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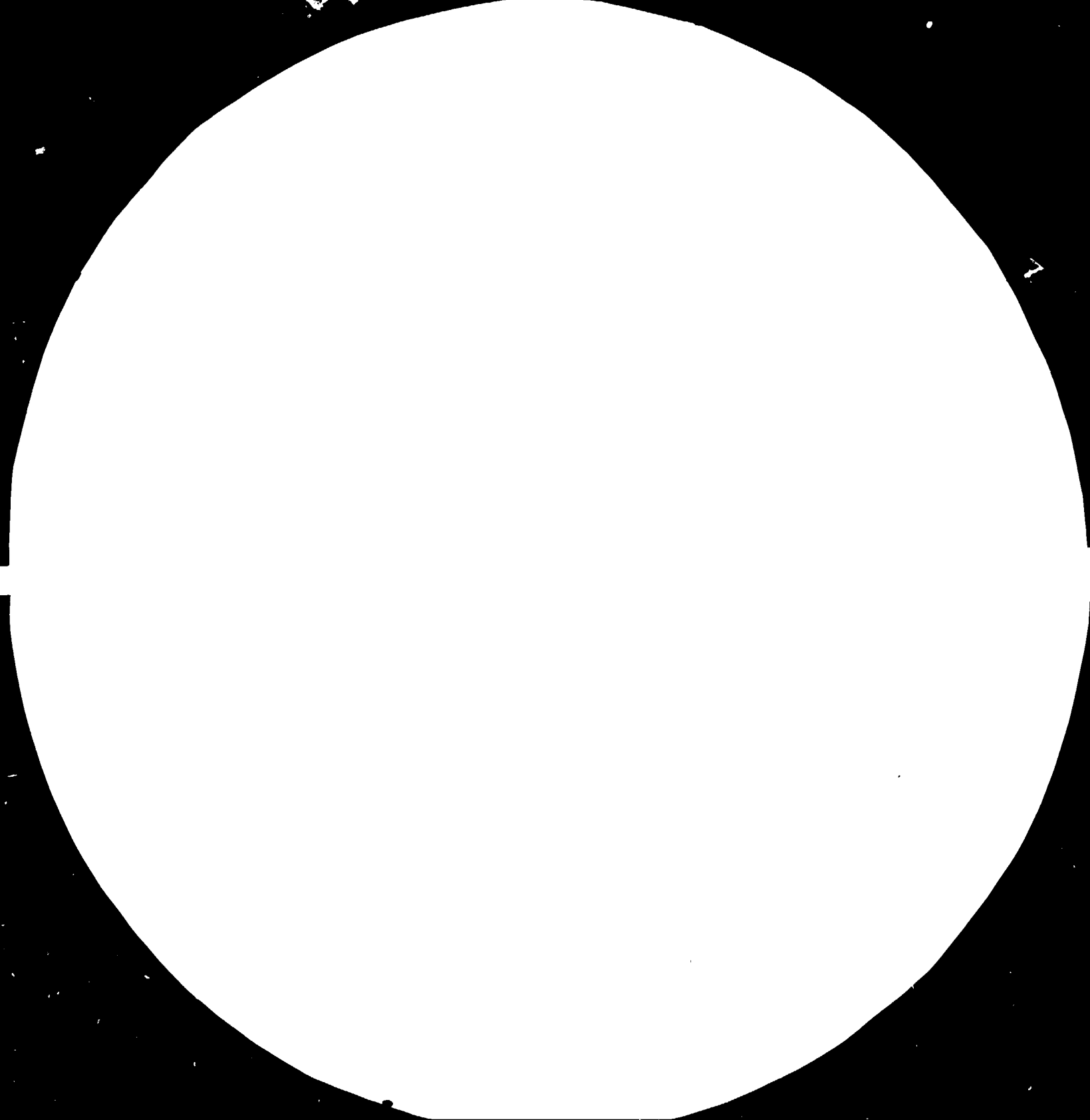

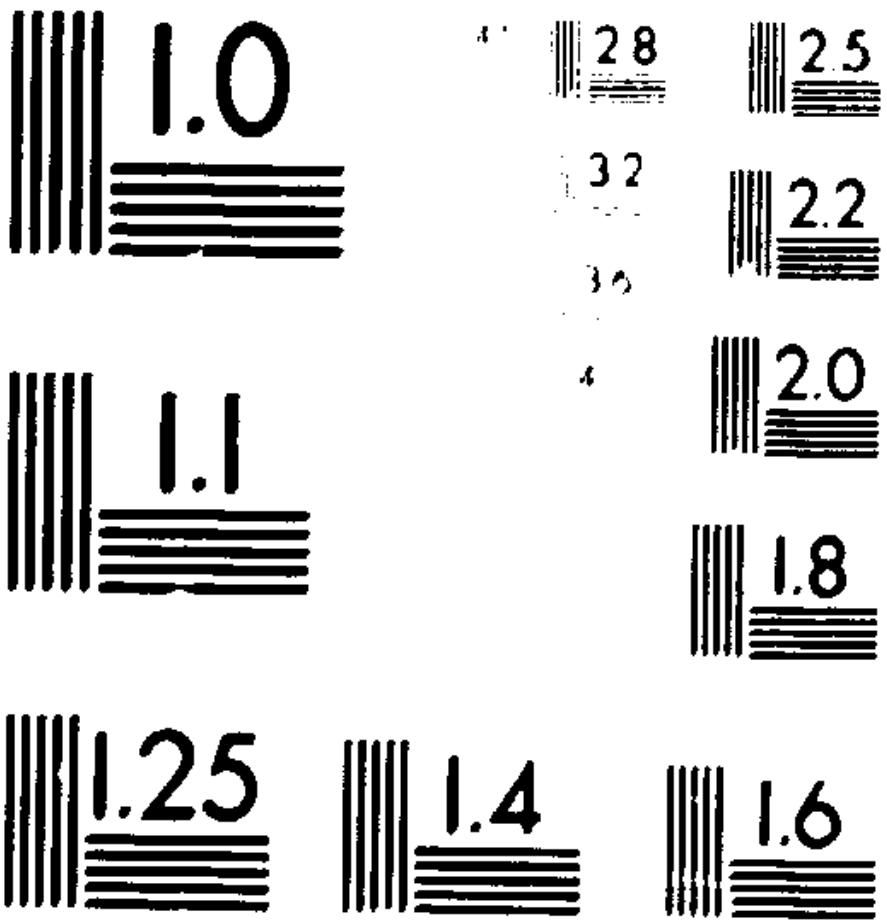

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ESCAP Regional Energy Development Programme (REDP)
Regional Network for Small Hydropower (RN-SHP)

Technical Advisory Group (TAG)
First Meeting

Hangzhou, China, 11 - 13 December 1984

COUNTRY PAPER: THAILAND*, (Small hydropower).

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Introduction

Although small hydropower plays a modest role in Thailand's energy scenarios in comparison with fossil fuels and major hydros in rural electrification, it gains substantial momentum, especially in the area where villages are so widely dispersed and far from national grid that the extension becomes economically and technically unfeasible. Nevertheless, its widespread has been hampered by its high capital cost which resulted in the unfavourable long period of investment return. To enhance bright prospects of small hydropower in future, serious considerations should be taken so that all possible activities be oriented towards solving this hinderance.

1. Priority Subjects

The meetings and workshops on small hydropower organized previously could be considered as satisfactory. However, subjects dealt with in those meetings were oriented towards fundamental knowledge of small hydro development. They are excellent in their own context but their contribution to the cost reduction of the project is questionable.

With this concept in view, priority subjects for future expert group meeting, workshop and training courses are thus proposed as follows:

i) Expert Group Meeting

Subject — Feasibility study

Objective — To identify various drawbacks and inappropriate criteria and methodology currently employed in the feasibility study of small-scale hydro and formulate a new internationally recognized standard manual, specifically tailored for the feasibility study of small-scale hydro schemes.

Participants — Experts from member countries as well as from international and United Nations Organizations and from technical and financial sectors.

Justification — Feasibility study is the decisive factor for the existence of project and it is mandatory. Since small-scale hydro is rather a newly emerging area, the criteria and methodology currently employed by the financial institutions was adopted from the conventional one used for the feasibility study of major hydro. They are inappropriate and consume substantial time and money, which small-scale hydro cannot afford. In addition they are oriented towards financial benefits rather than economic. As a result many projects good for rural development were discarded simply because their overwhelming intangible benefits could not be counted in the evaluation and the projects thus became infeasible. A new criteria and methodology specifically tailored for small-scale hydro have to be innovated.

ii) Workshop

Subject — Design and construction of low-cost civil works

Objective — To exchange and compile information and experience in the design and construction of low-cost civil works in various countries.

Participants — Experts from implementing agencies in small-scale hydro from member countries and also invited experts from outside the region.

Justification — The major cost of the small-scale hydro is the civil works and in some cases occupies as much as two-thirds of the project costs. The simplified standard design and construction approach to alleviate the cost of civil work will help to increase the economic viability of the small-scale hydro projects.

iii) Training Courses

a) Subject — Civil Works Design

Objective — To train junior civil engineers in the design of low-cost civil works.

Trainees — Junior civil engineers from the region.

Justification — Civil works is the major investment portion of the small-scale hydro. However, the civil work can be designed and constructed by local engineers at reasonable cost providing that they have the appropriate information and experience. Unlike the mechanical and electrical counterparts, the knowledge of civil design existed in all countries of the region. In addition, their acquaintance with local materials available and site conditions offer merits of their work. In many cases, especially for small hydro in remote areas, these qualifications have evidently proved to be of great advantages to the design of low-cost civil works. This course will broaden the horizon of these engineers and thus strengthen their capabilities in this field.

b) Subject — Small Propeller Turbine Design

Objective — To train mechanical engineers in the design of small propeller turbine for irrigation canal.

Trainees — Mechanical engineers

Justification — In rural areas of many countries in this region, the governments have constructed many small weirs and canals for irrigation. These weirs and canal drops offer excellent small hydro potentials for electricity generation or mechanical power that the farmers in the vicinities can utilize. Yet, these potentials have not been harnessed, its constraint is the costly generating equipment, particularly the turbine. Therefore the know-how of small propeller turbine design, probably in the range of 1 to 5

kilowatts, and exchange of information on locally manufactured low-cost propeller turbine in order to increase the productivity and improve the quality of life of a large sector of population will be greatly beneficial to the rural poor.

2. Priority Subject Areas for Joint/Co-operative Research Projects

In hydro-electric generation it is vital that the frequency has to be constantly maintained no matter how the load varies. Normally, hydraulic or electro-hydraulic governor is used for controlling the speed. This type of governor required sophistication in design, precision in manufacturing and highly trained personnel to adjust and maintain. Therefore, they are supplied by only a handful of manufacturers around the world, and of course, at a very high price. The electronic load controller recently developed and introduced to the market opened the new era of low-cost, but near free maintenance governor.

In our experience as the user and manufacturer of the load controller under the license from U.K. for over five years, the load controller proved its claim. However, its limitation in capacity (not over 100 kW) and in application (consistent amount of water discharge)and the problem of heat dissipation of the dummy load together with its performance that does not allow synchronization with other machines made its application confined to the small, isolated run off the river with high discharge hydro scheme. Nevertheless, its concept and performance are quite impressive. In addition its low-cost makes it challenging to explore into the possibilities of modifying it for flow controlled application. In this new application the electronic part will function as a frequency sensor. The change in frequency as the result of the load variation will transmit the electric command signal to drive the gear motor coupled to the flow control valve which will increase or decrease the flow according to the requirement. Thus the turbine speed will be constantly maintained.

At present, the National Energy Administration is developing this type

of governor. The performance of the prototype simulated in the laboratory was encouraging and actual field test will be carried out soon. However, the perfection of its performance requires further research work. In this regard, Thailand proposes the development of this type of governor as the priority subject area for joint and co-operative research projects.

3. Areas and Type of Activities where Thailand could take the Lead for Organizing Decentralized Projects, Subject to Availability of Financial Support

The area of activities that Thailand can propose to take the lead for organizing decentralized projects is on-site training course on the co-operative approach in the management of construction and operation of small hydro for rural villages.

In Thailand, many rural villages in remote areas, have enjoyed better quality of lives through electricity from small decentralized hydro power developed and managed by the villages themselves. In each project the villages will form among themselves a co-operative in joint venture with the Government to construct small hydropower stations in their vicinity. The villages contribute free labour and free local materials. The Government provides the rest including generating equipment as well as technical assistance. The contribution from two sectors will be converted to shares which will be held by all participants. The revenue from the electricity will be shared among the shareholders. With this approach the Government can reduce the investment on rural electrification and allocate the burden on the operation and maintenance on remote decentralized stations. The villagers on the other hand, will benefit from the increase of productivity and enjoy better living conditions through electricity and co-operative benefits.

This approach can be duplicated in every country in the region providing that the technique of management and the will of people to co-operate exists. Thailand proposes to offer on-site training course in this know-how to the countries of the region, subject to availability of supporting funding will be made available from the UN organizations.

5. Information on experts, consulting and engineering companies, equipemnt manufacturers and civil work construction companies engaged in small/mini hydro power activities*

Quite a number of experts on small/mini hydro activities in every discipline such as hydrology, engineering, geology, etc., are available in Thailand. Most of them work with the Government sector. In the case of equipment manufacturers, there exists one each for turbine and generator manufacturer and their products were confined to small units (below 500 kilowatts) for domestic use. However, they have entered into agreement with a European manufacturer to produce the bigger unit for domestic use as well as for export in the very near future. In case of the transformers, several manufacturers exist and their products are of top quality and gain good reputation both at home and abroad. As for consulting and engineering services over a dozen of companies have good qualified personnel and experiences. Double of this figure are engaged in civil construction. In short, Thailand is well equipped as far as planning and civil construction are concerned, but in the case of generating equipment, the need to import big size units still exists.

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* Mention of firm names and commercial products does not imply the endorsement of the United Nations.

ANNEX I

CONSULTING FIRMS IN THE MINI HYDRO PROJECTS

1. Team Consulting Engineers Co.Ltd.
2. K. Engineering Consultants Co.Ltd.
3. National Engineering Consultants Co.Ltd.
4. Thailand Institute of Scientific and Technological Research
5. SPAN Co. Ltd.
6. National Engineering Consultants Co.Ltd.
7. Soil Test Siam Engineering Consultants Co.Ltd.
8. Asian Engineering Consultants Co.Ltd.
9. Resources Engineering Consultants
10. TESCO Ltd.
11. Thai DCI Co.Ltd.
12. South-East Asian Technology Co.Ltd.

ANNEX II

CIVIL CONTRACTOR

1. Chiengmai Construction (1979) Co.Ltd.
2. Siam Civil Engineering Co.Ltd.
3. Italian - Thai Development Corporation
4. Prasong Transport Ltd.
5. Chiengmai Asia Co.Ltd.
6. Sang Patana Construction Co.Ltd.
7. San Pa Khoi Construction Co.Ltd.
8. Thai Industrial and Engineering Service Company Ltd.

EQUIPMENT MANUFACTORY

	Name	Product
1.	Thai Generator Co.Ltd.	Generator and Switchboard
2.	Thai - MC Co.Ltd.	Turbine and Generator
3.	Sirivivat Co.Ltd.	Transformer
4.	Thai Maxwell Co.Ltd.	Transformer
5.	Ekarat Engineering Co.Ltd.	Transformer
6.	U-Tah Engineering Co.Ltd.	Switchboard
7.	T.S.M. Electric	Transmission line equipment
8.	South-East Commercial	Turbine and Generator
9.	Siam Syndicate Co.Ltd.	Valve
10.	Mining and Industry Metal Work Ltd. Part.	Turbine