Proposal Format

A. Basic Data
1. Activity Title: **Wangan Aji Micro Hydro Project**
2. ADB Project Officer: Sujata Gupta
3. Request Date: 14 June 2004
4. Implementing Organization: Local Cooperative
5. Types of Interventions: Pilot Interventions
6. Amount of Request: USD 182,000
7. Period this funding request will cover: October 2004 – August 2005
8. Region/Country: Indonesia

B. Description of Implementing Organization

1. The subproject will be implemented by the local cooperative of Wangan Aji village (Wonosobo District, Central Java), supported by district government of Wonosobo, and Directorate General of Electricity and Energy Utilization (DGEEU), Government of Indonesia. DGEEU has been the focal point of similar technical assistance provided by ADB in the recent past and has the necessary qualified staff, the commitment and mandate to promote renewable energy (RE). The village cooperative managing the subproject will function like a business entity. The Office of the Ministry for Cooperative and Small and Medium Enterprise (MCSME) will legalize the cooperative and will also provide assistance and supervision in the management of the cooperative.

2. The village cooperative management structure would consist of an Executive Board (EB) and a Supervisory Board (SB). The cooperative EB will at a minimum consist of a Chairman, Secretary and Treasurer, who will administer the daily operation of the cooperative. The cooperative would establish a business unit and appoint a manager responsible for the its overall functioning. The SB will include representatives from the government and outside experts, and advise the EB, supervise the operation of cooperative and approve the annual report (including the annual financial balance sheet and any cost related matters) prepared by the EB.

C. Proposed Subproject

1. Background and Rationale:

3. In Indonesia, rural economic development is particularly important as approximately 60% of the population lives in rural areas. Electricity is a vital input for economic development in urban as well as rural areas. The electricity sector is projected to grow at 4.3%. However, rural electrification is forecasted to stagnate, as power allocations to rural areas by the state-owned electricity company (PLN) remain unchanged. Rural electrification using RE sources such as micro hydropower, solar, biomass and wind have high potential for reducing this gap in an environmentally benign manner. However, RE projects face many barriers preventing their implementation.

4. The slow progress of investments in the micro hydro sector is due to many constraints, including political and public awareness, subsidization on conventional (particularly oil) energy prices and the financing difficulties. The present subsidized prices for fossil fuels greatly reduce the potential profits from micro hydro installations. Despite many RE policies, political support and awareness among decision-makers is yet to be fully achieved. Most financial institutions and banks in Indonesia are still reluctant to enter into RE as they are not fully aware about the business characteristics and risks associated with such investments. Widespread application of micro hydro technologies would improve efficiency and reliability of power, and provide an appropriate energy mix at relatively low costs. As Indonesia endeavors to expand its electricity infrastructure in rural areas, installing more efficient micro hydro plants (MHP) at reasonable investment costs generating low cost electricity is an important clean energy option to exploit.

5. The Government's commitment to stimulate the development of RE is indicated by its efforts in formulating policies that aim to promote investments in RE. The government established the "PSK Tersebar" facility based on the Ministerial Decree No. 1122 K/30/MEM/2002, dated on June 12, 2002, to promote the development of distributed small power generation utilizing renewable energy sources. This legislation allows independent power producers (IPP) to exploit renewable energy sources for electricity generation of up to 1 MW size and to supply electricity to the national grid of PLN. The selling price is to be determined by the delivered cost of electricity (HPP) at the interconnecting point and voltage.

6. Wonosobo is a land-lock district situated at an average of 750m above sea level (ASL) and surrounded with two high mountains of Sindoro (3,435m ASL) and Sumbing (3,371m ASL). The combination of such topographical conditions and high rainfall conditions (2,270 – 4,835 mm/year), makes Wonosobo a potential area for the development of small and run-off river hydro-electric power plants distributed all over in the region. Despite its hydro potential Wonosobo imports electricity from the neighboring districts of Banjarnegara and Kebumen. Further, being a mountainous region, it is very important that the local community (mostly living in remote villages) of Wonosobo preserves its natural environment. With the support of the local government, six potential micro hydropower sites in the Wonosobo district with a total generating capacity of approximately 3 MW and individual capacity ranging between 100 – 900 kW have been identified. One of the sites, Wangan Aji, is proposed as the sub-project.

7. Most of the community in Wonosobo and around the project site are working in the agriculture sector, and are involved with rice and vegetable farming. According to the Central Bureau of Statistics, the average per-capita income of population at Wonosobo in 2003 was approximately IDR 1,800,000 (USD 200) per-year. The monthly per-capita poverty line in Wonosobo is reported to be about IDR 100,000. This approximates to a monthly income of IDR 400,000 (USD 45) per family. According to the investigation at the village level the monthly expenditures of most families lie in the range between IDR 250,000 and IDR 300,000 per-family. Thus most of the households live below the poverty line.

Sub-Project

8. Wangan Aji is proposed as a demonstration project to be implemented under the framework of the PSK Tersebar. Wangan Aji MHP is estimated to generate about 970,000 kWh every year. This electricity will be sold to PLN using "PSK Tersebar" facility through its existing local grid. The micro hydro project in Wangan Aji will be owned and operated by a village cooperative of Wangan Aji. The above scheme will provide the following benefits.

9. The community of Wangan Aji village will benefit from improved quality of electricity and revenue from sale of surplus electricity. Improved supply of electricity will increase livelihood generation options; provide better health, education and communication facilities. It is planned to utilize part of the electricity generated to meet the electricity requirements for a community based silk processing and spinning unit. Surplus revenue after allocating for operation and maintenance (O&M) will be used for community development and to improve existing facilities. The district government of Wonosobo will benefit for being able to utilize its local resources for electricity generation and thus reducing electricity imports. Additionally, the local government will also benefit from income tax revenue.

10. Environmental benefits include replacing fossil fuel based electricity generation, particularly from diesel powered generating sets. Every kWh of electricity generated by a diesel engine releases about 1 kg CO2 equivalent. The MHP will reduce CO2 emissions by 971 tonnes every year.

11. There are two categories of local environmental benefits related to MHP. The first is catchment area protection and the second is the reduction of local air pollution. MHP depend on the availability of water. Water infiltration, water runoff and vegetation are important factors for

MHP. Bad infiltration coefficient will reduce the amount of water that infiltrates into the soil increasing the runoff coefficient, increasing the incidence of floods. The preferred condition is good infiltration coefficient and natural runoff coefficient. With this combination the rivers are ensured to have water even during the dry season. Vegetation plays an important role in keeping the infiltration coefficient in the natural range. Preservation of natural vegetation will also prevent soil erosion and conserve the natural habitat preserving the region's biodiversity. The sustainability of the MHP depends closely on how the environment and hydrological conditions of the catchments area are maintained. Therefore, the presence of a well performing MHP will encourage local community to preserve its surrounding catchments area.

12. The second local environmental benefit is reduction of local air pollution. For Wagan Aji this improvement results from the replacement of kerosene lamps by electric lamps. An increase in electricity supply will not replace kerosene stoves or wood stoves as these are very expensive options. It is estimated that a household uses 1 liter of kerosene per night for lighting releasing about 2 kg of CO2 and at least 2.4 grams of NOx. By replacing the kerosene lamps with electric lamps, indoor NOx and CO2 emission will be reduced improving indoor air quality significantly. Few houses also run diesel generators. An exact figure is not available, but every village has at least one diesel generator. Electricity from hydropower will replace local diesel electricity generators and reduce local air pollution and the likelihood and incidence of air pollution related diseases.

13. The sub-project directly meets ADB's objective of promoting clean energy sources as outlined in its Energy Policy 2000.

2. Objectives:

14. The sub-project entails a decentralized, community level effort to construct and operate a MHP, thereby alleviating the poverty levels of the community and preserving the natural environment. Development of Wangan Aji MHP will demonstrate the technical viability of utilizing the irrigation channel in Wonosobo for electricity generation and prove its feasibility under the PSK Tersebar. The objectives of the project are: (i) preserving the environment, the catchments of Wangan Aji MHP; (ii) interconnecting Wangan Aji MHP to the national grid under the PSK Tersebar concept; (iii) proving the viability of MHP operated by the local community; (iv) sharing of project benefits by the community; (v) involvement and cooperation of the community and other important stakeholders in implementing, operating and managing the sub-project; and (vi) disseminating the success to other stakeholders in the country

15. The sub-project will sell electricity to the utility grid, and directly to the community. Potential consumers not already connected to the grid are likely to be the poorer households. The subproject profits can be loaned to these households to obtain connections through a loan facility.

16. The use of kerosene lamps is highly prevalent. It is estimated that each household consumes I liter of kerosene daily just for lighting. Use of kerosene for lighting results in emissions of NOx, and CO2. Increasing the access, the quantity and quality of electricity supplied to the village will reduce the use of kerosene lamps improving the indoor air quality, save fuel expenses, provide better quality illumination and extend the working hours.

17. The productive use of electricity will generate other economic activities (e.g. rice milling) resulting in increased employment opportunities and value addition for local produce. Village cooperative business activities that can be developed subsequently in Wangan Aji include, loan facilities for cooperative members, rice milling units, agriculture processing and product marketing facilities, weaving and handicraft units, carpentry and mechanical workshops. The community annual meeting will decide whether the profit (the revenue minus costs) generated by the sub-project will be further invested into other businesses or paid to the community as dividend.

3. Scope of Work/Description of Proposed Approaches:

18. The main activities of the sub-project are:

a. Preparation of detailed feasibility study including the engineering survey and preparation of tender documents by the domestic consultants hired under the sub-project. The consultants will have expertise in micro hydro engineering, finance and social issues. Detailed O&M manuals and schedules for civil building will be prepared during the detailed design phase. On completion of the feasibility report, the consultants will prepare a progress report for the village cooperative, the local government, DGEEU and ADB.
b. The local contractors under the guidance of the consultants and the village cooperative will do civil works construction.
c. The electro-mechanical equipment will be supplied, installed and commissioned on a turnkey basis according to the specifications of the feasibility study. The suppliers of the equipment will provide the operation manuals and the maintenance schedules for the equipment. The contractor in accordance with PLN regulations will elaborate the maintenance schedule for the transmission facilities. The turnkey contractors will also undertake training of local personnel.
d. The consultants and village cooperative will develop a community benefit-sharing plan. The consultants will also train local personnel in bookkeeping procedures.
e. The consultants will assess the financial viability of the MHP without a grant and determine options (e.g., soft loans, revolving fund) to finance other similar projects.
f. On commissioning of the MHP the consultants will organize a workshop for stakeholders from other MHP sites, local government, DGEEU, financial institutions, ADB and donors. The workshop will present the lessons learned.

19. For the continuous operation of the MHP, it must be technically simple and easy to operate and maintain as most MHPs operate in rural and remote areas with limited availability of skilled personnel and infrastructure. Reliability is important, to avoid frequent material and component replacement. Experience has shown that the rural community was able to operate and maintain MHPs of simple and indigenous design and construction.

20. The MHP will be a business unit under the village cooperative and operate as a profit center managed by a professional manager (who would be recruited from local community or outsourced). This unit would act like an independent energy service company (ESCO) responsible for O&M of the plant, collection of electricity sales proceeds from the utility and the community, management of revenues, transparent bookkeeping, and reporting. Every year an annual balance sheet and report will be presented to the community at the annual meeting. The EB and the SB of the cooperative will approve this report.

4. Workplan and Reporting

21. The timeframe of the main activities – planning, implementation, and construction are shown in Annex 1. The pre-construction phase is of 4 months, followed by a construction phase of 6 months, which will include civil works and equipment installation and commissioning. The consultants will provide a progress report in month 4 and draft final report at the end of the construction phase in month 11 and a final report at the end of the project. A workshop will be organized on completion of the draft final report and any recommendations received from the workshop will be incorporated in the final report.

5. **Expected Outputs and Outcomes**

22. The expected outputs of the sub-project include: (i) A 125 kW MHP producing 971,000 kWh of clean electricity every year; (ii) Community operation and management of a MHP and a community benefit-sharing plan; (iii) trained local personnel to operate and manage the MHP; (iv) report on lessons learned from the pilot MHP, including those on coordination between different levels of government, cooperatives, PLN and other stakeholders; and (v) an assessment of the

financial viability of similar MHPs. The sub-project will provide multiple and long term benefits for the region, i.e. utilize its clean energy sources for reliable and sustainable electricity supply, save its financial resources, alleviate the poverty of the rural community, promote natural resource preservation, and demonstrate the viability of MHP. Annex 2 shows the inputs, activities, outputs and outcomes related to the sub-project.

6. Subproject Evaluation and Information Dissemination

23. The experience during project implementation will be documented, formulated and published. The results will be presented at a workshop organized for stakeholders from neighboring sites and financial institutions. A promotion model will be developed for dissemination to other areas, stakeholders and financial institutions.

7. Scope of Replication/Use in other DMCs

24. The subproject will provide a model to replicate at the similar sites in Indonesia and in other DMCs with appropriate modifications.

D. Cost Estimate and Disbursement Schedule

25. The total project cost is $243,000 including a partner contribution of $61,000 and $182,000 is requested from ADB's Poverty Environment Program. Details of the cost estimate and disbursements are provided in Annex 3. It is proposed that the local government procures the land for the sub-project and will grant it to the village cooperative. The community's contribution would be in the form of land, materials, and man-day during the construction period.

26. Financial sustainability is related to the continued operation of the plant. The project revenue must at least cover the costs for operation, maintenance and re-investment required. Most MHPs fulfill the above criteria, as they require medium-sized up-front investment and low O&M costs. The revenue generated has to be managed and controlled professionally to avoid misuse and misappropriation. To ensure this the project design provides for training on book keeping procedures. Also, all electricity sales revenue will be directly deposited in a bank through the ESCO account. The manager will prepare an annual financial report on revenue generated, costs and a proposal for fund allocation. The fund allocation will include the budget required for the next year's O&M of the plant (e.g. wages and salary, spare parts, routine maintenance, and repair) and yearly depreciation of the technical components (e.g. turbine, generator, and control unit). To ensure sustainability of the plant the allocated depreciation fund will be consistently paid to a specific account.

E. Proposed Subproject Management System

27. There are four main stakeholders of the subproject are: the village cooperative, the district government, PLN, and DGEEU. During the implementation phase, consultants will support the village cooperative. Subsequently, the cooperative will operate the sub-project, acting as an ESCO. The details of the management system are discussed in paragraphs 1, 2 and 20.The district government will facilitate project processing, for example, through the prompt provision of water and land use permits. DGEEU has to commission and approve the MHP before it is connected to the grid. On approval, DGEEU will issue the Electricity Business Permit (IUK) for "PSK Tersebar. PLN has an important role in its agreement to purchase electricity at non-firm capacity at the defined price as mandated by the Ministerial Decree on "PSK Tersebar".

28. The above scheme demonstrates the management and operation of the MHP by the village community. The village cooperative controls the revenues and decides on the use of its revenues. Women will be encouraged to join the cooperative. This sub-project will also demonstrate the feasibility of micro hydro plants to PLN, DGEEU, local governments and financial institutions. The sub-project would instill a sense of ownership for the MHP among the local

community, which will promote conservation and more efficient utilization of natural resources.

Annex 1

Project Workplan and Reporting schedule for the mini hydropower project

No.	Activities	Months										
		1	2	3	4	5	6	7	8	9	10	11
1	**Feasibility Study Preparation**											
	Enginerring Survey											
	Feasibility Study Preparation											
	Tendering											
2	**Progress Report**											
3	**Civil Works Construction**											
	Site Mobilitation											
	Weir											
	Intake											
	Forebay											
	Penstock & supports											
	Power House											
	Tailrace											
4	**Semi-annual Monitoring**											
5	**Electro - Mechanical Works**											
	Manufacturing of turbines											
	Manufakture of DTC Controller											
	Procurement of switchgear & associated equip.											
	Procurement of generator											
	Installation of turbine & associated equip.											
	Installation of generator & electrical equip.											
	Commisioning and testing of plant											
6	**Draft Final Report (incld community benefit sharing scheme)**											
7	**Workshop**											
8	**Final Report**											

Annex 2

Inputs	Activity	Outputs	Outcome (Indicators)
1. Technical design 2. Feasibility study 3. Labor inputs 4. Equipment 5. Civil works	1. Construction of MHP including civil works and installation of equipment. 2. Construction of transmission and distribution lines 3. Skill transfer to local stakeholders – Technical skills – Managerial skills 4. Initiation of benefits sharing plan	1. MHP. 2. Electricity off take and distribution system 3. Workshop on community based MHP operation and management for stakeholders, neighbors and financial institutions. 4. Progress report 5. Final report including report on lessons learned.	1. Well-functioning MHP. 2. Revenue from electricity sales to the utility and direct sales to consumers. 3. Profit generating village cooperative/ESCO 4. Increase in membership of the cooperative. 5. Increase in processing, manufacturing and marketing activities in the village. 6. Loan facility operated by the village cooperative using profits from the MHP. 7. Enlightened village community 8. Replication of MHP in other villages in the district. 9. Proof of financial viability of MHP during the operational lifetime of the sub-project.

Annex 3

Cost Estimate for Wangan Aji Micro Hydro Plant

Item	Partner Contribution	Requested	Total	Disbursement
Civil work		$ 46,000	$ 46,000	Payment on submission of invoice
Electro Mechanical Equip.	$ 40,000	$ 100,000	$ 140,000	Payment on submission of invoice
Transmission & Distribution Lines		$ 6,000	$ 6,000	Payment on submission of invoice
Land Aquisition	$ 8,500		$ 8,500	Payment on initiation of subproject
Survey, Feasibility Study & Detailed Design, & Community Benefit Sharing Scheme		$ 10,000	$ 10,000	50% payment on initiation of subproject and balance on submission of final report
Information Dissemination and Workshop		$ 10,000	$ 10,000	Payment on submission of Final Report
In-Kind Support by Project Partners	$ 12,500		$ 10,000	
Contingencies		$ 10,000	$ 10,000	
Total Expenses	$ 61,000	$ 182,000	$ 243,000	