OCCASION

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

DISCLAIMER

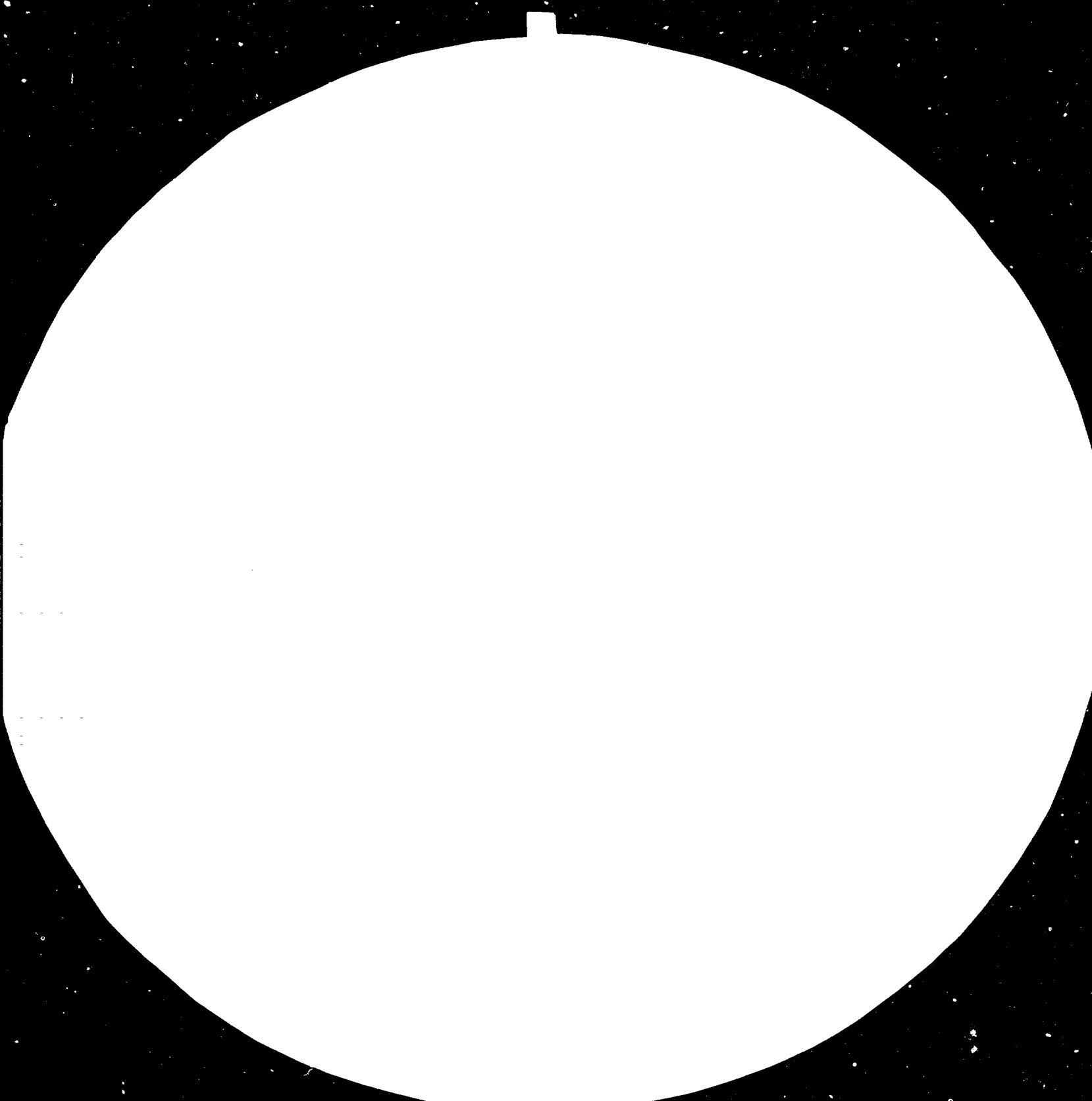
FAIR USE POLICY

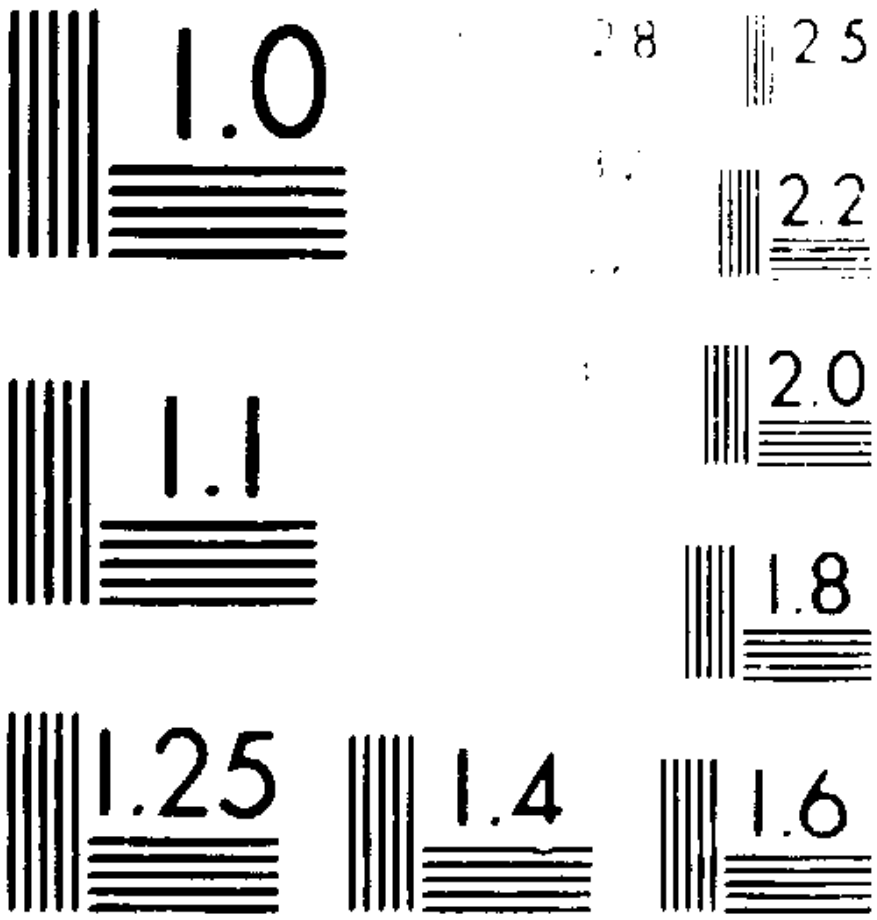
CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org




1.0
2.8
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

12763

Distr.
LIMITED

ID/WG.403/10
27 July 1983

ENGLISH

United Nations Industrial Development Organization

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

THE STATUS OF SMALL HYDRO POWER in the Commonwealth of Dominica*

by

Rawlins Bruney**

---

* This document has been reproduced without formal editing.

** Electrical Engineer, Dominica Electricity Services, Roseau.

V.83-58903

1. Introduction

The island of Dominica, located at the centre of the East Caribbean chain of islands, is volcanic in origin and very mountainous. On a land area of approximately 750 square kilometers there are at least four peaks above 1,200 meters in altitude. These mountains, under the influence of the moist North-East Trade Winds, provide an abundance of rainfall and create ideal conditions for the dense tropical rain forest that covers a large portion of the island. Then there are streams - literally hundreds of them - that flow perenially along the steep-sided valleys to the sea. Herein lies what is undoubtedly Dominica's greatest natural resource - water.

Dominica's economy is based on agriculture with bananas being the main export crop followed by grapefruits, oranges, coconuts and limes. Recently the trend has been towards the development of small agro-based industries one of which, a coconut oils and soap concern, is now the biggest consumer of power on the island.

2. Electricity Production

The national grid extends along the entire west coast and through to the north-east of the island where it serves about two-thirds of the population of 70,000 living in mainly coastal settlements. Economic pressures have prevented extension of the network to the east and south-east areas. At year-end 1982, the system provided power to 8,000 consumers with a peak demand of just over three megawatts and a gross annual production of 15.7 million kilowatt - hours. Ninety-three percent of the energy produced in 1982 by the island's lone power company DOMLEC (Dominica Electricity Services) came from its two hydro-electric stations. The remainder represents peaking and dry season and emergency backup which was met by diesel generator sets.

DOMLEC is now approaching the end of a major rehabilitation programme following massive destruction of its generation and distribution plant by a hurricane in August, 1979. Prior to this disaster the statistics read roughly: 11,000 consumers; 17.3 million kWh generation per year (1978); peak demand 3.7 MW.

3. Hydro Generation - Present

The two existing hydro-electric stations are located in the Roseau valley just inland from the capital, Roseau. They are both high head run-of-the-river type installations with only daily regulation being provided by the first, Trafalgar, which in turn partially regulates the other, Padu, located downstream of the former.

Trafalgar was commissioned in 1952 and now has three similar GILKES Pelton turbo-generator sets, each rated at 320 kilowatts. The station operates on a gross head of 286 metres. The nearly 2 kilometres of pipeline varies from an open channel after the stream diversion to a precast concrete pipe, then there is an 18-inch (0.5 m) woodstave pipe along the gentle slopes followed by two 12-inch (0.3 m) steel penstocks that take the water down the final near-vertical drop into the station. The penstocks together have a maximum discharge rate of 0.5 cubic metres per second.

Padu hydro station receives some of its water from the tailrace of Trafalgar and the remainder from the nearby Roseau River at the impounding headworks just upstream of Trafalgar Station. Approximately one kilometre of 36-inch (0.9 m) steel pipe takes the water to the two Padu turbines which are both 22.5-inch (0.57 m) diameter GILKES Turgo Impulse wheels. The penstock is equipped with a surge tank and it is capable of sustaining a maximum flow rate of 1.7 cubic metres per second. It has a gross head of 146 metres. Padu is remotely controlled from Trafalgar via multicore overhead cables. The two units are rated at 940 kilowatts each and were commissioned in 1967.

Both Trafalgar and Padu were put out of commission by the 1979 hurricane. Trafalgar suffered major pipeline damage while Padu was comparatively worse hit. Even the station building had to be substantially rebuilt as it was partially covered by a landslide. The two stations are now fully operational.

4. Hydro - Future Development

Plans are well underway for the construction of a third hydro-electric station at Titot upstream of Trafalgar. This new station is expected to have a rated output of 750 kilowatts and will be a relatively low-head, high-volume installation. Titot will utilize the discharge from the Fresh

Water Lake which is a natural reservoir located around Mount Micotrin at some 760 metres in altitude. Studies are presently being carried out into the possibility of constructing a dam to raise the level of the lake and thereby increase its storage capacity considerably.

Projections of current trends in power consumption indicate that additional generating plant will be required for the latest by 1985 if we are to cope comfortably with future demand. This was an overriding consideration in the selection of the Titot scheme in preference to two other equally attractive projects, Macoucherie and White River.

In addition, the introduction of Titot would provide increased flow to the two other stations cascaded downstream and, if the damming scheme proves feasible, there will be the benefit of greater storage and hence a higher dry season output. The upgrading of the pipeline and turbine capacities at both Trafalgar and Padu will be a natural step forward in the chain of events. Finally, because of its proximity, Titot could be controlled from Trafalgar in the same way as Padu. This would be an important cost-saving feature.

The Macoucherie and White River hydro schemes were surveyed in the mid-1970's as having output potentials of 7.5 megawatts and 2.5 megawatts respectively. It was proposed that they be developed along similar lines as the existing schemes i.e. high head with little storage. The steep-sided valleys that characterise most of the streams on the island make storage of any type a rather expensive proposition. The Fresh Water Lake, mentioned earlier, is probably the only exception in this respect.

Macoucherie in the west and White River in the south-east are part of future hydro development plans going well into the 1990's.

The Government of Dominica has been pursuing a programme to establish a number of small de-centralized hydro schemes around the country in areas not served by the public mains. This is considered the cheapest and quickest method of providing power to those population centres with the potential, in view of the comparatively high cost of running transmission lines across the countryside to link up these areas to the national grid.

There are now at least four such micro-hydro schemes at various stages of development, namely: River Jack at Delices, Sari Sari at La Plaine, Castle Bruce and Petite Savanne. By far the biggest problem common to all of them is that of funding. In this regard, the community self-help approach that is being encouraged in matters concerning the development of these projects, will go a long way towards reducing their overall costs.

Consideration is also being given to the idea of utilizing where possible, water works of the island's Central Water Authority as a means of tapping relatively cheap sources of hydro power. Funding is being sought from outside for one such pilot project to be sited in the south-east of the island.

5. Conclusion

The future development of the Commonwealth of Dominica depends to a great extent on the harnessing of its energy potential. We must tap our abundant resources of indigenous power be it hydro, geothermal, wind or solar, in order to reduce our dependence of scarce and costly fossil fuels. It is the view of the writer that when all things are considered, including the time factor, the locally available expertise and the installation and running costs, there can be no doubt that we would be wise to concentrate our efforts on hydro development as top priority.