



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

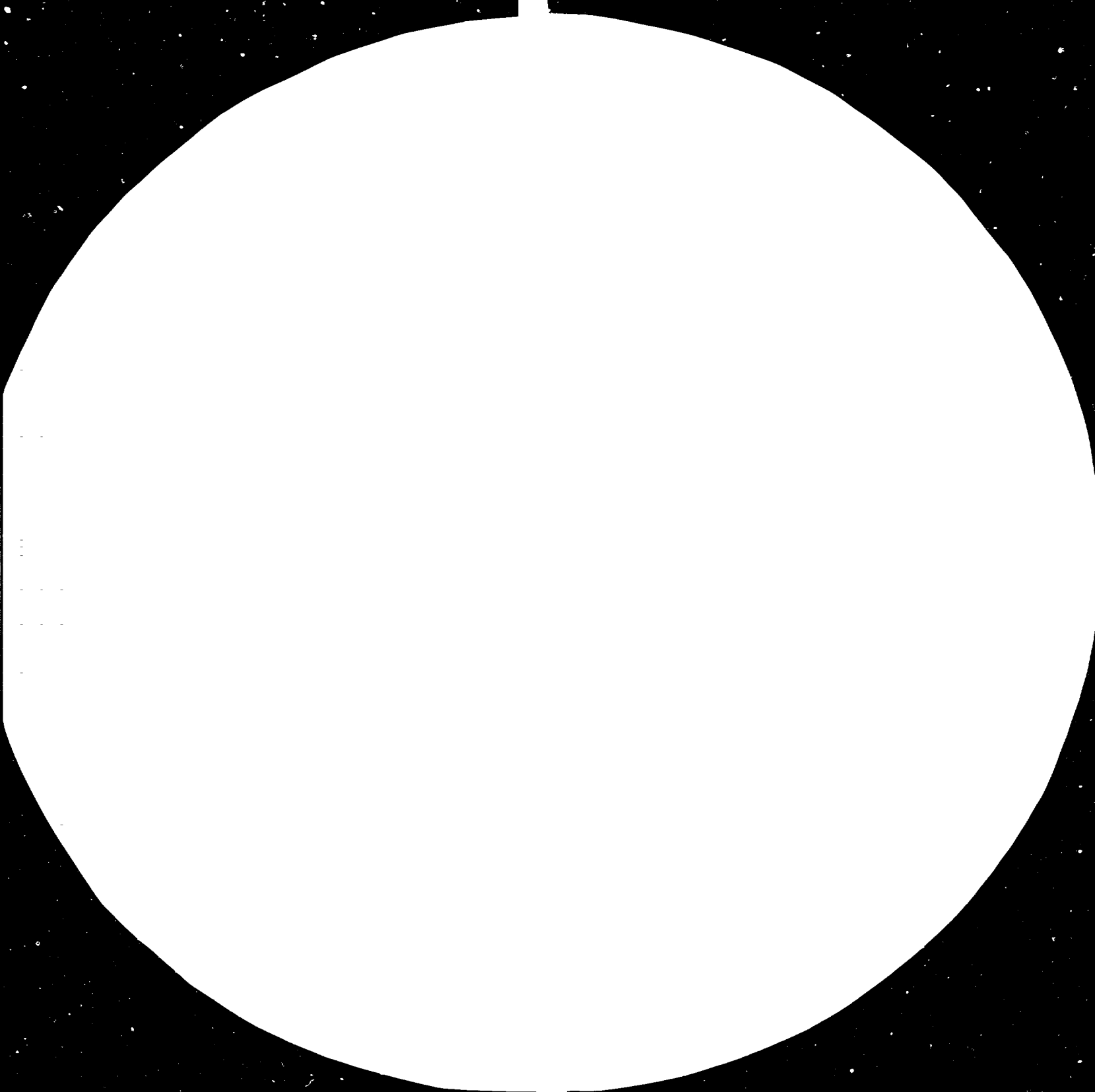
## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)







12765



United Nations Industrial Development Organization

Distr.  
LIMITED

ID/WG.403/15  
28 July 1983

ENGLISH

Third Workshop on Small Hydro Power  
RCTT/UNIDO/REDP/Government of Malaysia  
7 - 15 March 1983, Kuala Lumpur, Malaysia

LOCAL DESIGN AND MANUFACTURE OF EQUIPMENT  
AND AUXILIARY FOR MINI HYDRO POWER  
in the Kingdom of Thailand<sup>\*</sup>

by

K. Bhadrakom<sup>\*\*</sup>  
and  
C. Chartpolrak<sup>\*\*\*</sup>

832

- \* This document has been reproduced without formal editing.  
\*\* Chief, Construction Section I, Project Development and  
Promotion Division, National Energy Administration, Thailand  
\*\*\* Project Manager, Micro/Mini Hydro Electric Project  
National Energy Administration, Thailand.

V.83-58918

## I. Background Information

At present, about 75 percent of Thailand's energy supply is derived from imported oil. To reduce such heavy dependency and to diversify, the Fifth National Economic and Social Development Plan covering a period of five years from 1982 - 1986, called for the acceleration of the development of indigenous sources of energy. Hydro power is listed as one of the top priority to be developed. By 1986, it was planned to increase the generation of major hydro power from the 1980 capacity of 1,269 MW to 2,013 MW. The Plan also called for the acceleration of rural electrification programme to cover 50,034 villages or 92 percent of the country's villages by 1986, the increase of nearly two folds over the 1980 electrified villages.

However, the extension of the national grid to cover the villages nationwide is not economical, since the country is large and the villages are sparsely located, while the demand in each village is very low. In this situation, the development of the small-scale hydro generation is more appropriate.

The inventory of the small-scale hydro power potential compiled by the National Energy Administration identified that out of the 1066.0 MW S.M.G. potential, 243 sites with the total capacity of 413.5 MW and technical feasible to be developed. Among them, 25 top priority sites are selected to be implemented during this Fifth Plan. Their installed capacity is estimated to be 50,735 kW with the annual generation of about 215 GWh which will save 67,000 tons of oil yearly.

To reduce the investment cost of the implementation, the villagers are encouraged to participate in the development of the project to maximum possible extent. In this way the cost of civil work can be reduced as much as 40 percent. For the generating equipments, in the smaller scale projects, the locally manufactured machineries have already been adopted, but on the larger scale, they have to be imported.

## II. Type of Equipment being Locally Manufactured

The local manufacturers in generating equipments and electrical appurtenance have been in existence in Thailand for several decades. Among them, the transformer manufacturers are the oldest while the turbine manufacturers are the youngest. The types and the capacity of the equipments being manufactured are as follows:

### 1. Turbine

Two types of turbines are being locally produced at present, the crossflow turbine and the Pelton turbine. For the crossflow turbine, two standardized sizes of runner of 200 and 400 millimetres are being manufactured which cover the head range between 4 to 100 metres. The maximum unit output ever installed is 50 kilowatts with the efficiency of around 75 percent. The speed increaser is either belt, chain drive or gear, depending on the capacity of the unit.

For the Pelton turbine, several standardized bucket sizes, depending on the flow and capacity, are made. For the smaller capacity unit, fixed-area nozzles are employed, but for the bigger sizes, the adjustable nozzles are installed. The maximum unit capacity ever produced is 100 kilowatts at the head of 210 metres and the efficiency of about 80 percent. Since the water quality is quite abrasive, the buckets and nozzles are made of stainless steel as standard product.

### 2. Governor

At present, the electronic load controller is being manufactured under the licensing of G.P. Electronics Ltd. of England. The maximum capacity ever produced is 30 kVA. No flow-control governor is manufactured.

### 3. Generators

There are several generator manufacturers in Thailand, however, only one factory can produce upto international standard. The maximum unit capacity is 630 kVA. The overspeed ratio is 2.0.

#### 4. Switchgears and Switchboards

The components are imported and are assembled locally.

#### 5. Transformers

There are many local manufacturers whose products meet international standards. Some have the experience over 20 years. The maximum size ever manufactured is 12,000 kVA and the highest voltage level is 69 kv.

### III. Assistance needed by local manufacturers

The electrical industries possess adequate capabilities in the design and development of their own products, since they acquired them from the developed country or manufactured under the license and their testing facilities are quite good. Therefore, the assistance needed in this field is not so essential. However, for the turbine manufactures, the situation differs, at present, no manufacturer has its own testing facility, the tests have to be carried out at site. So the development was rather slow. The situation may be better should the testing facility, owned by the National Energy Administration, a Government agency, be completed which was scheduled to be by the end of 1983. Nevertheless, the exchange of information on the new technology and experience in the development of these machineries are still needed.

On the aspects of Government incentives to promote local manufacture, the Government encourages the procurement of local made machineries for all Government projects to the maximum extent possible. The preferential basis on the local products ruled that the local product must be procured, should its price not exceed 15 percent of that of the imported one. The Government also set up a special sub-committee on the accelerated development of mini/micro hydro, which one of its objective is to identify and assist in solving the problem of the local manufacturer as well as to invent the incentive measure.

#### IV. Conclusion

The local design and manufacture of equipments for the small-scale hydro power development do exist in Thailand. However, their capabilities are rather limited, especially on the turbine. Two types of turbines namely, Pelton and crossflow, are currently manufactured, the maximum unit size ever produced is 100 kw. However, it is anticipated that the manufacture of 500 kw unit size is possible. The electronic load controller is also produced locally under British license. But for the electrical machineries, the capability to manufacture is rather high. The Government incentives to promote local manufacturers also are available at moderate level. The assistance needed by the local manufacture is in the form of exchange of information on new technology and experience in the development of the related machineries and equipments.



