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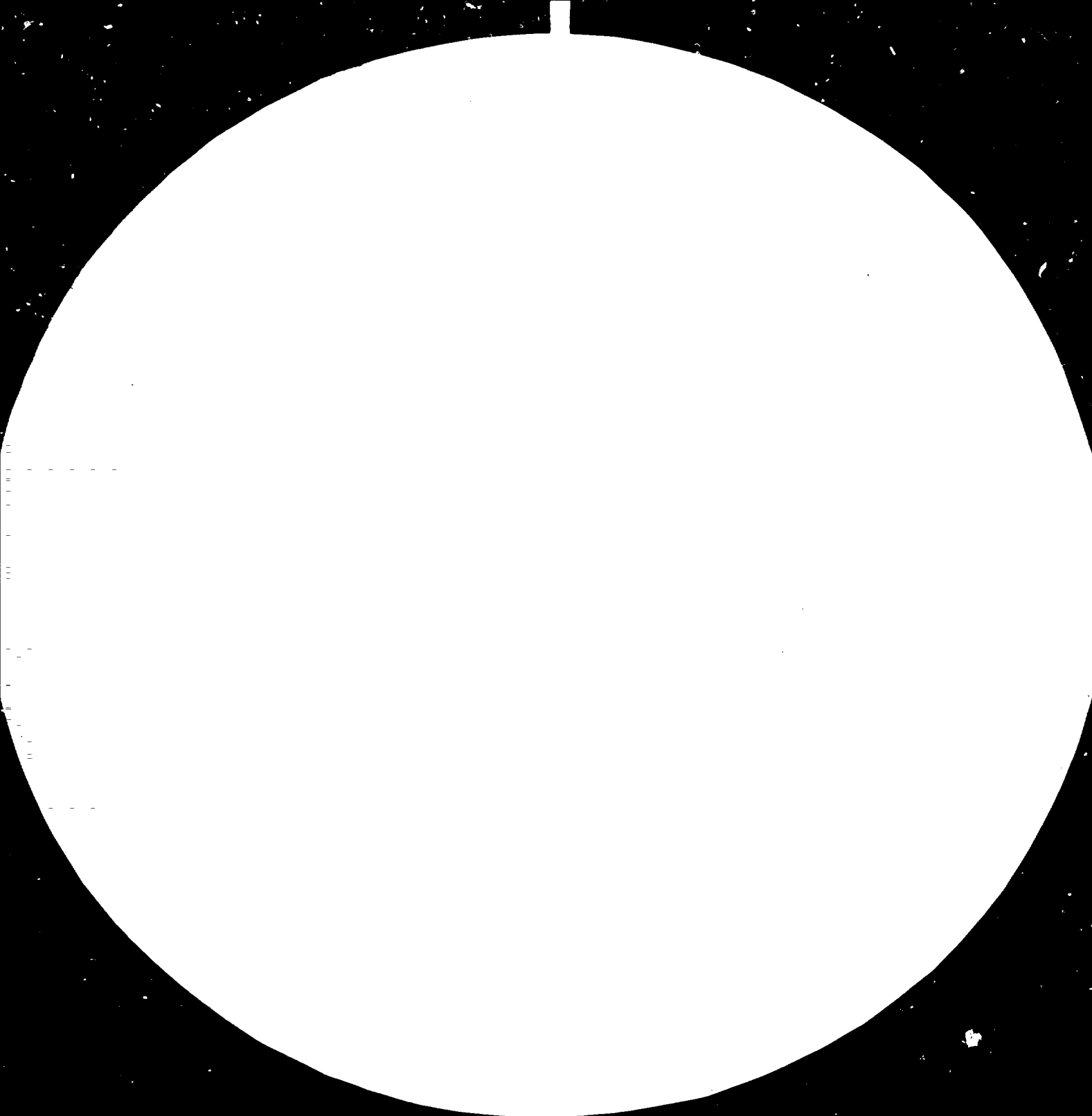
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12001



United Nations Industrial Development Organization

Distr.
LIMITED

ID/WG.376/8
10 November 1982

ENGLISH

Joint UNDP/UNIDO/ESCAP/China 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, P.R. China, 12-17 July 1982

DRAFT NOTE FOR DISCUSSION*. (Hydroelectric power).

by

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V.82-33607

1. Concept of an ESCAP Regional Network System and Applications

The basic objective of a Regional Network System for Small and Mini Hydro Generation is the integration and dissemination of the relevant techniques for SHG/MHG development and the associated research, development and training efforts. In most developing countries energy from SHG/MHG is considered as useful incremental energy although exhibiting often inherently random features. The extent of development and economy of SHG/MHG energy is related to the approach and technology adopted. Therefore, the main thrust of the regional network system should be towards achieving interchanges between the countries which would enable the maximum development of low cost SHG/MHG energy within the individual constraints. The following are considered useful aspects for regional co-operation through the network system.

1.1 Technical Aspects

1.1.1 Methodological improvements, simplifications and standardisations for the following.

- Location and order of hydropower development
- Hydrological, topological and geological feature identification.
- Head, flow, capacity, water conveyance, type of turbine - generator, general and electrical layout determination.

1.1.2 Commercially available electromechanical technologies, their individual suitabilities, and local adaptation for cost minimisation. Economic water conveyance systems and alternative material applications. Construction techniques. Cost breakdowns.

1.1.3 Acceptable standards for civil and electromechanical aspects. Failure reports and analysis.

1.1.4 Research and development efforts.

1.2 Economic Aspects.

1.2.1 Standardised project formulation procedure and economic viability demonstration for integral and/or external financing consideration. Determining development priorities.

1.2.2 Methods of Financing

1.2.3 Project cost breakdown and unit costs. Basis of sale when relevant.

Possibilities for private sector enterprise.

Pricing policies.

1.3 Operation, Maintenance and Training Aspects

1.3.1 Operating modes and procedures. Multipurpose constraints. Safety and reliability ensurance. Management and staffing.

1.3.2 Maintenance of civil and electromechanical components. Scheduled and breakdown maintenance.

1.3.3 Approach to training. Institutional framework. Training programme. Course structures for different types of personnel. Pilot programme. Funding.

2. Research and Development Needs

In general SHG/MHG technology is mature and what is relevant here is the adaptation and innovation bringing perhaps the conventional approaches to meet specific conditions in each individual country. The following are considered useful discussion aspects.

- 2.1 Technological progresses leading to cheaper and adaptable arrangements such as the use of cross flow turbines and asynchronous generators. Commercial availabilities of units and components. Reference costs.
- 2.2 Constructional technique developments leading to cheaper waterway and power plant arrangements. Typical designs. Reference costs.
- 2.3 Equipment and material testing for penstock and turbine-generator manufacturer. Construction method analysis. Transmission and distribution considerations.
- 2.4 Pilot Plants. Funding of research and development. Transferring the technology to the industry.

3. Training Needs

Training is an essential component for the success of SHG/MHG plans in any country. It should give the conventional as well as the non-conventional approaches to hydropower development. General categories of personnel ranging from engineers with development responsibilities of operators. The institutional framework for training should be in keeping with the existing SHG/MHG developments and those envisaged in the foreseeable future.

- 3.1 In general, engineers with a good theoretical and practical background require less formal training. It is more important for them to study in depth relevant SHG/MHG literature both commercial and non-commercial including project reports, spend short times in manufacturing and project sites, feasibility study and design teams, and produce comprehensive well illustrated reports for critical review by non-experienced and trained engineers.

Besides the civil, mechanical and electrical view points it is important that engineers for SHG/MHG should have a knowledge of industrial processes, economic evaluation, operations research and simulation principles.

3.2 The training needs for the subordinate classes of feasibility study assisting, fabrication and erecting assistance, and operation and maintenance personnel should cover the following aspects.

- Basic engineering technology.
- Basic operating principles of MHG and associated equipment.
- Interpretation of technical drawings and operation manuals.
- Use of instruments.
- Maintenance and repair of the civil, electrical and mechanical components of standard MHG arrangements.
- Identification of mechanical and electrical malfunctions.
- Workshop practice.
- Safety procedures.
- Methods of water flow assessment. Interpreting and processing records and graphical information.
- Methods of head assessment. Interpreting topological information and cartographic material.

These should be well supplemented by thorough practical training with actual or pilot projects under supervision and guidance.

3.3 The institutional framework within which the training takes place is important and would normally involve co-operation between universities, technical institutes, research facilities and electricity utilities. The level and sources of funding available would determine the program extent.

4. Management and Operation of the Hangzhou Regional
Centre for Research, Development and Training in
SHG/MHG

It is suggested that this centre should be managed by a group of representatives from the ESCAP countries and relevant UN and non UN organizations with direct interest in SHG/MHG. The country representation and funding could be related to the scale of SHG/MHG activity existing and proposed. The following are possible services which could be expected from the centre.

- 4.1 Library extending reference facility on a comprehensive collection of commercial and non-commercial publications covering SHG/MHG including project reports, case studies etc. on projects and equipment development. Research and development publications should also be accessible through this library.
- 4.2 Provide constructional details of SHG/MHG arrangements for various physical conditions, recommendations on layouts and material usage, reference prices, likely operational problems and remedial actions, modes of operation possible, pricing policies, management and staffing, training suggestions etc. with suitable documentation where possible. The centre should of course receive such data in the first instance and do processing and validating before dissemination.
- 4.3 Provide broad based training courses with suitable literature. The presence of a comprehensive collection of typical equipment found in SHG/MHG developments with illustrations of their principles of operation would be advantageous.

