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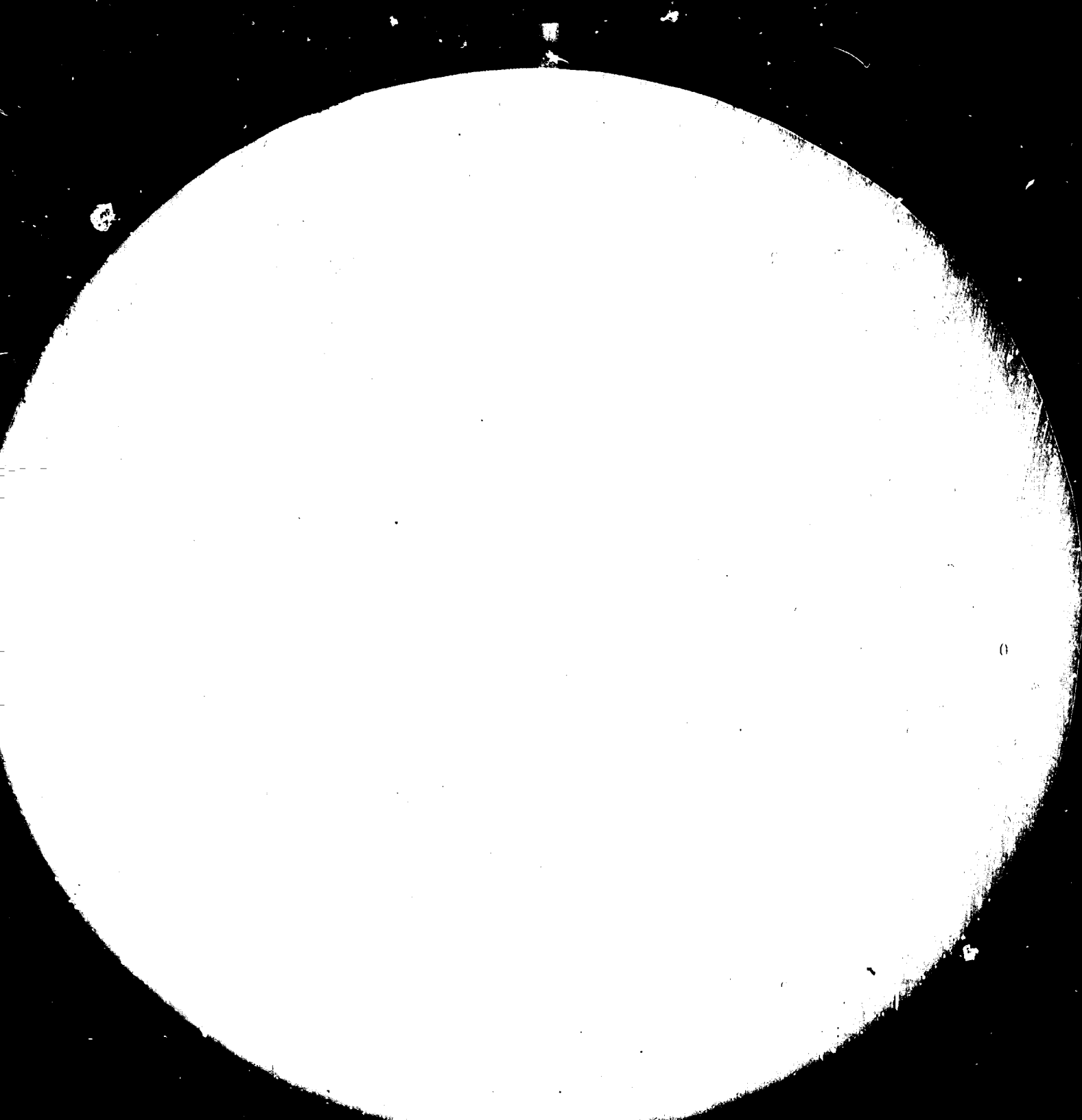
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System and the Assessment of Priority Needs on  
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REGIONAL NETWORK SYSTEM ON MHG-SHG TO PROMOTE MHG  
AND APPLICATION IN DEVELOPING COUNTRIES \*

by

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1. Regional Net-work System on MHG-SHG to promote MHG and application in developing countries.

#### Lead Agency in each country

It has been recognised at the forum of UNIDO seminars, etc. that MHG technology is sufficiently distinct to warrant recognition as a specialised pursuit. It is, therefore, assumed that organisations - preferably at the Central Level depending on the social structure of the country-dealing with matters exclusively pertaining to the development of MHG would have been established in the countries of the region. In case these are not existing in certain countries, it is necessary that such organisations are set up with immediate effect. Functioning of Regional Net-work System (RNS) would be greatly facilitated with such country-organisations.

In case the size of the country is small or their total hydro potential is not very great, there would be a tendency to have only one organisation for both major (conventional) hydro projects and SHG-MHG. But the role to be played by the SHG-MHG is different in more than one ways and it would be advantageous to form a separate organisation for SHG-MHG. This organisation will have a large number of important duties to handle for making their programme successful. The importance of such an organisation can be realised in the context of the following.

#### Collection of country-specific conditions

It is also recognised that for promotion and application of the MHG in the developing countries, it is necessary to evolve a technology which is rather simple in nature and amenable to be adopted by a particular country. To illustrate this point, it may be mentioned that each country in the world is different as far as occurring of general precipitation, its duration and

resultant water flows in the rivers/streams, etc. The terrain as well as its geology differs widely. Utilisation of waters is greatly influenced by this single factor, e.g. size and type of the dam for a particular scheme are governed by this. For this purpose country-specific conditions have to be identified and considerations given for tackling such specific conditions for preparation of feasibility report of MHG schemes. It is, thus essential that the respective country-organisations make comprehensive listing of such conditions and collect detailed data/characteristics of such conditions. The RNS may assist in listing the specific conditions. The evolution of methodology for dealing with such conditions will be one of the important considerations of the RNS.

#### Preparation of Guidelines

It is felt that the RNS would be in a position to assimilate the variety of data collected by them and prepare exhaustive guidelines which can serve as handy material for preparation of feasibility reports of the MHG. Such guidelines are intended to cover almost all the aspects of the development of MHG - which can broadly be categorised as water planning (head-discharge), geological surveys, broad civil features, water control, use of construction material, load forecasting, number and rating of generating units, electrical and mechanical equipment, utilisation of power, etc. This is, no doubt a formidable task. But it is considered that the RNS would be capable of handling such a task. The guidelines/handbook brought out by the OLADE deals with only certain aspects, stress being given on assisting decision makers to make a specific choice/selection. The document - "Chinese Experience in Small/Mini Hydro Power Generation" is a valuable contribution in this regard. However, this pertains to the many specific conditions of that country. R.N.S. guidelines should consider the fundamentals required for preparation of such feasibility reports, by all the countries of the Region.

### Standardisation

It has also been suggested during the UNIDO seminars that certain amount of standardisation, especially in respect of sizes of the generating plant and equipment would help in reducing the cost of the generating units. The RNS can attempt this with the help of representatives of certain reputed manufacturers. It may be mentioned that already a few manufacturing firms have made very good attempts in this regard and have published pamphlets of their standardised sets. The available data and specific requirements of certain countries can be examined and some recommendations in respect of unit sizes evolved.

There is a vast scope for standardisation of electrical designs of the power station. There can be very little variation from country to country. The requirement of the electrical equipment itself (such as switching arrangement, protective system, etc.) can also be standardised.

### Specific Consultancy

Even after bringing out the guidelines, certain countries may require second opinion on the feasibility reports prepared by them in respect of certain schemes. Such reports can be received by RNS for expert examination. In other words, the RNS should be in a position to render specific consultancy on limited references. This should be considered as one of the important roles of the RNS. For this purpose certain panels may be set up which can handle a particular portion of the feasibility report for consultancy. Broadly, these panels can be formed for hydrology, geology, project features, civil construction, choice of plant and equipment, etc. The RNS would have to have comprehensive inventory on various subjects concerning MHG.

The SHG-MHG will usually include aspects of utilisation of waters for irrigation, navigation, fish culture, etc. It would be an important consideration for the RNS whether it can

involve itself with this, even in any limited manner.

There are quite a few Consultancy Organisations available in the region both in the private sector and in the Public (Govt.) sector. Some of the countries might like to retain consultants for detailed works. It might, therefore, be of interest if a list of consultants is maintained by the RNS.

#### Local Industries

One of the prime objectives of UNIDO is giving fillip to the industries. A part of the SHG-MHG should be consumed by the local industries. Feasibility of types of local industry to be developed can be another consideration of the RNS. This would also include possibility of the extent of manufacture of generating plant and equipment for the SHG-MHG. This is a very specialised subject. As already brought out, quite a few reputed firms are offering competitive equipment with better performance. For a smaller country, it may be necessary to weigh the relative merits of local manufacture against the ready availability of such equipment.

#### Updating of Technology

With the efforts undertaken by the RNS as well as continuous attention being given by certain manufacturers of equipment for MHG, up-dating of guidelines may be necessary from time to time. This might especially be on the technology front-such as hydraulic turbine designs, governing, excitation, etc. For this purpose senior experts may meet periodically and take a stock of the new developments in the intervening period with a view to improve the existing guidelines.



2. Actual Needs at National Level for R & D.

As far as our country, INDIA is concerned, development in the field of MHG is taking place steadily over a large number of years. Technology in the field of civil engineering and the appropriate designs have fairly been advanced to tackle the difficult geological situation and structural problems, and use of local construction materials.

Development is taking place to evolve simpler designs in respect of civil construction features in keeping with the terrain and size of development. These include diversion structure, flood routing, intake arrangement, water conductor system, desilting tanks, forebay, penstock intake, penstocks, spilling arrangement, power house building, tailrace channel etc. Detailed description of the arrangements being evolved may be out of place for this paper. These can be discussed at the RNS as and when necessary.

The main criteria for development of civil structures for SHG-MHG is aimed at their simplicity. Thus simulation, hydraulic modelling, etc. is not required. Though the country has one of the finest Water & Power Research Stations in the region, located at Pune, presently its facilities are not being utilised for SHG-MHG.

In the field of generating units and electrical equipment the process of evolution in the form of betterment of machine designs, use of new materials, simpler methods of fabrication etc. is continuously taking place. The R&D effort in this regard is confined to four to five manufacturing firms who are engaged in the manufacture of generating plant and equipment. Almost all types of modern designs including bulb and tubular type of turbines, governing equipment, excitation systems are being evolved. Some of the firms have set up hydraulic laboratories where facilities exist for ascertaining hydrodynamic behaviour of the turbine - such as efficiency, cavitation, vortices. Laboratories also exist for testing of

materials where possibility of utilising different types of materials, in light of their behaviour during the operation of the equipment is determined.

3. Actual Need at National Level for training in the field of MHG-SHG.

As mentioned above, on account of the development in this field already taking place in this country quite a few concerned organisations have now grown with the personnel having proper and adequate training/experience. In India actual execution of the projects under SHG-MHG is in the charge of various States. Development in some of the States, however, has lagged behind in spite of having substantial hydro potential, due to various reasons. Need for proper training of personnel from these States has been keenly felt.

There can be two facets of imparting training to the candidates - (i) through theoretical training and (ii) through practical training. This country has brought out exhaustive guidelines for development of small hydro-electric schemes. This would enable concerned people grasp the concept and importance of small hydro as distinct conventional or major hydro projects.

The fundamentals of the various topics dealt in the guidelines can be brought home through lectures by specialists. After this, practical training can be arranged both in the field as well as in the laboratories. The field training may include potential surveys such as looking out for prospective sites for development, their selection and suitability for various civil structures, selection of river stretches for measurement of flows, geological inspection, etc. The laboratory training can be given in various subjects depending on the facilities created. These can be for actual measurement of flows by various methods, use of various types of notches, computation of data; also selection of most appropriate type of prime-mover through a display of a range of equipment, depending on the head and discharge of

the scheme. Various model of switching arrangement can also be arranged in the laboratory.

After completion of these basic requirements, the trainees can also be subjected to the exercise of evolving certain schemes. The relative merits and demerits of the schemes thus prepared by them, can then be discussed with them in joint discussions.

4. Suggestions on the Management and Operation of Regional Centre for Research, Development and Training in the Field of small-mini Power Generation.

Establishment of Hangzhou Regional Centre (HRC)

It is expected that the HRC will be created with the cooperation of the Government of the People's Republic of China. The facilities to be provided at the HRC should be decided by the Member Countries of the Region. The extent of facilities would entirely depend on the general requirements, agreement on which would be possible to be reached during deliberations of the Senior Expert Group Meeting. Most of the equipment and know-how for the HRC will be forthcoming with the present status of Chinese technology. In case there is a consensus on having facilities of still more sophistication, probably some facilities of the equipment might need consideration of the Sponsoring Authorities about its procurement.

Management

Viewed in the above context management of the HRC may be entrusted to the Chinese Government. Policy of management of the HRC can be framed during the discussions. There would be a need for formation of a Governing Council which can direct the functioning from time to time. The Governing Council should have representatives of UNDP, ESCAP, PRC, and at least a couple of member countries. These member countries can be rotated. The policy for selection of the trainees at the HRC would also be decided by the Governing Council.

### Training Programme

Training would be one of the important functions of the HRC. Once the facilities being provided are known, the level of trainees can be decided by the individual member countries. The training course should be of the duration of about two months. Visits to the actual SHG-MHG stations may also be included.

### Research & Development

With primary aim of making SHG-MHG simple in nature scope for research would be rather limited. The country-specific conditions are likely to differ. Still there would be common areas for consideration. The type of dams and their designs, as well as generating plant and equipment are prominent areas. Dam designs would be dependant on the common materials used. Some of the materials for utilization can be identified and typical dam design can be evolved. Development of turbines especially is a vast field for research. Already considerable data on this is available. Display of the development in China in this field can be made at the HRC. Research facilities can be created in the areas for improvement in the efficiency of the machine, simpler governing, operation with minimum attention, etc. However, this matter will need very careful consideration.

After about six batches of trainees complete their programme of training the Senior Expert Group may meet again and take a stock of the benefits derived by the trainees. In the light of the experience thus gained, suggestions for orientation, strengthening of the functioning, further developments, etc. can be considered jointly.

