

PD-AY-279

Memo to: Samuel Bunker
From: David Zoellner
Subject: Asia/S. Pacific Trip
Date: July 30, 1982

Indonesia

1. There is substantial physical potential, government interest and donor funding agency willingness to develop small (5 MW) hydro schemes in Indonesia.
2. I visited a number of individuals and read several documents, lists of which are attached.
3. I developed a scope of work, also attached, that proposed: a) a resource assessment, b) technical advice on equipment design and development, c) development of a training program and d) development of a strategic plan for small hydro development.
4. The scope includes roles and responsibilities for USAID, GOI and NRECA.
5. In exit briefings to GOI and USAID, the following comments were made:

GOI

- a) funds to support this effort will be difficult to find - it may not be feasible until April 83, with new budget resources.
- b) the briefing attendees would meet again before the end of July to settle the budget matter and notify USAID of their findings.
- c) they were in agreement re. the activities in the scope.

USAID

- a) there are no funds in the Mission to cover their share (\$46,000+)
 - b) they propose doing the resource assessment first - the other three could be worked into Mission projects "in the pipeline" but 2 to 3 years distant
 - c) to cover the cost of the resource assessment they suggest
 - 1) NRECA pay for it all
 - 2) GOI cover USAID share
 - 3) Mission be given Project Development Funds to cover USAID share
6. I promised to return to Washington and present my findings to USAID/W, who would reach a decision on how to proceed and then notify USAID Jakarta.

Malaysia

1. The National Electricity Board (NEB) has a substantial staff to implement an ambitious mini-hydro program which the WB wants to support.

2. The staff is disturbed at the findings by the engineering firms (cost and design approach) - feels that their approach was not appropriate. Wants to involve Malaysian construction firms, local labor and materials.
3. They are actively developing their own equipment from designs by SKAT, ITDG and others.
4. They are very anxious to have NRECA assist them via the UNESCAP scope for workshop planning and management and for equipment and site development technical assistance.
5. The mini-hydro staff requested several SDH documents, which I promised to send.
6. Upon leaving I agreed to develop a response to the ESCAP request from RCTT (Bangalore) after discussing the approach with USAID and IPD Administrator. A meeting record is attached.

Fiji

1. I had discussions with staffs of USAID, UNIDO, GOF and SPEC which were all positive and useful. A meeting record is attached.
2. There is substantial physical small hydro potential in Fiji and other S. Pacific island countries, there are some schemes operating, others underway and a general interest in developing additional ones.
3. One source of in-country assistance and cooperation are the PVO's - R. Craig is sending a circular cable with A. Inversin resume to determine if there's any interest.
4. Another source of assistance are the EEC/UNDP funds for energy development - the September meetings of SPEC/SPC should be key for decision-making.
5. I agreed to await word from R. Craig on PVO response and in the meantime to send material on IPD to Craig for distribution.
6. In my absence, we have a request for assistance from Vanuatu - this lends some urgency for a USAID decision and timely response.

Indonesia Meetings Record (Summary Notes)

1. Bob Ichord
USAID/Asia Bureau
Washington, D.C.

Discussed relevant new Mission directions re. electrification and energy.

Emphasis on integrated water resource management - institutional and social aspects.

Build on the Citanduy experience. National Watershed Project (Enrique Barriou, Project Manager) for '84 will be appropriate for small hydro. Potential also for small hydro in outer islands - Lombok, Sutawesi, etc. Energy emphasis should be on coal and hydro.

Talk to Will Knowland re. renewable resources and Sam Boskin re. PUSPIPTEK and potential for US and Indonesia manufacturing cooperation/licensing, technology transfer. Small hydro assistance should be feasible under PUSPIPTEK (Note: PLN should be a big client of PUSPIPTEK.) In the Rural Development Office, Doug Tinsler, Head, can discuss potential for small hydro in Provincial Development Program.

2. Dr. Samaun Samadikun
Director General of Power
Ministry of Mines and Energy
Telephone: 324217, 323607

28 June, 1982

Ir. Djurzan Hamid
Chief Subdirector of Capital Participation
Mines and Energy
Telephone: 323607

Ir. M. Pandjaitan
Chief
Monitoring and Regulation of New and
Renewable Energy Resources, Mines and
Energy

(Note: Dr. Samaun is responsible for coordinating small hydro development in Indonesia.)

World Bank (WB) will assist with survey of "big" hydro-5 MW and up.

Asian Development Bank (ADB) will assist with lower scale - regional or district oriented supplies. Funds will be provided for 1 province - emphasis on electrical energy

from hydro, geothermal, peat, wood, etc. ADB will send 1 person in July to assess planned project. ADB will put up construction capital, but is looking for seed money - also interested in a survey methodology. There will be 5-man counterpart team - 2 PLN and 3 Ministry of Mines and Energy personnel for this project (funding level at \$700,000).

GOI water use priority; 1-Agriculture, 2-Water Supply, 3-Power.

Electricity Distribution - carried out by Government, e.g., PLN, Directorate General of Cooperatives (DGC) and private plants, e.g., large systems such as PERTAMINA, Steel Co., INCO, (excess energy sold domestically) and small systems such as 100-500 kW diesels for mills and surrounding homes.

Land Use - problem with use practices creating loss of top soil, additional sediment loads and general negative impact on water resources.

Local involvement - Dr. Samaun stressed the need for involvement of BAPPENAS, Universities, local manufacturers, local labor, local materials, etc.

3. Dave Straley
USAID/Jakarta
Science & Technology
Telephone: 340001

29 June, 1982

Discussed "DC Electric" project using 3 kW micro hydro unit, designed and developed by BPPT, to charge batteries in rural area. Using 6 M head, 300 litres/sec flow in irrigation canal - propeller unit (fixed vane and blades).

PUSPIPTEK - energy lab, \$12 x 10⁶ for equipment, training (academic and at US National Labs), research-oriented, commercial-oriented.

4. Sam Boskin, Chief
Science and Technology Branch
USAID/Jakarta
Telephone: 340001

30 June 1982

Discussed USAID projects related to small hydro.

PUSPIPTEK - Energy Laboratory of National Science/Technology Laboratory of Indonesia. Energy technology ("metal bending"), training, coordinate with US firms, joint venture, focus on commercially available-feasible technically-local production spacing potential. Hope to get USAID with approval by Sept. Work with BPPT. Thrust is on industrial support for makers and sellers of equipment.

National Watershed Program - deal with workable projects. Organizational approach-institutional focus.

BPPT - USAID interested in replication of battery-charging project. Increase unit capacity to 10 kW.

Minister Habibe (Ministry of Research & Technology) - interested in working, universities into PUSPIPTEK.

Will Knowland
Regional Environmental Advisor
USAID/Jakarta
Telephone: 340001

30 June, 1982

Requested that NRECA small hydro team, when they come to Indonesia, make slide presentation to BPPT.

Indonesia water law will be revised, along with policy in regulations in the coming year.

There is a growing emphasis in Government of Indonesia (GOI) on water supply to meet increasing village needs.

There is an important paper on watershed problems by Enrique B.

Java/Bali - precedent of villagers working well together on local projects. Good potential for small hydro on Bali.

6. Kevin Rushing
Agricultural Officer
USAID/Jakarta
Telephone: 340001 Ext. 370

30 June 1982

Citanduy I, focusing on existing irrigation systems improvement and a small amount of new canal construction will continue until Oct. '84.

Citanduy II, focusing 75% on agriculture, will be funded until Oct. of '86.

National Watershed Project - currently being debated in Mission--outcome not clear.

Solo River Basin - project in Sulawesi with potential for small hydro co-funded by FAO (UNDP office in Jakarta) and WB (developing a pre-appraisal report).

7. Dr. Lolo M. Panggabean
Coordinator for USAID Project
Directorate of Technology Development
BPPT
Telephone 304246-0
Ir. G. Budiadi
Ir. H. Djoko Susanto

1 July 1982

Four staff people at BPPT are working on the "DC Electric" Project. Turbine tested at Cipayung.

BPPT Power - manufacturing power turbines. Work with Suryono to develop turbine program. The Directorate of Technology Development will be responsible for developing micro-scale turbines - perhaps up to 10 or 15 kW - for isolated villages, small streams Process: design by BPPT - manufacture by Institute for Technology, Bandung (ITB) (Mr. Sularso) - test at LMK (PLN energy research) hydro laboratory (Cipayung).

Plan for a hydro lab on PUSPIPTEK site (25-30 km outside of Jakarta) to test turbines, pumps etc. Only on paper at the present.

Training/technical assistance - for the design and manufacture of equipment up to 100 kW - propeller, cross-flow, pelton, Francis. Training should be by degrees and phased

into higher levels as engineers progress. Interest is in both electrical and mechanical equipment. Work with ITB for University in-put (Note: weakness at ITB-too much trial and error in equipment development.)

8. Professor Suryono
Sr. Advisor
PLN
Telephone: 715708

1 July 1982

N. Sumatra - PLN planning electric distribution assisted by BCI (Enex Group of New Zealand) - BCI evaluated 80 mini hydro sites as part of this assistance. ADB paid for survey. Report used for Power XII planning at WB. 6 sites to be developed.

Need a resource assessment for sites less than 5 MW.

Ministry of Research and Technology - Agency for Development of Technology, Minister Habibe, is interested in manufacturing small hydro turbines. Gave Rp 16×10^6 to Bravijaya University (E. Java, Malang) to carry out research for development of small turbines. Gave Rp. 25×10^6 to Mr. Harry S. at ITB (Bandung) to develop the electronic load controller.

Aswar Anas - Governor of W. Sumatra. Interested in developing mini hydro and cooperatives. Limited budget of Rp 5,200,000. Requested help from Habibe.

Policy from recent meeting - all resource assessments with USAID assistance will be coordinated by PLN. All assessments then "put in a pot" and DGP will decide how sites are developed and managed.

ASEAN - the ASEAN Permanent Committee on Science and Technology will establish in Jakarta a Center for Watershed Management.

Indicated that Mr. Chandran of WB (Indonesia desk at WB) was interested in satellite images as a source of information on hydro potential.

9. Cliff Nunn
Resident Manager, Luwu Irrigation Project (USAID)
Palopo, Sulawesi

30 June 1982

Mr. Nunn is a consultant with CHECCHI/DMJM.

Balease River - hydro and irrigation feasibility studies done by Dutch engineers.

Master plan for 14 rivers in Sulawesi prepared in 1976 but has been updated.

Report should be in Mission. USAID-Dutch venture (DHV Dutch consulting firm).

Ir. Sessu Senang - Acting Project Manager for Luwu Irrigation Project (located in Ujung Pandang or Palopo).

Extensive hydro potential around Bone Bone, Luwu, Balease. Suggests someone look at developing hydro facilities for electric coop at Luwu.

10. Dr. Jan Gerards
Water Management Specialist (consultant)
USAID/Jakarta
Telephone: 340001 Ext. 246/340

1 July 1982

Water availability in Indonesia is widely variable. Runoff is unpredictable due to watershed soil management practices, deforestation, sediment problems.

Sedimentation - in highly populated areas, arises from upland soil mismanagement
- dense population - dense irrigation.

Agriculture price structure - drives crops development and location, e.g., rice paddy in lowlands, coffee in highlands.

Sumatra - much transmigration forest areas.

Rainfall - generally decreases in intensity from West to East. Rainfall higher in upper elevations.

Department of Meteorology - source of maps, rainfall data, irrigation reports are at USAID, WB.

DPMA - Directorate of Hydraulic Research, Director General of Water Research, Ministry of Public Works, Bandung. Source of sedimentation data (not easy to get), gauging stations, location, flow data.

11. Ir. H. Kulitt, Director
Project Budget
PLN
Telephone: 715708

· 1 July, 1982

Contact person in PLN for New Zealand and Japanese surveys. Contact person for information on sites, maps, etc. Staff knowledgeable on small hydro. Since first 5-year plan (Repelita):

9 locations - 1,174 kW (before Repelita)

11 locations - 1,219 kW Repelita I

12 locations - 1,775 kW Repelita II

12 locations - 5,903 kW Repelita III

France - loan for 5 sites - scattered - will be hard to manage.

Of the last 12 sites (Repelita III), 7 sites are funded purely by GOI. Of these last 12 - 8 will be under construction by '84, 4 are operational now.

PLN is negotiating for a loan from the WB on N. Sumatra - 6 locations, 9 units of 750 kW. Loan negotiating should be finished by Dec. '82.

Planned geographic development:

N. Sumatra - WB

S. Sumatra - USAID

Bali/Lombok - UK

Sulawesi - ADB

Development assistance needs - site reconnaissance through to construction
Repelita IV - 55 MW of small hydropower is the goal. In a recent decision - re. small hydro site survey - coops/PLN split up work with PLN involved in survey, coops involved in management.

12. Ibnoe Soedjono, Director
Research and Development
Dept. of Trade and Cooperatives
Telephonic: 370060, 772445, 772448

2 July, 1982

Ranking of development assistance needs:

- a. Inventory of potential sites
- b. Preparation of feasibility studies

Survey of W. Java, C. Java, W. Sumatra was conducted by Ir. Harry S. (ITB) - report will be due in September. In a recent decision - on sites surveyed up to 1 MW, given to coops, over 1 MW, given to PLN.

ADB - interested in small hydro if it can be integrated into community development. Contact: Dr. Jha, Head, Community Development, ADB, Manilla.

Department of Finance - source of Indonesian capital for site development if project is feasible. Contact: Dr. Kristiadi, Director of Investment and State Property, Telephone: 362798, 373309 Ext. 775.

13. Hartoyo Notodipuro, Deputy Director
Planning, Director of Center for Analysis of
Electricity Problems
PLN
Telephone: 791155, 792098, 793908

3 July 1982

Easy facility maintenance is critical - more so than local manufacturing - later for local manufacturing. PLN is preparing small hydro development plan on a regional basis - e.g. WB in N. Sumatra. Regional Development Office prepared (W/BCI) report to develop 6 sites in N. Sumatra. Need to develop a pattern for hydro development.

Attempting to develop a long term strategy for microhydro e.g. grid vs. isolated.

Maps - grid (existing and planned), population, topographic are all available - need advance notice.

Management of small hydro sites - under discussion.

Needs: Training for local manufacturers, local consultants, local cooperatives.

14. Ir. Harry Sosrohadisewojo
Chairman, Electrical Engineering Department
Institute of Technology
Bandung
Telephone: JKT. 714029
Ban. 022-83316

·7 July 1982

Development assistance needs:

1. Assist villages with appropriate technology.
2. Need to expand "blue collar" expertise - mid level technical skills.
3. Need energy planning policy.

Technical/Trade schools have no experience with turbine development.

(Note: wide difference between textbook theory and real application.) i.e. the "intermediate level needs building up" There's been no follow-up on Indonesian studies - W. Sumatra, for example. Governor is interested in W. Sumatra - water mills formerly used for rice hulling - diesels now used, but problem with fuel cost and delivery - want to go back to water power for mechanical and electrical use for rice processing, etc.

In W. Sumatra, Ceubajak Desa was studied by Harry for prefeasibility for technical, financial, infrastructure, but can get no Indonesian funding.

Three reports on surveys in W. Sumatra, W. Java and C. Java are being prepared (in Bahasa, Indonesia) - available in September.

Has a grant (approximately DM 150,000) from GTZ for technical assistance in site survey and equipment development - W. Germany has implied they are interested in further loans/grants for hydro development. Harry is leaving for 8 weeks research work at Technical University in Braunschweig - develop superslow speed generator to be regulated magnetically (eliminate speed increaser, voltage regulator, exciter). Interested in assistance from NRECA in developing ideas/designs for equipment protection in failure.

Those present at DGP Office for Zoellner briefing
on small hydro scope of work in Indonesia

Briefing Attendees: 8 July, 1982

- | | | |
|-----|----------------------|----------------------------|
| 1. | Abdul Kadir | DGP |
| 2. | Katut Kontra | PLN |
| 3. | Ir. Sjoufjan Awal | PDO |
| 4. | Ir Djurzan Hamid | DGP |
| 5. | Dr. Firman Tambunan | DGP |
| 6. | Bargres Moedijontoyo | |
| 7. | Ibno Subroto | LMK (PLN) |
| 8. | C.S. Hu | PLN |
| 9. | Mrs. Mubardy | PLN-Main Ofc. Dir. for R/E |
| 10. | John Rumondor | PLN-Main Ofc. Dir. for R/E |
| 11. | Professor Suryono | PLN-Sr. Advisor |

Zoellner/Warner/McNeill

DRAFT SCOPE OF WORK

USAID ASSISTANCE TO GOI FOR DEVELOPMENT OF SMALL SCALE (LESS THAN 5 MW) HYDROPOWER

I. Background

Through a Cooperative Agreement with USAID, NRECA can provide technical assistance in a broad range of topics for the development and management of small scale hydropower resources.

In response to a request for assistance from the GOI, the USAID Mission in Jakarta has asked Dr. David Zoellner, Manager of the NRECA Small Decentralized Hydropower Program to visit Indonesia and assist USAID/PTE in preparation of a scope of work for said assistance.

During the course of Dr. Zoellner's two-week visit, a number of background documents was collected and exploratory meetings and interviews were held with key USAID and GOI staff. Listings of relevant documents, persons contacted and others useful for the NRECA team to contact are attached to this draft Scope of Work.

The following topics summarize Dr. Zoellner's findings during his brief visit:

Resource Potential

There is a substantial physical resource with potential for development in all of Indonesia. The World Bank estimates a potential of 31,000 MW, including large scale plants. Many sites exist for development of both high head and low head schemes. Rainfall is seasonal and variable in timing and intensity for both elevation and island geography relative to the Equator, but generally adequate for power systems. Principal difficulties with development of the physical resource include: trend toward increased sediment loads in streams; general lack of good flow data, particularly for small streams and isolation of many potential sites with respect to infrastructure e.g. load centers, transportation, communication.

Past History

Indonesia has a past history of development of small hydro sites, begun in 1923 and continued currently during which there are more than 12 sites under construction by PLN and others. During Repelita I and II most of the equipment was imported and their capacities were in the lower range. During Repelita III many of the turbines are manufactured in Indonesia and their capacities are increasing. Most of the plants are owned and operated by PLN. A few sites are owned and operated locally and fewer still are private. Principal difficulties found with some of these existing sites are: lack of local or nearby technical expertise to maintain the system; lack of local interest and/or organization to manage the system; inadequate tariff structures and unreliable power.

Donor/Bank Activity

In addition to USAID, the World Bank and the Asian Development Bank (ADB), other bilateral donors and the Indonesian government itself are all interested in funding the development of small hydro systems in Indonesia. Currently the Japanese are conducting a 2-yr. survey of sites with potential greater than 5 MW; the World Bank is considering plans to fund the development of 6 sites in N. Sumatra; USAID assessments have been assigned to S. Sumatra; the UK to Bali and Lombok; the Governor of W. Sumatra seeks funds for site development; France is developing 5 scattered sites and W. Germany and the Netherlands are allegedly, "waiting in the wings". The key problem with this activity is the absence of national policy requiring the development of a long and short term strategy containing such important elements as assessment, construction and management of this technology via a framework assigning agency responsibilities, priority areas, budget, all of which would be integrated into a national power plan.

Rural Electrification

There is substantial interest in rural electrification. Current programs are being carried out by PLN and DGC. Interest in and support for local development of electrification has been widely articulated by such agencies as BAPPENAS, Department of Trade and and Cooperatives, Ministry of Interior, and others. Although only about 3,000 villages out of approximately 57,000 have been electrified, there is substantial interest in electricity in homes for security, lighting, status, businesses in homes, and in commerce for cottage industries and in agriculture for processing and irrigation pumping. National annual consumption of electricity averages 76 kWh per capita and rural consumption seems to vary, between 25 and 45 kWh per customer.

Affordability does not seem to be as great a challenge as planning, organization and implementation. The most significant problem is apparently the wide range of central and regional agencies with independent authority to develop small scale hydropower for rural electrification.

Equipment

There is widespread interest in, and capability for, designing and building some of the small hydro hardware. Active programs exist, largely for micro schemes and/or equipment, at ITB (Bandung), Dian Desa (Yogyakarta), BPPT (Jakarta) and LMK (Cipayung). These research-oriented groups are active in experimentally designing, developing and testing mechanical and electrical equipment with hopes of replicability and commercial applications in Indonesia. Commercial fabricators and manufacturers of turbines include P.T. Barata and C.V. Sukaraja. Some governors, generators, switch gear, etc., can be assembled but none of which are manufactured commercially in Indonesia. The Minister of Research and Technology has expressed a keen interest in seeing that Indonesia designs and manufactures its own turbines. Generally, the turbines presently developed are good but need refinement for efficiency of existing designs, increased capacity of existing designs and new designs to allow developers to choose from a broader range of turbines types.

USAID Projects

There are existing and planned USAID projects with potential for a small hydro element. PUSPIPTEK, the planned National Science and Technology Laboratory will have an Energy Research Laboratory funded by USAID and managed by BPPT focussing on academic and hands-on training and on commercialization of developed technologies through technology transfer; DC Village Electricity Project having developed, with BPPT/ITB/LMK, a 3 KW propeller unit for battery-charging, would like to refine the turbine design, expand the capacity to 10 KW; National Watershed Project, if implemented will focus on integrated watershed management building on the Citanduy experience of a model for appropriate land use for agriculture and institutional arrangements, particular potential may exist for site development for power for villages or irrigation pumping; National Watershed Policy contains elements for administration and management for river basin development and training for water resource monitoring instrumentation, data collection and analysis all of which are important elements in resource assessment and system management of small hydro schemes; Luwu Irrigation Project encompasses and is adjacent to an area of considerable resource potential, some of which is already documented, suggesting the development of feasibility information for one or more sites that could, in the near or long term, supply such load centers as the Luwu Rural Electric Cooperative and/or PLN electric customers in and around the Palopo area. Many of these projects and programs will require decisions by USAID on policy, budget and content before serious consideration may be given to integrating assessments for and possible development of small hydro schemes.

Site Evaluation

There is a strong GOI interest in having a general inventory of sites under 5 MW in Indonesia and in having USAID assistance with reconnaissance of specific areas, namely the provinces of Bengkulu, Jambi, Lampung, S. Sumatra and W. Sumatra followed by

feasibility studies of specific sites in that area. This interest appears to be due to at least two factors: the insistence of the WB that to prepare feasibility reports to Bank standards will require outside (expat) assistance and the apparent haphazard approach to small hydro development of accepting all donors of aid and development bank assistance in order to "shelve" as many feasibility studies as possible for future funding. Much, but not all of the impetus for site development comes not from GOI, but originates from profit-oriented consulting firms or bilateral assistance agencies requiring equipment purchased from their frequently government-subsidized manufacturers. This in itself is not bad. The problem in Indonesia is the absence of any clear, well thought out direction for all this activity that should and could be provided in a detailed master plan.

Training

There is unanimous agreement on the need for training in all phases of site development, in systems management and in equipment design and manufacture. The facilities at present - LMK hydro lab at Cipayung, ITB at Bandung, BPPT in Jakarta, PLN training facilities and in the future - PUSPIPTEK and others all maintain potential for use in micro and mini hydro training assistance. Participation of counterparts in resource assessment is recognized as important practical experience. There is interest in U.S. equipment manufacture - electrical, electronic and mechanical and in methods for transferring that technology, with appropriate modifications, to Indonesia. There is considerable knowledge and expertise currently available in Indonesia, however, depth of capability within agencies and breadth of skills in institutions could be increased and broadened respectively.

In summary, the key to a successful NRECA team effort in Indonesia is integration. Integrating small hydro development on a large scale into broader programs of government priority - water resource development, energy planning, the 4th 5 - year plan, etc. and on a small scale - matching appropriate equipment to management capabilities, for example. Proposed plans, programs and projects, where possible, should

be tied into existing and/or planned funding activities. Above all, the effort should be consistent with USAID energy policy as articulated in Energy Assistance Policy Paper, January 1981. Particular emphasis will be placed on guidance criteria provided in that document for: 1) energy analysis and planning, 2) energy training and institutional development, 3) increasing energy supplies and 4) rural electrification.

II. Scope of Work

A. Summary

The effort will consist of four separate projects requiring different expertise, different levels of effort and different times to complete.

Project One Resource Assessment.

Review data, identify sites, select 5 or 6 for prefeasibility studies and 1 or 2 for feasibility studies. Develop criteria for use in resource assessment methodology.

Project Two Technical Assistance

Evaluate existing facilities for equipment R&D as well as manufacturing, recommend a program plan of continuing assistance. Assist with design improvements for DC Electric Project and with ITB electronic load controller development.

Project Three Training.

Develop training program for PLN, DGC, et al on most appropriate aspects of site development and management.

Project Four Strategy Planning.

Review on-going small hydro activities, agency responsibilities, existing planning and coordination structure, broad government plans and programs, develop policy and implementation plan for small hydro.

B. Procedure

Project One

Resource Assessment.

- Step One. Meet with key GOI staff, collect information and discuss specific sites. Consideration will be given to sites in Bengkulu, Lampung, Jambi, S. Sumatra, W. Sumatra and the Luwu area (Sulawesi).
- Step Two. Screen sites identified from discussions, reports, and maps down to six (6) sites for feasibility studies.
- Step Three. Carry out prefeasibility studies on six (6) sites in the field.
- Step Four. Prepare draft report and discuss with GOI/USAID the two (2) recommended sites for feasibility analysis.
- Step five. Return to field and carry out feasibility study on two sites.
- Step Six. Return to Jakarta, prepare draft report which will be left with GOI/USAID. Report will include a chapter on criteria developed for a cost effective, yet technically adequate methodology for resource assessment. A plan will be included for field testing this approach.
- Step Seven. Return to Washington, finalize report and submit to GOI/USAID.

Responsibilities for Project One:

NRECA. Provide experts, pay their salaries, furnish specialized equipment and/or instruments, furnish specialized technical documents, prepare reports, furnish logistic support, office space, materials and general support in Jakarta (Metro and Luwu, if applicable).

USAID. Furnish team guidance, maps and reports where possible, coordinate meetings with GOI, pay overseas and in-country travel for team, provide back-up office support, if needed and pay per diem for team.

GOI. Furnish team counterparts, arrange field trips including contacts, itinerary, vehicles, local guide, contacts and appropriate reservations, provide all maps, data, photos, reports available.

Note: Before team departs Washington, NRECA will investigate the usefulness of color satellite maps of Indonesia and take appropriate action should these maps appear to be helpful.

Project Two Technical Assistance

Step One. Visit technical facilities and collect information through interviews, observation and reports, special attention will be given to facilities: BPPT, ITB, Dian Desa, LMK and others possibly suggested by Minister of Research and Technology.

Step Two. Evaluate strengths and weaknesses of facilities for small hydro equipment R. & D. Consider adequacy of budget, staff, facilities and the products developed.

Step Three. Evaluate the DC Electric Project turbine, assist with scale-up designs and designs for Francis and Pelton turbines up to 100 kW.

Step Four. Evaluate ITB electronic load controller, assist with design modifications and recommend improvements. Provide consultation for safety design to protect mechanical and electrical equipment in failure.

Step Five. Review known donor/development bank/USAID projects or programs planned to assist equipment design and development. Give particular attention to the planned PUSPIPTEK Energy Research Lab

Step Six. Prepare draft report with a planned program for inclusion of small scale hydro into appropriate planned equipment-oriented projects. Included should be discussion of Indonesian and U.S. manufacturers and opportunities for technology transfer through tours, internships, manufacturing under license, etc. Draft report will be left with USAID/GOI.

Step Seven. Return to Washington, finalize report and submit to USAID/GOI.

Responsibilities for Project Two:

NRECA. As described in Project One

USAID. As described in Project One

GOI. As described in Project One

Project Three. Training.

Step One. Review on-going and planned small hydro activities in GOI.

Step Two. Discuss training needs with GOI staff.

Step Three. Evaluate selected candidate sites for training.

Step Four. Prepare training plan on all aspects of site development and management, include academic and hands-on approaches. Courses will include descriptions, cost, schedules, audience, facilities, faculty, manuals and other such important elements.

Step Five. Prepare draft report and leave with USAID/GOI.

Step Six. Return to Washington, finalize report and submit to USAID/GOI.

Responsibilities for Project Three:

NRECA. As described in Project One

USAID. As described in Project One

GOI. As described in Project One

Project Four Strategic Planning.

Step One. Review on-going rural electric and small hydro activities.
Examine relevant agency and institutional responsibilities.

Step Two. Review government energy, resource and national development plans for relevance to small hydro development and management.

Step Three. Meet with and discuss activities of representatives of appropriate policy and planning entities, e.g. BAKOREN, Energy Planning Unit and others.

Step Four. Develop both a policy for small hydro schemes consistent with other policies and plans and a program plan or strategy for implementing that policy.

Step Five. Prepare a draft report and leave with USAID/GOI.

Step Six. Return to Washington, finalize report and submit to USAID/GOI.

Responsibilities for Project Four:

NRECA. As described in Project One

USAID. As described in Project One

GOI. As described in Project One

III. Project Manning

A. Expertise

Project One

Small Hydro Engineer - experienced in field site assessments, prefeasibility and feasibility studies of small hydro systems in developing countries. Civil, Electrical or Mechanical Engineer. Carry out site screening and assessment for power production, equipment sizing, concept design, bid specs, etc. Responsible for report preparation.

Hydrologist - experienced in hydrologic methodology in developing countries particularly for agricultural use. Hydrologist, Civil Engineer, Agricultural Engineer, etc. Apply NRECA hydrologic methodology, evaluate potential for integrating sites into planned and existing irrigation schemes, evaluate hydrologic data, make recommendations for gauging station placement, data collection and analysis. Consider severe sedimentation problem in many Indonesian streams. In field studies, provide hydrologic measurements and calculations. Evaluate maps, data for site identification. Share in report writing.

Sociologist/Economist - experienced in social and economic evaluation of small hydro or other small scale energy technologies in rural setting. Sociologist, Economist, other. Look at social, environmental and economic

impacts of proposed sites, focus on end uses of power, contribute economic and financial analyses for field sites. Share in report writing.

Project Two

Small Hydro Engineer - experienced in micro and mini-scale mechanical equipment design, development in the US and developing countries. Knowledge of Indonesian facilities for manufacturing, R. & D. of equipment. Civil, Mechanical, Aero Engineer or other. Carry out evaluation of facilities, analyze programs/plans for technical assistance, evaluate DC Electric Project equipment and assist with design needs. Responsible for report preparation.

Electrical Engineer - experienced in electrical and electronic equipment associated with mini and micro-scale hydro (and/or perhaps other small-scale technologies). Electrical Engineer or Electrical Technician. Carry out evaluation of facilities, evaluate ITB research effort with electrical and electronic equipment. Share in report writing.

Project Three

Small Hydro Training Specialist - experienced in designing and carrying out workshops, seminars and/or training sessions in developing countries, particularly related to small hydropower development. Carry out all activities of evaluation, plan development and report preparation. Field of discipline requirements is broad.

Project Four

Institutional Specialist - experienced in institutional arrangements in developing countries, knowledgeable of Indonesian institutional organizations, policies relating to national and energy planning, generally familiar with small hydro activity in Indonesia. Carry out all activities of evaluation, plan development and report preparation. Field of discipline requirements is broad.

B. Level of Effort

		<u>Man-months</u>
Project one	3 x 2.5	7.5
Project two	2 x 1.5	3.0
Project three	1 x 1	1.0
Project four	1 x 1	<u>1.0</u>
	Total	12.5

IV. Project Timing

<u>Project</u>	<u>Begin</u>	<u>End</u>
One	First wk Sept. '82	Mid-Nov. '82
Two	First wk Jan. '82	Mid-Feb. '83
Three	First wk Jan. '82	First wk Feb. '83
Four	First wk Jan. '82	First wk Feb. '83

V. Cost

1. Salaries (12.5 man-months @ \$220/day, 6-day week)	65,800
2. Travel (International) (7 round-trips @ \$3000/round trip, Economy class) <u>Option:</u> (7 round-trip @ \$1500/round trip, Budget)	21,000 10,500
3. Travel (in-country) (6 round-trip to S. Sumatra @ \$150/round-trip) (3 round-trip to Ujung Pandang @ \$250/round-trip) (2 round-trip to Bandung @ \$100/round-trip) (2 round-trip to Yogyakarta @ \$150/round-trip) (1 round-trip to Semarang @ \$75/round-trip)	2,125
4. Per Diem (Jakarta 130 days @ \$87/day (Other, 250 days @ \$50/day)	23,810

Total	112,735
NRECA	65,800
USAID	46,935

REFERENCE DOCUMENTS

1. Small Scale Hydropower and Geothermal Energy in Indonesia. Appendix G in Energy Planning for Development in Indonesia E/DI. May, 1981.
2. Rural Electrification in Indonesia: Policy Options and Institutional Alternatives. Lalit Sen. Harvard Institute for International Development. December, 1980.
3. Resource Assessment, Design and Development of Mini Hydro Electric Schemes in North Sumatra. BCI (Enex Group). Final Report March 1982.
4. Micro Hydro Power Plants in Indonesia. (Note: Since Pelita I). PLN July, 1982.
5. Report on the PRE Survey of Hydro Electricity Plant by Cooperatives in West Sumatra District of Pasaman. DGC. 24 January, 1982.
6. Terms of Reference. Survey on Rural Electric Cooperatives. DGC
7. Memorandum of Meeting. USAID. 12 November 1981.
8. Feasibility Study of New Locations for Rural Electricity Project Through the Cooperative in East Java, West Java, Central Java, Special District of Yogyakarta, South Kalimantan, Bali, South Sumatra, South Sulawesi, Nusa Tenggara Barat and Nusa Tenggara Timur. Department of Trade and Cooperative, Trade and Cooperative Research and Development Board 1981. Book I and Book II.
9. NRECA Team Report. PDO Indonesia. Rural Electrification Projects. Indonesia. National Rural Electric Cooperative Association. Jakarta, Indonesia. April - May, 1982.
10. NRECA Team Report. PLN Indonesia. Rural Electrification Projects. Indonesia. National Rural Electric Cooperative Assoriation. Jakarta, Indonesia. April - May, 1982.
11. Energy Assistance Policy Paper. USAID. January 1981.
12. Micro Hydro Electric Power Plant Development and Rural Electrification in Indonesia. Departmental Report R25/75. Prof. J.L. Woodward Papua New Guinea University of Technology. July, 1975.

13. Alternative Strategies for Energy Supply in Indonesia 1979-2003: Analysis of Impacts Upon Capital, Manpower and Material Resources. BPPT /Bechtel, Inc. December, 1980.
14. Terms of Reference, COOP/PDO Evaluation, Rural Electrification Project. USAID. July, 1982.
15. Management of Mini-Hydro Power Plants for Rural Electrification. (Report on a visit to mini-hydro sites in C. Java, E. Java and Bali). Lalit Sen. 10 April, 1982.
16. Letter from Ir. Ibnoe Soedjono to Mr. Robert Davis, 7 December, 1982.
17. Preliminary Back to Office Report- Indonesia - Watershed Development Project I. World Bank Office Memorandum. 8 December, 1980.
18. National Water Resources Policy and Planning Development. USAID. Project Description.
19. Rural Development and Rural Electrification in Indonesia: Problems of Helping the Poor in Developing Countries. Peter McCawley, in Proceedings, Canadian Council for Southeast Asian Studies, Ninth Annual Conference. November, 1979.
20. Indonesia: Issues and Options in the Energy Sector. UNDP/World Bank Energy Sector Assessment Program. November, 1981.
21. Potensi PLTM di Indonesia, Sumatra Selatan, Bengkulu, Lampung/Jambi.
22. Energy Planning For Development in Indonesia. Vols. I-IV. Directorate General for Power, Ministry of Mines and Energy, Rep. of Indonesia and Energy/Development International. October 1981.
23. PUSPIPTEK Energy Research Laboratory. USAID Project Paper.

SUMMARY RECORD OF MEETINGS

1. Bob Ichord
USAID/W. Asia Bureau
Washington, D.C.
Date: 22 June, 1982

2. Dr. Samaun Samadikun
Director General of Power
Ministry of Mines and Energy (Tel. 324217, 323607)

Ir. Djurzan Hamid, Chief
Sub-Directorate of Capital Participation
Minister of Mines and Energy (Tel. 323607)

Ir. M. Pandjaitan, Chief
Monitoring and Regulation of New and Renewable
Energy Resources
Minister of Mines and Energy
Date: 28 June, 1982

3. Mr. Dave Straley
Science and Technology
USAID/Jakarta (Tel. 340001)
Date: 29 June, 1982

4. Mr. Sam Boskin, Chief
Science and Technology Branch
USAID/Jakarta (Tel. 340001)
Date: 30 June, 1982

5. Mr. Will Knowland
Regional Energy Advisor
USAID/Jakarta (Tel. 340001)
Date: 30 June, 1982

6. Mr. Kevin Rushing
Agricultural Officer
USAID/Jakarta (Tel. 340001, Ext. 370)
Date: 30 June, 1982

7. Dr. Lolo M. Panggabean
Coord. for USAID Project
Directorate of Technology Dev.
BPPT (Tel. 304246-0)
Date: 1 July, 1982

8. Prof. Suryono
Senior Advisor
PLN (Tel. 715708)
Date: 1 July, 1982

9. Mr. Cliff Nunn
Resident Manager, Luwu Irrigation Project (USAID)
Palopo, Sulawesi
Date: 30 June, 1982

10. Dr. Jan Gerards
Water Mgt. Specialist
USAID/Jakarta (Tel. 340001, ext. 246/340)
Date: 1 July, 1982
11. Ir. H. Kulitt, Director
Project Budget
PLN (Tel. 715708)
Date: 1 July, 1982
12. Ibnoe Soedjono, Director
Research and Development
Dept. of Trade and Cooperatives (Tel. 370060, 772445, 772448)
Date: 2 July, 1982
13. Hartoyo Notodipuro
Dep. Director of Planning and
Director Center for Analysis of Electricity Problems
PLN (Tel. 791155, 792098, 793908)
Date: 3 July, 1982.
14. Ir. Harry Sosrohadisewojo, Head
Electrical Engineering Department
Institute of Technology
Bandung
(Tel. 022-83316)
15. Robert Davis, Chief
Power, Transportation and Engineering
U.S. Agency for Intl. Development
Jakarta (Tel. 340001)

Additional Useful Contacts

1. BAPPENAS - Mr. Sugan. Local development, local (Rp.) funds. Local organizations local decision - making. (Tel. 352961)
2. BPPT - Mr. Ramelan. Liaison with Ministry of Industry.
3. DGC - Mr. Kardjono, Director General of International Trade. National tariffs, policy for coops using PLN tariffs. (Tel. 792213)
4. Ministry of Public Works - Mr. Sudaryokio, Director General of Water Resources. Plans for development location of photos, maps, data, etc. - probably in regional offices.
5. USAID
 - a. Mike Hauben - Citanduy Project Manager.
 - b. Enrique Barieu - National Watershed Project Manager.
 - c. Rick Mackmer - Rural Development.
 - d. Bill Ackerman - Luwu Irrigation Project Manager.

6. WB
 - a. P.T. Reddy (Indian) - Irrigation Engineer
 - b. Azad Khan (Pakistan) - Irrigation Engineer
 - c. Masud Mayin - Irrigation Engineer
(Tel. 587871, 587874, 8th Floor, Arthaloka Bldg.)
Excellent Contact:
 1. Water data, Irrigation Information.
 2. Solo R. B. Project.
7. Ministry of Mines & Energy - Ir. Abdul Kadir, Director of Power Development.
Often acts for Dr. Samaun Samadikun (Tel. 324423, 323607)
8. Directorate of Irrigation (Tel. 713704, 710989, 775381)
 - a. Gatot Sunarjo, Chief, Planning Division.
 - b. Ir. Sihous Beng, Dep. Chief Planning Division.Excellent source of information on the Luwu project, reports on rivers, hydro feasibility, etc. on Sulawesi.
9. David Warner
Engineering Advisor
USAID/Jakarta (Tel. 340001 ext. 222)
Dave will serve as the principal USAID contact for the NRECA small hydro team.
10. Ir. Sjoufjan Awal, Chief
Project Dev. Office
Department of Trade and Cooperatives (Tel. 323963)
Works directly with NRECA in developing rural electric cooperatives.
11. Ir. Ibnu Subroto (Ibnoe Soebroto)
LMK/PISFP
PLN (Tel. 793908, 791098, 791155)
He runs the mini hydro facility at Cipayung and generally coordinates small hydro work at LMK. Chief of Mini Hydro, Power Research Institute.
12. Robert Davis, Chief
P.T.E.
USAID/Jakarta
Bob will Maintain overall responsibility for NRECA small hydro team activities.

Malaysia Meeting Record (Summary notes)

Hoesni Nasaruddin, Project Manager
Mini Hydro Project
LLN (National Electric Board)
Kuala Lumpur
Malaysia
Tel.

10 July 1982

Met with Hoesni and staff (names and positions are attached of those attending) - others were in the field. One project Engineer was in China for the UN mini hydro conference).

Within the N.E.B. upper management, there is political bias toward some sites regardless of cost. Mini hydro program staff are also resisting pressure from upper NEB management and Stanley to bring in contractor from U.S. (Stanley) to do the site work - too expensive and does not recognize in-country capability. Hoesni dismayed at high cost figures from Stanley/Tudor.

The scope of UN assistance includes:

- 3 months - 1 person to organize conference
- 6 months - 1 person to provide technical assistance, advise on local manufacture, other topics.
- 1 month - hydrologist.
- fellowships for 4-6 people who are involved in program implementation.

NRECA is being looked at for the first two items. RCTT is to bear per diem and transportation costs, NEB will host - transportation, in-country, etc.

On the conference UNIDO, ESCAP, SKAT, and NRECA will all be involved - it's not clear how but there's a clear division between UN and SKAT/NRECA. NRECA will submit scope for technical assistance/conference planning to RCTT immediately.

Although the wish is for a Nov. '82 conference, it could be slipped. Plenary papers should be presented, but the emphasis should be on interaction, information exchange between neighbors involved in mini-hydro. Papers/discussion groups first week, field trips the second. Focus on appropriate technology and local equipment - use of slides, methodologies.

There is an interest in Malaysia in being the focal point for information on mini-micro hydro which would be compiled and sent out to Asia/Pacific.

Notes on equipment:

1. 2 turbines are being fabricated and installed -
 - Propeller turbine - local workshop. Doing 5 more. Fixed blade, adjustable vane, 48 kW. The site is Sungai Machap. An irrigation drop structure 7 M head. Retrofit. Manual control grid connected. Tourist area to be developed.
 - Cross-flow turbine - designed from SKAT with local mod. 72 kW. 30 M head. High density polyethylene pipe - 14" diameter, used for penstock. Site is Sungai Tapah Kanan. Using electric load controller made by Hetley. Have also looked at other ELC's, i.e. Keytronic (Australia), Fuji Electric (Japan-see brochure), China. (Note: ITDG is not making/selling any ELC's right now - they're involved in a lawsuit.)

2. Cross flow units in parallel. Planning to develop three 50 kW units on common shaft with belt drive.

Request for technical assistance:

1. Electronic load control equipment level. Modify Fuji unit perhaps - look to other equipment for potential for local manufacture and use.
2. Refine existing propeller and crossflow designs, increase their capacity - develop parallel units concept.
3. Program for ease of maintenance.
4. Pattern designs for casting (Aluminum/Bronze) buckets for peltons, and blades for propellers.
5. Background material on peltons - information on manufacture up to 100 kW.

Miscellaneous Topics:

Hoesni is developing policy paper on management - below 50 kW units for local management - KED currently controls all power generation. There is a stream sedimentation problem from logging. There is a strong need for local contractors to become innovative, less risk-oriented, in sites with difficult terrain and weather.

Those present at meeting at NEB, Kuala Lumpur on 10 July

NAME POSITION

- | | | |
|----|----------------------|--|
| 1. | Dr. David Zoellner | Manager, Small Hydro Program, NRECA. |
| 2. | Amimuddin b. Ariffin | Asst. Project Engineer (Civil) Mini Hydro. |
| 3. | Zulkifile Osman | Asst. Project Engineer (Civil), Mini Hydro, LLN. |
| 4. | Hardeep Singh | Asst. Project Engineer (Electrical) Mini Hydro, LLN. |
| 5. | Ammil Mahamud | Asst. Project Engineer (Mechanical) Mini Hydro, LLN |
| 6. | Kamaruzaman Jamil | Asst. Project Engineer (Electrical) |
| 7. | Mashitah Jamaludin | Asst. Project Engineer (Mechanical) |
| 8. | Hoesni Nasaruddin | Project Manager Mini Hydro. |

DOCUMENTS COLLECTED IN MALAYSIA

1. Report on Visit to the National Electricity Board the States of Malaysia. Mini Hydro, Kuala Lumpur. U. Meir. Swiss Center for Appropriate Technology (SKT), June 1-3, 1982.
2. Carta Turus Tempoh Perlaksanaan, Projek-Projek Mini Hidro Hingga. LLN. June, 1982.
3. Experiences in the Development of Mini Hydro Stations in Peninsular Malaysia. H. Nasaruddin. July, 1982.

4. Joint UNIDO/ESCAP Senior Expert Group Meeting on the Creation of a Regional Network System and the Assessment of Priority Needs on Research, Development and Training in the Field of Small-Mini Hydro Power Generation. Hangzhou, People's Republic of China, 12-17, July, 1982. Md. Zubir Zainal and Hoesni Nasaruddin.
5. Carta Organisasi Jabatan Mini Hidro. LLN. 1982.
6. APR - Junior and APR-III AC Power Regulators. Fuji Electric. Co., Ltd.

Fiji Meeting Record

Anthony Pagani, Director
Small Scale Industries Project
UNIDO
Suva
Fiji

12 July 1982

It will appear costly to transmit power from Monasavu, a large hydro site under construction, to all remote areas. Small hydro survey(s) have been carried out on Fiji by various people - U.S. Peace Corps, NZ, U.N., etc. U.N. looked at one or two streams and held a small local workshop. A 15 kW system currently being developed should be finished in August.

Rainfall is unpredictable in Fiji - heaviest in the East. May need hybrid hydro-diesel systems where flows are uncertain. Thinks someone could look at 6, 10, or 12 sites and after the survey do prefeasibility studies on the best.

His chief project effort is the Rural Service Project, (RSP). It is well-designed. Many types of small equipment, note electric and mechanical are designed and manufactured for use on the local level. A service unit (repair shop) is also constructed for local maintenance. This appears to be an excellent source of productive use equipment, and the service units are an excellent base for maintenance.

Paul Worrall is a Volunteer Service Overseas engineer with RSP. Pagani would not release any reports, photos, etc. without consent of Arthur Holcombe, Regional Representative of UNDP. (Note: Craig to try to get the material and forward it to NRECA.)

Robert Craig, Director
Regional Development Office
USAID
Suva
Fiji

13 July 1982

Currently the South Pacific Economic Commission (SPEC) is planning to use \$6 x 10⁶ from EEC and \$2 x 10⁶ from the UN for renewable energy development projects. (Project outline is attached) SPEC is the executive arm (secretariat) of the Pacific Forum an annual meeting of regional Prime Ministers. Another regional body, the S. Pacific Commission (SPC), funded by USAID, "colonial" in history (how it is currently perceived), is not too active currently, but may be in the Fall. The U.S. puts up 17% of the SPC budget, Australia puts up 30% and regional countries much of the rest. Much antagonism in SPC over who's in charge of what.

SPEC is lightly staffed - expertise must come from UN and expats.

Two important Fall energy meetings:

1. Sept. (21-25?) - SPEC. Presentation of country papers, discuss SPEC staff list of projects, donors present, where and how to proceed. USAID will be present in Fiji.
2. Sept (?) - SPC Conference in Tahiti. Technical and political aspects. USAID will be represented.

Reports will be prepared on both meetings re. technical and political policy.

USAID has no bilateral program. Budget is approximately $\$4.5 \times 10^6$ - $\$3.0 \times 10^6$ of which funds PVO's (Note: see attached '81 Annual Report). Rest goes to SPC and the University of South Pacific. Some money in Title XII with Cornell - University of South Pacific - University of Hawaii to upgrade agricultural school and extend agricultural services. The $\$3 \times 10^6$ is spread out in 21 Operational Program Grants to 16 PVO's and 5 Peace Corps projects. The PVO/PC approach seems to be what works in the South Pacific. Bob needs information on micro, say, up to 25 kW, for distribution in the region. Bob will pass A. Inversin resume around to see if there's interest among PVO's in the field in appropriate countries. PVO's would provide local assistance. Bob unclear about in-country travel.

Peter Johnson
Ministry of Energy
Suva
Fiji

13 July 1982

The Ministry of Energy is a fledgling organization. Until EEC money came along, there was only the Minister (Bill Clark), Peter Johnson and Suliana Siwatibau (alternate energy). They're growing now, Peter has a Deputy (Herb somebody from Missouri State Energy Office), a Canadian and they're continuing to search for staff. Their role is to coordinate energy planning and development in Fiji with the Fiji Electricity Authority (FEA) and the Public Works Department (PWD). (Note: Dennis Blackett, Principal Engineer, PWD.) The PWD will be responsible for small hydro - they have some 65 schemes now and are interested in 40 more 7-50 kW range.

The Ministry of Energy will try to focus on policy aspects of energy development.

There is a need for a rural electric assessment in Fiji. Currently, $\$50$ /household for genset and wiring, plus 8-10¢/kWh for fuel plus approximately $\$200$ /year for inspection/maintenance. Plant sizes are too big, maintenance costs are getting too high, loads are low - mainly for lighting. Would like to

- Put up 3 KVA sets for 10-20 house areas.
- Change fees to 40-50¢/kWh - central, $\$1.00+$ /kWh for remote to cover maintenance fees, engineering, etc.

Dr. Tony Weir
Senior Energy Office
S. Pacific Bureau for Economic Co-operation (SPEC)
Suva
Fiji
Telex 2229 FJ; Tel. 312600

Mr. Tommy Scanlan
Project Officer
SPEC

14 July 1982

SPEC, especially Dr. Weir (formerly with University of South Pacific), is interested in NRECA work in rural electrification in other developing countries. Feels there's a need for that kind of assistance in Fiji and other S. Pacific countries that will be getting EEC aid.

Mini hydro schemes on Fiji currently used only for lighting-low load. Feels PV would be cheaper than existing diesel. In Fiji a 40 W PV scheme would be cheaper, easier to maintain than a 100 kW diesel genset.

Mini hydro schemes would be good on PNG, but he feels true costs of mini hydro schemes are underrated, especially where engineering design time is concerned. Feels village level input of materials and labor, including housing the foreman, are required. Believes careful and appropriate designs must be undertaken. There are plenty of small Mission sites - Taveuni, PNG, Fiji, Solomons that have been operating for years. A 100 kW scheme on N. Taveuni is being developed with assistance from New Zealand - the stage of development and management scheme are both under question. On the Solomon islands of Malaita and Isabel there are schemes developed by New Zealand at Malu and Buala respectively, in the 50-100 kW range. Volcanic activity is a caution when developing sites in the S. Pacific.

Following the SPEC conference in September a regional overview document should be available. Following revisions, etc., specific country reports should also be available - at a somewhat later date. Feels that there is good potential in Vanuatu, particularly on Pentecost Island and Efate Island - plenty of mountains, water and possibly rainfall data (at SPEC)?

D. Zoellner promised to send publications on IPD and small hydro.

DOCUMENTS ACQUIRED IN FIJI

1. Lists of Maps and Reproduction Service Available from Lands and Survey Division of Ministry of Lands and Mineral Resources.
2. Pacific Energy Program and Provisional Agenda and Program. Letter to U.S. Ambassador Eckert from J. P. Sheppard, Director a.i., SPEC.
3. U.S. Private and Voluntary Organizations Take the Lead in AID's Unique South Pacific Program. Robert V. Craig, Sr. USAID. July 10, 1981.
4. Tentative Core List of Energy Projects for EEC Funding. SPEC. July, 1982.
5. United States Aid in The South Pacific. South Pacific Regional Development Office. USAID.
6. Save the Children Reports . . . on Tuvalu. 1982 Save the Children.
7. Rural Energy in Fiji: a survey of domestic rural energy use and potential. Suliana Siwatibau. 1981.