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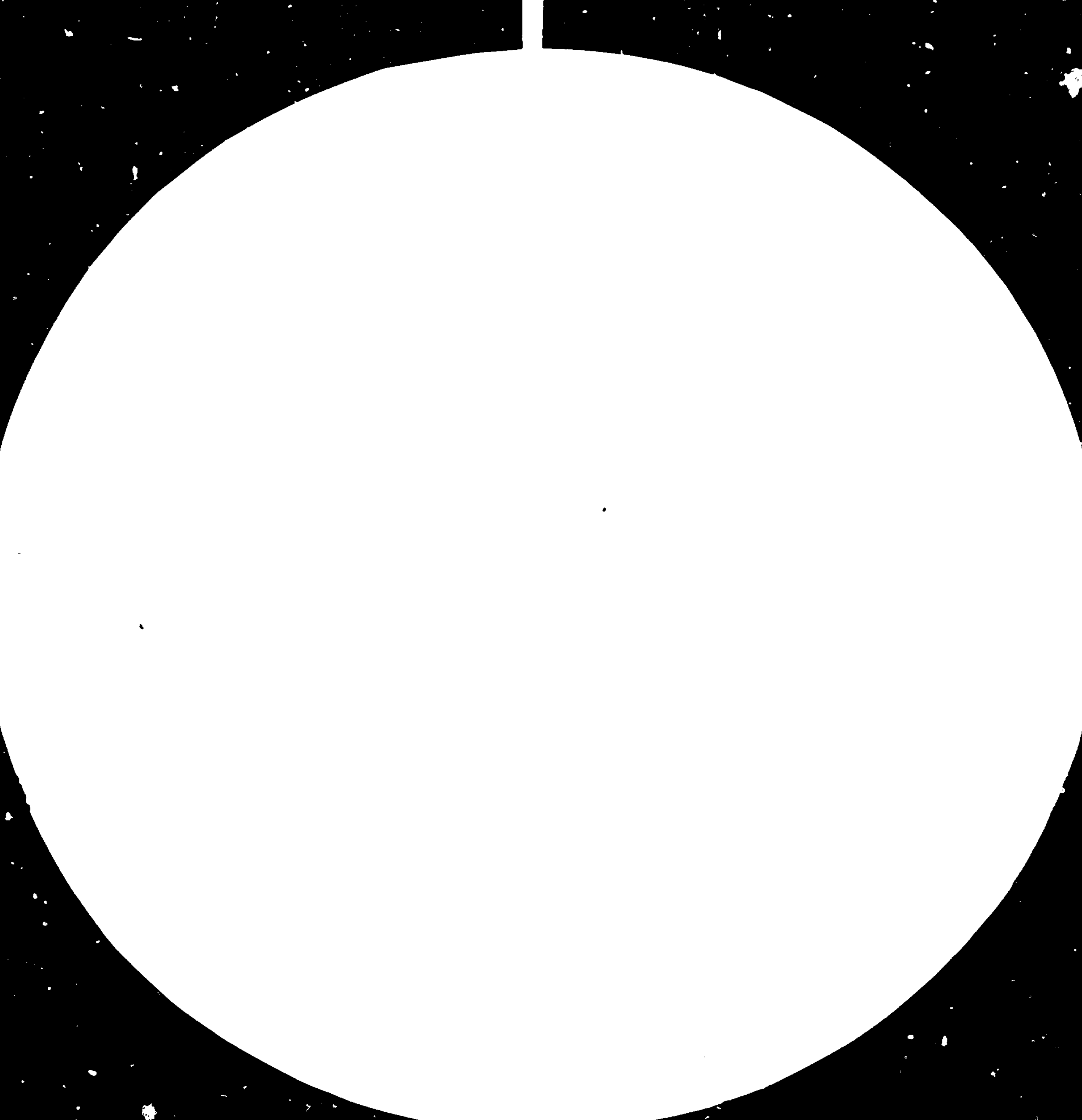

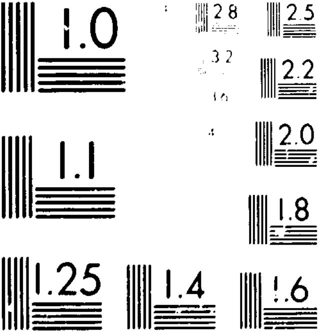

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Joint UNIDO/ESCAP Senior Expert Group Meeting on the Creation of a Regional Network System and the Assessment of Priority Needs on Research, Development and Training in the Field of Small/Mini Hydro Power Generation

Hangzhou, People's Republic of China, 12-17 July 1982

PHILIPPINE PROPOSAL.

for the Management of the Regional Centre in Small/Mini Hydro Power Generation

Hangzhou, People's Republic of China*

by

Zenaida A. Santos**

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INTRODUCTION

The Philippines is in the second year of a seven year programme to construct 300MWs of mini-hydro power plants. Six power plants with an aggregate capacity of 10MWs will be commissioned this year. Construction will be started on another 16 plants by the end of the year. Feasibility investigations have been completed on some 82 sites with a total potential of about 95 MWs.

The suggestions given below are based on our experiences at this early stage of the programme. The main objective we have in the programme is to maximize energy output within the constraint of generating power at a cost equal to or less than the local National Power Corporation grid rates. To achieve this objective, we have concluded that we should concentrate on the development of the larger sites first; and, in any case, to only develop sites with a potential of more than about 600 KW.

Given this decision, our experience has been that the areas most in need of strengthening in order to accelerate our programme are hydrological analysis and low cost design.

1. Regional Network on MHG

A. Newsletter - An important area of action for any regional network is that of exchange of new ideas and experiences. The publishing of a quarterly newsletter should be quite useful in this respect.

A newsletter might consist of a regular section of progress reports on country programmes. For each issue, 2 to 4 contributed papers on technical or policy aspects of MHG could also be included. Possibly, equipment manufacturers might finance publication in return for advertising space.

B. Topical Seminars - Many countries of the region are facing the need to train relatively inexperienced personnel on MHG technology. Seminars on specific topics of interest, could be arranged on a regional basis. Such seminars, to be useful, should not cover broad general subjects but rather be focused on in-depth review of specific topics.

For example, a seminar on penstock design and construction techniques could be very useful. It is our experience that, in considerable measure, the economic viability of small hydro plants revolves around the question of penstock costs.

Other seminars might be held on site selection, dam design and equipment availability and selection.

2. Research and Development (R + D)

A. Low Cost Design + Construction Techniques - With the limited potential of MHG power plants, it is critical to viability to keep civil works costs to a minimum. The design problems for MHG are in many ways unique to the field. This uniqueness is determined by the typically remote, very rugged location and by the limited type and amount of construction. Most engineering curricula give little attention to problems similar to those faced by the MHG specialist and typically, as of today, there has been little practical experience developed.

An effort to collect and publish available ideas and experiences would be a useful service for design engineers in many countries of the region. If funds could be found, a project to extend the knowledge of lower cost construction techniques could provide long run value.

B. Interpretative Hydrology - Generally speaking, there is little specific data on the hydrology of the small streams suitable for MHG power plants. Thus, site selection and equipment optimization have to be done with hydrological assumptions derived from models of rainfall, watershed and run-off as supplemented by data from gauging stations on any larger streams in the vicinity.

A compendium of interpretative hydrology techniques derived for Asian conditions and written for the Asian engineer would be highly valuable.

C. Power Plant Optimization - The MHG engineer must select equipment, choose the site and design civil works under conditions of considerable uncertainty and with different objective functions in mind.

Objectives can vary from programme to programme and even sometimes from site to site. Objectives might be:

1. maximization of energy capture at, or below a given cost;
2. minimization of generation cost,
3. development of maximum reliable power (where reliable might be defined as available at least 90% of the time).

These objectives must be served in the real world where availability of equipment is not continuous but comes in discrete steps. Questions must be answered on type and number of units and on site development.

The preparations of a computerized programme for optimization of the general design parameters of a power plant would be very useful. Optimization against any one of at least the above objective functions would be necessary.

3. Training

A. Working Seminar on Power Plant Design - A strong need is to develop an expanded capability as rapidly as feasible on the part of young engineers.

The development of a 3 to 4 month course in which participants would be engaged in the conceptual development of MHG power plants for specific sites would be very useful. The course would involve field investigation of real sites and team development of conceptual designs with critical review by a panel of engineers with extensive MHG experience.

B. Cost Estimating - Feasibility decisions and construction contract evaluation cannot be efficiently accomplished without accurate and reliable cost estimates. Little practical experience exists on cost estimation for small construction projects at remote mountainous sites.

A training programme in this area could be most valuable. The programme should cover estimating of costs for construction in difficult sites.

C. Interpretative Hydrology - Refering back to the earlier suggested (2b) need for research on hydrology, a similar training requirement exists.

4. Center Management and Operation

Some ideas for the center are:

A. An advisory board composed of representatives from the countries of the region should be formed. The advisory board would provide suggestions on programmes and operations to meet the needs of the countries of the region.

B. Provisions should be made to have persons from the regional countries assigned for 1 or 2 year tours as staff members of the center.

C. One useful function of the center might be to monitor programme developments in the region and to provide a point for the development of regional programmes to meet the specific technical needs arising from country programmes.