators for entrepreneurs interested in renewable energy businesses, and concessions for rural energy services.	Support for development of businesses is included in Component 3 (iii) b and c. The commune hydros are essentially concessions. Private sector concessions could be considered in future as both the capacity for regulation and the capacity of the private sector increases.
Training internships at energy companies (e.g. ELF, Shell) and in Ministries of Energy in nations where they are working well, as well at some NGOs would provide one key resource for the expansion of the energy expertise base in Vietnam to support these activities. Second, an international advisory group could play a key role in encouraging exchange with other nations and utilities undergoing similar restructuring.	Exchange of experience between Vietnamese renewables experts/institutes and international experts/businesses is already underway and will continue to be supported through study tours, twinning, etc. However, the situation in Vietnam requires focusing on those areas where opportunity to work exists during the transition to a market economy. There are few countries engaged in this particular transition, that are further advanced than Vietnam. Links and exchange with China, the main one, are already strong.
Regarding the experience with the Dong Nai community and other failed public-sector projects, it is also important to clarify the relative prices paid by families receiving services from the public and private service providers. With a loan of this magnitude, some of the problems of public projects, such as capital for system repairs and effective access to international markets, could be rectified.	The difference between the two systems was primarily one of presence or lack of good business practice. The "commercial systems" had paid operators that collected payments and maintained the systems, while the "community" systems relied on informal arrangements. The emphasis in the community hydro/hybrid grids is on the commitment of the community and on support to the community to ensure that the operation is run as a business. The text will be strengthened to clarify this aspect.
If economically least cost planning will be the basis of decisions on renewable energy systems it is critical that true life-cycle cost accounting will be used. The incremental cost annex does not in all cases reflect these true, life-cycle costs, without which clean energy options are placed at a financial disadvantage that benefits neither the communities or the	Evaluation of the two investment components included a full economic analysis on a life-cycle basis. Background reports are available with the detailed analyses. The section of the main report on economic and financial analysis, and the incremental cost annex, will be strengthened to reflect the analysis.

environment.	
Annex 2, page 7: megawatt hours of electricity not completed (listed as XX MWh). It is important to provide an estimate here so that capacity factors and necessary backups (if any) can be evaluated.	The text has been completed and full information supplied.
Minor Comments	**Response**
Page 6 & 17: more efficient household lighting is not listed in paragraph (a), but should clearly be a part of the energy efficiency resources included in this package. DSM programs, such as the U. S. Green Lights initiative (Duke and Kammen, 1999) have been show to be even more effective when coupled with residential energy and lighting efficiency improvements.	Only the renewables components are covered by this review. DSM components are still in early stages of design.
Page 7 and Annex I: Performance Indicators. Energy services provided, in principle, to households often has little bearing on energy availability to poorer families, which often differentially impacts women and children. Additional means can be included to address this equity issue include special low-income grants; and targeting communities with a combination of pay-for-service as well as public-goods energy services.	The communities targeted for the commune-based renewable grids are among the poorest in Vietnam. The component already proposes that there will be a grant from the GOV (not GEF) that covers up to 90% of the capital cost of the facility, with about 10% to be contributed to the community in kind. The project proposes pay-for-service. The connection fee is expected to be low, about $30, and the monthly fee for 20 kWh about $1.00. If households cannot afford even this level of expenditure, additional assistance could probably be better targeted to basic needs.
Page 20: Support for renewable energy small power producers will need to also include extensive training and internship opportunities (e.g. the information base and use of the grid/hybrid simulation software mentioned above). This would need to be included in Annex 2 as well. The market development package (item 2) states this as a goal, but it was not clear on reviewing the project document or the Incremental Cost Annex where this is explicitly supported. The degree to which this fits into the Rural Energy 2 Project will be key in retaining the bestqualified individuals and groups to build the industry.	This is included in the support to be provided under 3 (iii), as part of business development services to developers. Work on building the information base has already begun. Data bases have been created on not-to-be electrified communes, and on potential hydro sites. These databases will be developed further .
Annex 2, Page 4: with the vast array of international groups operating in Vietnam assisting in the energy sector plus this new, large program, a means to work effectively between the agencies is needed.	MoI has adopted the Renewable Energy Action Plan framework and agreed to coordinate all donor activities. This is supported by the project under component 3 (iii) a, support for Renewable Energy Program Management.
Annex 2, page 9: The discussion of the GEF alternative is unclear. Use of hybrid system planning tools would provide a means to estimate the savings, and thus the incremental benefit of the renewable energy GEF component.	Text has been added to explain more clearly the GEF alternative. The financial, economic, and GHG emissions savings have been estimated using spreadsheet models in the studies “Techno-Economic Assessment” and “Feasibility Study of Community Hydro/hybrid Grids”. Text will be added to the incremental cost annex to refer to these reports.
Annex 2, Page 11: Added resources are recommended for the EER Component 3(iii) (a) Renewable Energy Program Management Support. Training courses, and seed funds for renewable energy businesses would likely have a large impact, if added to the program.	Business development activities are included as part of all components, but especially in Component 3 (iii). These activities are detailed in the Renewable Energy Action Plan report.
Annex 2, page 11: the ‘pump priming’ or market expansion possibility of the program is not clarified. Is this through a market transformation process (e.g. Duke and Kammen, 1999) or simply a projection of sector growth?	The expansion of the community based renewable grids depends first on demonstrating that such grids can be sustainable. Past performance arises serious doubts as more than 60% of existing grids are out of service. This is the reason

	for the strong focus of this cpomponent on community mobilization and support from provincial and district level. If successful, the program will be expanded with additional funds from the GOV and donors. Japan and Sweden have already indicated interest in supporting the RARE fund.

ANNEX 4

Participatory Process Built Strong Consensus on Renewable Energy Action Plan

The SEER Renewable Energy Components are solidly grounded in a longterm strategic approach to renewable energy in Vietnam. The activities are based on the proposed activities in Phase 1 of the Renewable Energy Action Plan for Vietnam (REAP). The REAP was developed through a participatory process that involved stakeholders, EVN, MoI and the Bank.

The Bank team and EVN believe that the participatory process was key to reaching a strong consensus that led the Ministry of Planning and Investment to endorse the REAP, and MoI to take responsibility for implementing it. The team believes that this process has several important lessons for other renewable energy projects:

- It is useful to develop a longterm framework, before developing individual projects and activities.
- That framework is especially valuable if it has been arrived at through a participatory process, that result in consensus among a broad range of stakeholders.
- The framework then provides a useful tool for coordination by all interested parties.

The first step in the REAP was a participatory workshop to kick off the study. This workshop was chaired by Dr. Pham Khanh Toan, of the Instiutute of Energy, who headed the REAP team on behalf of EVN, and facilitated by Enno Heijndermans from the Bank. It was attended by the Vietnamese Women's Union, renewable energy companies, institutes and universities, Vietnamese Bank of the Poor, industry departments of the provinces, industrial departments of the provinces, EVN, Government ministries including Planning and Investment, Industry, Science, Technology and Environment, Agriculture and Rural Development, the Committee for Ethnic Minorities and Mountainous Areas, and other international agencies. Contrary to the expectation of the Vietnamese organizers, participation were lively contributors. The workshop followed the Objective Oriented Planning Approach, where participants are invited to contribute by writing on cards. Using this method, participants reached consensus on the renewable applications with the most potential, the barriers to their widespread use in Vietnam, and potential solutions. Objective trees were created to prioritize the barriers. The results of the workshop were written up in a report that was translated into Vietnamese and distributed to the participants. [1]

The results of the first phase were used to design several studies, supported by ESMAP and ASTAE funds. These studies complemented studies already underway under the Rural Energy Project, with funding from PHRD, and the Swiss and New Zealand governments. Studies carried out in direct association with the REAP included the following:

- Entec, 2000. *Investment and Business Plan for Setting up a Micro Hydro Turbine Manufacturing Business in Vietnam.*.
- Entec. 2000. *Package C: Techno-Economic Assessment Model.*
- Fichtner/Colenco. 1999. *Technical Assistance for Preparation of Proposed Rural Energy Project, Package 2: Pricing Policy for Rural Electrification.*
- Finucane, J., et.al. *REAP Package D: Program Design for Isolated Households Segment.*
- Hydro Power Center. 2000. *Package B: Collection of Basic Information and Mapping Information for Vietnam.*
- Meritec, 2000. *REAP Package E: Feasibility Study of a Program to Develop and/or Rehabilitate Community-Scale Hydro-Based Mini Grids.*

[1] See ESMAP Technical Report 001, "Options for Renewable Energy in Vietnam", July 2000.

- Meritec, 2000. *Turn-Key Micro Hydro-Diesel Hybrid and Battery Charging Station Pilot Project.*
- Meritec, 1999. *Vietnam Renewable Energy Small Power Purchase Agreement.*
- Meritec, 2000. *Vietnam Rural Energy Project Pre-Investment Study Report for Pipeline Development of New Small Hydro Projects*
- Ministry of Industry. 2000. *Rural Electrification Policy.*
- Nguyet Anh Pham. 2000. *Background Information for Institutional and Policy Aspects of Renewable Energy Development.*

A key study resulted in a database on about 1000 communes in all parts of the country, that had been identified by EVN's regional subsidiaries as communes that would not be served by the electricity grid in the foreseeable future. The Hydropower Institute carried out a basic survey of the characteristics of these communes, and created the data base that includes data on population, number of households, per capita income, village spacing, access to seasonal road, perennial road, health center, school, market and small hydro potential. The Hydropower Institute also compiled a database on known small hydro sites in the country. It is intended to make these databases available to the public.

When the studies were completed, the Bank team prepared a draft Renewable Energy Action Plan report, which was first reviewed and commented on by EVN and the Institute of Energy team. The report was then presented in Hanoi at second participatory workshop, in October 2000, attended by the same stakeholders that attended the first workshop. The draft report had been translated and distributed to participants in advance by the Institute of Energy. The format of the workshop was brief presentations on different sections of the report, followed by lengthy discussion and comments by participants. Craeful notes were taken and several participants contributed new insights and data.

The participants in the October workshop unanimously endorsed the report, after making extensive comments. The comments were then incorporated into the final report, which was jointly published by MoI, EVN and the Bank, in Vietnamese and English[2]. After approval by the Ministry of Planning and Investment, MoI adopted the REAP and took responsibility for coordinating its implementation. The SEER project, endorsed by the Ministry of Science, Technology and Environment, is the first step in implementing the REAP.

[2] Ministry of Industry, EVN, World Bank, "Renewable Energy Action Plan", July 2001, available from the Infoshop in the World Bank, Washington, the World Bank publications office in Hanoi, and the Institute of Energy.