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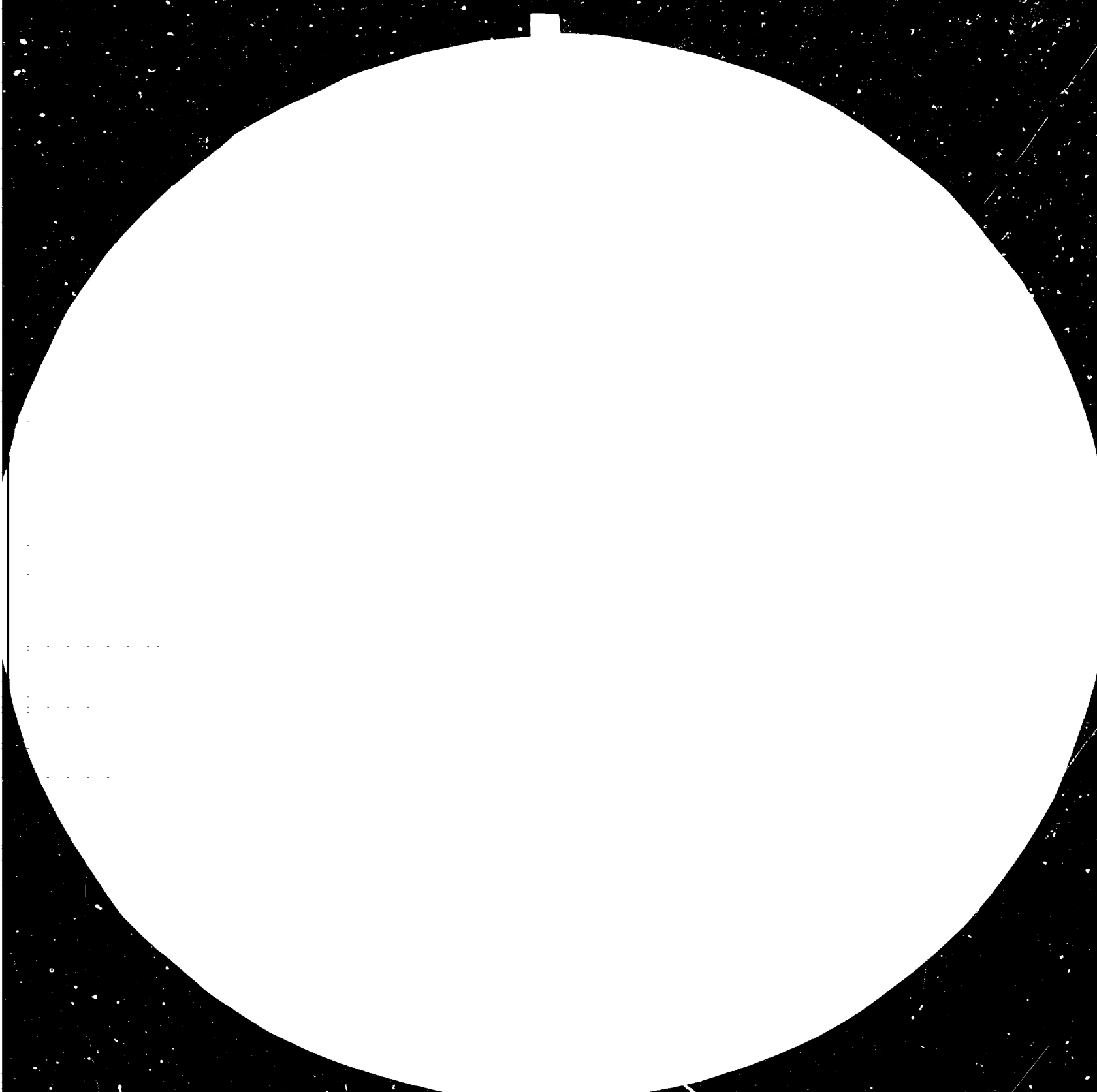
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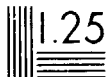
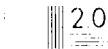
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CENTRALIZED SYSTEM OF MINI HYDRO PROJECTS PLANNING
AND IMPLEMENTATION IN PENINSULAR MALAYSIA*

by

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I. INTRODUCTION

The National Electricity Board, being an Agency of the Government of Malaysia, started a small mini hydro program in early 1979. The proposals for 2 pilot projects were expanded in the earlier part of 1980 and it resulted in a program for implementation of 22 trial schemes. Further interest shown by the Government led to the employment of Consultants. To-date the number of projects to be implemented in Peninsular Malaysia for the 4th Malaysia Plan is 102 (82 of which is in Peninsular Malaysia and 20 in Sabah and Sarawak). Apart from those planned the 22 projects mentioned are in various stages of construction. The capacities of these projects range from 50 KW to 1500 KW and the definition of mini hydro has been adopted to be those in the range of 25 KW up to 5000 KW.

The rationale behind the implementation of mini hydro schemes is to achieve national objective of rural electrification by developing small hydro potentials within the country in the most economical way. The total projects include the power stations, transmission lines (11kV) and the distribution system. A number of the projects are grid connected and a few are expected to run in isolation.

The National Electricity Board being the Agency of the Government is a centralised body taking care of all electricity generation, transmission and distribution in Peninsular Malaysia. Therefore all projects undertaken as far as electrical energy generation is concerned has got to be done by the National Electricity Board. As such, project planning and implementation of mini/micro hydro in the country is based on the centralised management system as instituted in the structure of the Board.

(i) Structure of the Board

The National Electricity Board of Malaysia covers generation, transmission and distribution of the electrical energy. As far as rural electrification is concerned the National Electricity Board plays a very important role in providing electrical energy to the rural sector with the aim of bringing up standards of living to the rural people. As such, a

number of divisions in the Board have been engaging active in supplying electricity to rural areas of the country. These departments include the Distribution Department, the Rural Electrification Department, the Generation Department (Diesel) and the Minihydro Department. In the total structure the Rural Electrification Department provides the initial planning and implementation of projects in the rural areas. This Department is backed by the Distribution Department as well as the Generation Department (Diesel) where necessary. The development undertaken by the Generation Department (Diesel) is in terms of providing 12 or 24 hours diesel electric generation system for the rural areas. The setting of the Mini Hydro Department in 1980 expanded the arms of the Board in terms of rural electrification and harnessing of a renewable energy resource.

(ii) Functions of the Appropriate Departments

As an example, in the setting up of a mini hydro electric generating system in the rural area, a site, when approved, is taken up and the departments concerned would be Mini Hydro and the Rural Electrification Department. The Mini Hydro Department confines itself with the preparation of designs, computer studies of the site. The information as far as transmission and distribution is concerned will be in the hands of the Rural Electrification Department. On completion of the sites the commissioned station will be handed over to the district i.e. the distribution centre of that district. The function of the N.E.B.'s district office is administrative in nature and this department's role is in the collection of revenue and maintenance of the electrical system. The Generation Department (Diesel) is the department responsible for maintenance of all mini hydro stations throughout the country. Monitoring is done by the Research and Development Department of the National Electricity Board.

II. GENERAL APPROACH

The priority of mini hydro is to promote rural electrification. The type of mini/micro generating system that is to be developed for each potential site depends upon two identifiable markets :-

(a) Isolated Areas

These isolated stations are remote villages and are characterised by lower plant factor and uneconomical generating system. The generating plant serving such market must be designed to meet the maximum demand of the areas and the system must operate to comply with the trends of the demands on a daily basis.

(b) Grid Connected Stations

A large number of villages under the rural electrification programme suffer very low voltage and are highly capacitive transmission systems. It has been found that by adding mini hydro generating systems to the ends of these lines as well as providing electrical energy to villages way beyond the technical limitations may prove economical and viable. Mini hydro projects of such category are designed for optimum capacity to obtain the maximum benefit of cost of energy generated. Full exploitation of these sites takes place during high flow seasons.

III. PLANNING

In a centralised system of management of mini hydro, planning is simplified by having a centralised effort in terms of the following :-

(a) Data Collection

With its extensive network to the rural areas a centralised management system data on virtually all the villages throughout the country has been collected at a central department. As such it is easy to know whether such villages have been electrified or not. At the same time data relating to transmission lines and distribution systems are also known. Topographical sheet studies can be done for areas that are close to township that have 12 or 24 hours supply. Further information can be easily obtained from the district offices of the National Electricity Board pertaining to details of villages, lengths of transmission line requirements, potential capacities of consumers, etc. The topographical studies on the other hand will provide catchment area, the volume of water available the head and the capacities of power stations expected.

(b) Reconnaissance Studies

After data collection in terms of topographical studies and available consumer characteristics reconnaissance study is necessary to determine the viability of the project. This involves sending out of men from the Mini Hydro Department to the potential site. The site visits will determine position of weir, estimated pipeline route and power station. Liaisons between the district office and other government agencies of the area will help in obtaining further information and details relating to the project. The vehicles used for reconnaissance studies and men required to do such work can normally be obtained with the help of the district offices. This minimises the need for extra vehicles on the ground as well as there is a localised knowledge of the site.

(c) Feasibility Studies

The feasibility study is carried out after full knowledge of the site has been known. Feasibility studies will require data from the reconnaissance studies and these are fed to the computer for economic evaluation. Variations may take the form of financial analysis or economic analysis. Computerisation on the centralised system is much easier as the computer time is much better utilised and at the same time standard procedures of analysis can be carried out. The standardisation of procedures in the feasibility studies helps a great deal in the determination as well as putting the order of priorities of implementation of schemes. It should be noted that with political implication of the introduction of mini hydro schemes to the rural electrification system makes it more difficult to determine sites that have priority above others.

IV. DESIGN AND APPROVAL

Standard designs of power stations, weirs, anchor blocks, surge tanks, etc. have been done and therefore a centralised system of design makes it much easier to choose the appropriate design of stations. The information gathered so far in terms of centralised management has made it possible for the Board to choose the best system of water collection necessary in mini hydro systems. Data pertaining to types of machines and electromechanical systems have been in one common pool and therefore these are retrieved when required for comparative assessment of mini hydro requirement. Design errors and corrections that have been made for earlier projects is anticipated not to happen again for new and upcoming projects. It should be noted that this centralised approach is useful in terms of mini hydro development throughout the country on a long term basis.

V. TENDER AND AWARD OF CONTRACT

Tendering of contracts, civil and electromechanical, from mini hydro systems are issued by the Purchasing & Contracts Department of the National Electricity Board. This means that the costing and rates of construction and purchase of equipment are almost standard. Potential contractors collect tender documents from the Headquarters of the National Electricity Board and they are taken to site visits of a member of the staff of the Mini Hydro Department prior to quotation. The award of contract is done by the Purchasing & Contracts Department on the recommendation of the Mini Hydro Department.

VI. SUPERVISION OF CONSTRUCTION

The National Electricity Board provides one site supervisor to supervise construction of the civil works of each mini hydro scheme. The site supervisor reports to the Headquarters on all activities carried out as well as details pertaining to the project during construction. Analysis of such data is carried out at the Headquarters where comparative studies are made on other projects of similar types. Experience gained from one site is often transferred to the other to ensure quality of work and the reduction of time.

VII. SUPERVISION OF INSTALLATION AND COMMISSIONING

Supervision of installation of electromechanical equipment as well as commissioning of these equipments are carried out on the centralised basis in view of the common nature of such activities. Procedures during such works are therefore minimised and costing is therefore reduced.

VIII. OPERATION OF STATION

On the completion of the station after commissioning the station is handed over to the district office of the National Electricity Board. The station is therefore no more under the centralised management scheme but falls under the localised administrative operation of the district office of the National Electricity Board. All manpower requirements for running the stations, salaries, wages, etc. is done at the district level.

IX. MAINTENANCE

The maintenance of stations is done from the centralised management system due to the fact that the number of diesel stations in the country is rather widespread. As such where mini hydro stations are on the route of the maintenance team, these stations will be maintained from time to time when necessary. Inspection of turbine runners, civil works and others will be done on a yearly or a two year basis. The compilation of such maintenance will help in determining the best possible operation procedures in the power stations.

X. MONITORING SYSTEM

The mini hydro stations are being monitored by the Research and Development Department. The monitoring is basically to gain further information on the operation of the stations especially on the indeterminant aspects such as hydrology, siltation, erosion, etc. Proper monitoring and feedback will ensure a bank of useful information which will be used for future projects.

XI. CONCLUSION

The centralised system of the management of mini hydro projects in Peninsular Malaysia has its advantages and disadvantages. As a whole it would seem that this system is the best from the point of view of political, statutory and social requirements of the country. It should be noted that a large number of the sites in the country may not be, if developed, used for rural electrification but for energy harvesting of available water resources. This needs centralised management system of implementation as the contribution of such systems would be beneficial more towards the displacement of fuel for use in the extended grid systems throughout Peninsular Malaysia.

