

HYDROPOWER DEVELOPMENT

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An Introduction to the Series

Hydropower planning covers a wide range of topics. Knowledge of technology, economics and the environment is needed. Another requirement is for planning skills which largely depend on professional expertise in the field. The transfer of experience to younger professionals has traditionally come about through close and continuous working relationships between older and younger colleagues.

Not all of this knowledge has been properly documented and there are few, if any, recent textbooks dealing with all the topics involved. Most recent publications in the field have been based on case studies. This situation has been the impetus for the present work. Compiling this comprehensive and systematic documentation on the planning, design, construction and operation of hydropower plants has been a challenging and time-consuming task.

In many industrialized countries professional expertise on hydropower is disappearing as the countries' hydropower resources are becoming fully exploited. However, Norway and many developing countries still have numerous unexploited hydropower resources, since hydropower is a clean and renewable source of energy when properly planned and managed, these resources will be of increasing importance in the future. Safeguarding and recording our present knowledge and experience in hydropower engineering are therefore matters of global significance.

The Norwegian Contribution to Hydropower

Although hydropower technology is global in scope, the series reflects primarily Norwegian experience. This is due to Norway's extensive exploitation of hydropower resources, encouraged by the local topography, geology and climate.

Most of the country is mountainous, and in recent geological times, mighty glaciers formed numerous lakes at high altitudes. This means that even small dams can create sizeable storage volumes which can be further increased by underwater "lake-tapping" – a technique pioneered by Norwegian engineers.

The country's geology provides a bonus since its mountains mainly consist of solid rock, which makes the construction of underground power stations relatively inexpensive.

Norway's climate should also be considered. The country's annual average precipitation of 1,400 mm has very uneven geographical distribution. During the winter, when the demand for electric power is greatest, much of the precipitation is retained on the ground as snow.

As the cheapest and most readily available waterfalls have been exploited, necessity has become the mother of invention forcing design engineers to find new solutions and adopt improved technologies. Such schemes have not only broken new ground, but are also economically viable. Norway's particular natural characteristics and the pressing demand for economical design have given rise to methods and solutions which represent major advances in hydropower technology and which are widely applicable to hydropower schemes in other countries.

The embodiment of Norwegian hydropower experience in this series not only meets the needs of Norwegian engineers but it will also be of great value to engineers engaged in the planning, construction and operation of hydropower plants elsewhere in the world.

About the Volumes

All volumes in the series are presented on the back cover of each volume. Each volume deals with a separate topic. The theoretical basis for each topic is set out and followed by a description of how it is applied in each discipline in practice. Each volume is thus a distillation of current thinking and practice within that particular topic or field.

The series is planned so that its volumes can be combined to meet the needs of different groups of readers. It should be noted that most of the content of each volume is original and has not been published before in existing textbooks. This means that when planning a complete course in hydropower engineering, this series will provide a valuable supplement to conventional textbooks.

Acknowledgements

The authors of the respective volumes are all leading professionals within their fields. The Editing Committee wants to extend to each of them its most sincere thanks for outstanding and unselfish efforts in realizing this project.

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LIST OF CONTENTS

1.INTRODUCTION: HYDRO POWER IN NORWAY	7
2.THE COUNTRY	9
3.THE RESOURCE BASE	11
Climate and hydrology	11
Geology	12
Topography	13
Resources for development	14
4.EARLY DEVELOPMENT	17
Norway's economy 1885	17
Public supply for the towns	18
Power for industry	20
5.COMING OF AGE (1900-1940)	21
Developing a legal framework	21
Boom years, 1906-20	23
Roles defined: State, municipal, private	27
Regional grids, power pooling	27
Rural electrification, local initiative, state support	28
6.RECENT YEARS (1945 -)	31
Recovery from wartime occupation	31
New technology, new designs	33
Joining forces, joint ventures	40
Planning large complexes	44
New options for low head development	56
Rural electrification: Mission accomplished	58
The national grid	59
Power across borders, the Nordel cooperation	60
A second round: Upgrading old plant	61
Small scale hydro power	65
Working with the environment	67
7.INSTITUTIONAL FRAMEWORK	70
Power supply	70
Regulatory bodies	71
Organizations	72
8.NORWEGIAN HYDRO POWER ENGINEERING	73
Planning and design	73
Construction	74
Manufacturing	76
Research	78
9.STATUS: HYDRO POWER AND OTHER ENERGY IN NORWAY	80
10.EPILOGUE: ENERGY FOR THE FUTURE	82
Index	83