Note: The TOR is for work to assess the potential of bagasse and rice husk by-products abundant in the country to contribute to electricity supply. Deliverables include a development strategy and feasibility studies for selected sites. TOR for local consultant is missing.

Terms of Reference
Bagasse/Rice Husk Co-generation Project Preparation

Background

<Brief description of objectives and scope of Bank rural electrification project; potential role for renewable energy sources, including biomass; implementation arrangements and status of the renewable energy component; previous work and studies on the subject>>

Objective

This task will investigate the potential for bagasse or rice husk cogeneration to contribute to grid power supplies in the country. The consultants will also propose a strategy for development that indicates the potential scale, activities, institutional arrangements and costs of a program to develop biomass cogeneration in the country. The assignment will build on already available information, for example, under the Rural Energy Master Plan Study.

Scope of Work

The consultants will:

1. Document the sugar cane industry in the country, building on material in Rural Energy Master Plan Study showing listing of mills, location, land area planted to cane, sugar production, cane milled, plans for expansion, ownership of mills and canfields, whether the mills operate their boilers in the off season, for what purpose and using what fuel, how many mills export power to the grid, how old are the mills, are there plans or programs to modernize and/or expand the industry, what major problems does the industry face.

2. Visit at least five mills that have prospects of providing power to the grid at a cost that is less than the avoided cost of the grid. The consultant will gather data on site characteristics, mill operation data, examining equipment and assessing the potential for increased power production for export to the grid (including additional power that could be obtained through plant efficiency improvements), and the additional investment costs;

3. Prepare pre-feasibility studies for increased power generation at these mills, showing financial and economic viability;

4. Estimate the potential for power production from the mills and the total investment costs required to achieve this potential.

5. Recommend a development strategy for bagasse and rice husk cogeneration, including:

- whether a development program appears feasible and at what scale, geographical focus, main activities needed, institutional responsibilities, budgets, and the degree to which cost recovery can be expected;

- evaluate the capacity in the country to design, manufacture, install, operate and maintain biomass boilers, steam turbines, and diesel generators, and make recommendations to improve it;
- evaluate and make recommendations on options for incentives required for mills to participate in such a program.

6. Identify constraints to power production from bagasse/rice husk cogeneration through discussion with staff of the sugar mills visited, the provincial and national industry departments, the provincial power service companies and the utility, and the Sugar Mill Association. And, try to prioritize them with the before mentioned organizations. The main barriers will be included, if necessary, in the barrier table given in Annex 1. Make recommendations to address these constraints including recommendations on policy and institutional arrangements, access to credit, access to technology and technical assistance required.

7. Carry out the above seven tasks for rice mills, or demonstrate that such investigation is not warranted.

Reporting Requirements

The Consultant will prepare a written, draft Feasibility Study Report summarizing the work undertaken and the conclusions and recommendations for the financial, institutional and technical assistance required from the Government of the country and from international agencies. the utility and the World Bank will review the draft Feasibility Study Report. The Consultant will discuss the comments made on the draft Feasibility Study Report, and will incorporate the comments into the final Feasibility Study Report, as appropriate.

The following deliverables are required as part of the Services:

- Feasibility Study Report (draft) 5 copies
- Feasibility Study Report (final) 10 copies (after review and receipt of comments)
- Unbound camera-ready paper copy and a computer disk or CD-ROM copy of the final Feasibility Study Report

The Feasibility Study Report will be presented in the English and the local language (translation can be implemented under a separate contract).

Copies of all supporting information obtained during the course of the Feasibility Study will be supplied to the Bank. Supporting information may be either attached to the Feasibility Study Report (as appendices), or bound in a separate volume(s), as appropriate.

The consultant will report to the task manager of the study at least at the following moments during their assignments: starting of the assignment, before going on a mission (discuss ToR for mission including scheduled meetings), after a mission (discuss back to office report), and draft final report.

The PMO will assist the consultants in preparing meetings with government agencies, and institutions involved in renewable energy, arrange travel to provinces and meetings, forward requests for information in advance of trips and accompany consultants to the field (at no additional cost to the consultants), review and comment on draft consultant reports and assist

consultants in obtaining all available information required for studies from the utility, PCs and power service companies, assist the consultants to identify sources of data in other agencies, and assist the consultants to obtain information from other agencies.

Local Consultant

This assignment will be implemented in collaboration with a local consultant to be hired by the contractor of this assignment. A draft ToR for the local consultant is attached as Annex 2.

Liaison

The Consultant will liase with the consultants appointed to carry out other renewable energy studies supported by the World Bank.

Time Schedule:

Activities	Ag	Sp	Oc	Nv	Dc	Jn	Fb	Mr	Ap	My	Jn	Jl	Ag
Interviews, data collection, analyses and formulation of draft report													
Final report													

Budget: US$ 40,000 including US$ 5,000 sub contract for local consultant.

ANNEX 1

Main Barriers to Renewable Energy Development in the country Identified at Renewable Energy Workshop June 15/16 1999

Program Component	General/Summary	Individual Household		Non-grid-connected Commune or Village		Grid Connected
		Pico Hydro System	PV Solar Home System	Battery Charging Station	Hydro Mini Grid	Mini Hydro System / Biomass Co-generation / Wind Farms
Resource						◙ No wind resource data available
Organizations/Businesses	◙ Lack of commercial business models		◙ Few commercial suppliers Maybe difficult to have (after) sales/services network near customers	◙ No commercial models with renewable energy	◙ Current grant based model of installation not sustainable ◙ No proven commercial models ◙ Inadequate management and O&M services	◙ Very limited number of project developers
Awareness	◙ Lack of awareness except for hydro systems	◙ About 120,000 in use ◙ Awareness of pico hydro not universal	◙ PV system not known by most households	◙ Not common in remote areas far from grid ◙ No demonstrations with renewable energy		◙ Investors not aware of opportunities
Market	◙ Market unknown (no data base available) ◙ The utility did not zone and prioritize areas where grid extension is not economical ◙ No comparison available of (dis)advantages of different rural electrification options ◙ Electricity consumption too low for financial sustainability (not enough productive use)	◙ Profile of buyer unknown ◙ Total market size unknown	◙ Profile of buyer unknown ◙ Total market size unknown	◙ Profile of buyer unknown ◙ Total market size unknown	◙ Total market size unknown (lack of data base and access to the data base) ◙ Electricity consumption too low for financial sustainability (not enough productive use) ◙ Difficult to assess market because its multipurpose facility	◙ Total market size unknown ◙ Low interest from utility in small hydro capacities
Product (quality/price)	◙ Low quality of technology except for PV	◙ Low cost of Chinese-made products ◙ High repair cost ◙ No voltage regulator ◙ Short life time ◙ Unsafe wiring	◙ Forced to import because of short life time of local batteries ◙ High investment cost ◙ High transaction cost with low volume	◙ Short life time of local battery\ies ◙ High investment cost if PV is used	◙ High initial investment cost ◙ No guarantee ◙ Poor quality of distribution line results in high cost ◙ Unsafe ◙ Needs diesel to provide year	◙ Hydro not available during dry season

		③ Not working in flood season or dry season	③ Limited service available from battery	③ Inconvenience of battery transportation ③ Limited service available from battery	round service ③ Low quality of local equipment especially blades	
Finance	③ Finance hardly available for projects and customers (including concessional loans) ③ No renewable energy financing fund available to offer long term financing (only short term loans available) ③ Difficult lending procedures in local banks	③	③ Difficult for households to get access to finance ③ Difficult to get money back by lender	③ No experience	③ Problems in getting long term loans from Banks ③ Lack of investment capital	③ Finance not available ③ Commune can't borrow
Policy	③ No high level renewable energy co-ordination body ③ No clear demarcation of responsibilities of government agencies on renewable energy ③ Have to get approval from PC, MPI and MOI and others ③ Private sector does not share responsibility for rural electrification with the utility ③ No subsidy similar to grid ③ No subsidy for poor ③ No subsidy or support for R&D ③ No waiver on VAT and import duties	③ Dumping of Chinese products below cost	③ High tax (40%) on imported batteries. VAT 10% ③ People unwilling to buy as expect grid will come		③ Technical specification inappropriate ③ Non existence/enforcement of electrical codes and fire safety ③ No ecological and environmental evaluation policy ③ Difficulties in resettlement compensation	③ Power tariff should include environment charges ③ Lack of regulation for small BOO/BOT projects ③ Difficulties in negotiating PPAs and tariff with the utility ③ Have to get approval from PC, MPI and MOI and others ③ Monopoly position of the utility scares investors ③ Difficulties in resettlement
Know how		③ Not up to date R&D knowledge			③ Not enough capacity to plan and assess feasibility (demand) studies	

Note:
Renewable energy systems are by definition limited by resource availability at the specific site
Target group for individual household systems and multi household systems are the rural poor people and have by definition a low purchasing power

ANNEX 2