

Gathering

Renewable

Energy in

Electrical

Networks

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PREFACE

In 1909 Wilhelm Ostwald, Nobel Laureate in Chemistry wrote in his book on Natural Science and Philosophy “*On the one hand there are the daily captured and converted radiation energies, which in economic terms represent regular income. On the other hand there are capitalised stockpiles in the form of fossil fuels. We are dealing, therefore, with a part of our energy system that behaves in some way like an unexpected inheritance, persuading the inheritor temporarily to lose sight of the principles of a lasting economy and to live for the day*”. In his introduction to an IEE special feature on Renewable Energy, professor Leon Freris wrote: “*One of the most exciting aspects of renewable energy is that it holds the promise that we will be permitted to enjoy the fruits of the technological civilisation and simultaneously respect the ecological laws and the rhythms of nature*”.

In much of the twentieth century the main energy concern was the eventual depletion of oil and gas reserves, and yet their price was kept relatively low. The global search for renewable and alternative energy sources started in earnest as a result of the sharp increase in the cost of oil by OPEC in 1973 following the Middle East war. The crisis that followed stabilised temporarily in the late 1970s as a result of the progress made in Arab-Israeli disengagement. However, the price of oil has rocketed again in the twenty first century, and this factor appears to have at last triggered a serious determination to rely more on alternative sources. Adding incentive for the search is the issue of global warming, a problem intensified by the use of fossil energy.

Electricity is the ideal medium for the transfer and use of energy. The transmission of energy by electricity is by far the simplest and fastest, as compared with the alternative energy options that require extensive road and railway networks. At the points of utilization, electricity is available instantly ‘on tap’.

The specific object of this book is to provide electric power engineers with information on the state of development of the renewable energy sources, as well as their characteristics and integration with the transmission and distribution power grids. An essential part in this respect is played by power electronic conditioning, which has been made possible by the practically unlimited ratings of power semiconductor switching technology.

If growing energy needs are to be met in a sustainable way, then renewables will be an essential part of the process, and further global constraints on emissions to the environment will accelerate their development. However, any predictions beyond a decade are almost certainly going to have to be revised due to the accelerating rate of technological change and the price volatility of oil, gas and raw materials.

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