THE GEOGRAPHY OF POWER RESOURCES

IN NEW ZEALAND

A Thesis Submitted to the
University of New Zealand
for the Degree of
Doctor of Philosophy

by

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TABLE OF CONTENTS

LIST OF FIGURES

APPENDIX FIGURES

LIST OF TABLES

APPENDIX

LIST OF PHOTOGRAPHS

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INTRODUCTION

For a century the development of power resources has contributed much to the geography of New Zealand. Today, more than ever before, the direct significance of energy production is seen, at the mine or dam site, on the road or railway, and indirectly in the home, the farm, and the factory. Nor is the situation static. Large dams and associated villages stand in areas which only a decade ago were remote and uninhabited, lakes are being drained and swamps reclaimed in the search for coal, and a man-made thermal area has been created, as spectacular as any natural one. Plans are made and changed, and before one large power development is completed another has been commenced. Energy is outstandingly important in the daily lives of New Zealanders yet only meagre information is available on New Zealand power resources and still less on the geography of those areas characterised by power resources and their exploitation.[1]

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1. The per capita consumption of all forms of energy in 1960, is about 6,700 kWh, almost 60% higher than it was in 1930. Before the present study was undertaken only one published article, as far as is known, had been written by a geographer on power resources. This was R.O. Buchanan's 'Hydroelectric Power Development in New Zealand', The Geographical Journal, Vol. 75, No. 5, 1930, pp. 444-461. Studies have been made of particular aspects of individual sources of energy, few have undertaken integrated studies of all sources of energy.

The lack of full geographical studies of such questions is not peculiar to New Zealand.[2] There are almost no well-known examples of integrated geographical studies of a number of different power resources. As a result this is a pioneer undertaking which covers much new ground but must necessarily lack the refinements of a work based on well-tried methods and a study founded on the experience of many other geographers working in the same field.

A major objective of this study of the geography of domestic power resources is to contribute to the regional geography of New Zealand. In order to attain this objective it was essential to make a preliminary examination of the areal variety of power resources and the areal variation in relationships which exist between power resources and other phenomena of geographic significance. At an early stage it became apparent that the following hypothesis could be postulated to account for the areal differences in the geographic significance of power resources in New Zealand:

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2. There are so few major studies by geographers that the most important can be readily listed: Philip Hjulström: 'The Economic Geography of Electricity', Geographica, No. 12, Uppsala, 1942; G. Kuriyan: Hydro-Electric Power in India - A Geographical Analysis, Madras 1948; Pierre George: Géographie de l'Energie, Paris, 1950; and Harold A. Classen: A Geographic Study of Power Development in the Niobrara Basin, With Emphasis on Hydroelectric Power, Unpublished Ph.D. thesis, U. Nebraska, Lincoln, 1955.

> "That power resources (their kind, occurrence exploitation and development) together with their associated features contribute in a varying degree to the character of New Zealand areas and to their differentiation, and that the extent of this contribution is directly proportional to the degree to which these resources are used"[3]

In the more comprehensive examination that follows the validity of the proposition is tested and any shortcomings are noted. In the conclusion the original problem posed in the Introduction is re-evaluated and where evidence from preceding chapters show that the proposition cannot be maintained it is qualified accordingly.

The work is organised in three parts: past, present and future. In the first section a brief history of New Zealand's power resources is used to provide connecting links between discussions of the geography of power in 1900, 1935 and the present. Attention is paid to changing areal

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3. By associated features is meant coalmines, steam bores, oil wells, dams, power houses, river control works and their ancillary buildings, transport and transmission systems for conveying coal and electricity as far as the market and settlements to accommodate workers directly concerned with the exploitation of power resources. The meanings of certain words are as follows: exploitation - turning to account, working; development - fuller working out, unfolding; contribute - help bring about; and extent - scope, noteworthiness.

patterns and to the evolution of present power areas - the 'energy regions'.

In the second part the character of each energy region is considered in detail, a comparison is made of the contribution of each to national energy production, and a chapter is included on energy use to indicate briefly some of the external factors which have direct bearing upon the degree to which regions have been exploited.

Finally in the third part, trends, potential power on a national basis and possible future uses of energy are discussed. This is followed by a conclusion and a short Appendix. A comprehensive bibliography of power in New Zealand is included as an indication of sources used and as an aid to future workers interested in the geography of power.

Information used in this paper has been derived from both library research and from fieldwork undertaken in all energy regions of New Zealand. Many authorities on various aspects of power development have been interviewed and a number of visits made to Wellington for discussions with officers of several government departments. Great reliance has been placed on cartographic presentation and where appropriate, information has been presented in a form which is as quantitative as possible. Almost three-fifths of the

maps and diagrams are original.[4]

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4. Maps, Technical Terms, Statistics, and Abbreviations.

Maps were reproduced and reduced by Xerography on to master plates and then printed lithographically.

Technical terms where necessary are explained in a glossary in the appendix.

In chapter 6 where the processing of a considerable amount of data was necessary and it was desirable to compare the production of all sources of energy for the same year, 1955, or 1955-1956 figures were used. Most of the other statistics are for 1957 or for 1957-1958.

The following abbreviations are used:

Appen. Journ. H.R., Appendix to the Journal of the House of Representatives; B.Th.U., British Thermal Unit; Bull., Bulletin; C.V., Calorific value; Cusec., Cubic feet per second; Geol. Surv., Geological Survey; GWh., gigawatt-hour; H.P., horsepower; kW, kilowatt; kWh., kilowatt-hour; MW, megawatt; Min. Works, Ministry of Works; N.Z. Elect. Dept., New Zealand Electricity Department; N.Z. Journ. Sci. Technol., New Zealand Journal of Science and Technology; O.F., outflow; Pers. comm., personal communication; p.s.i., Pounds per square inch; S.H.E.D., State Hydro-Electricity Department; and U.N.Z., University of New Zealand.