

# Preface

We, as inhabitants of this planet, are tired of nuclear weapons and atmospheric pollution from petroleum, natural gas, and coal combustion. We desire independence from fossil fuel and nuclear wars, and we want greater employment. A solution is urgently needed to make continued life on this planet viable, and we believe this means living in harmony with nature. Ultimately, the Sun is the only energy source available for human beings, plants and animals. The Sun and greenhouse gases work in concert to bring the average temperature of the atmosphere to 16 °C.

Humanity is trying to recover from the damage initiated by the Industrial Revolution, which supplied energy needs by polluting the environment, causing death of millions of human beings and destroying natural resources and agricultural products. The journey from coal to fuel oil and to nuclear waste heat and finally to energy efficiency, directed by the external costs of energy production, ended up with the internalisation of external costs (in the 1980s for the USA and in 1993 for Europe by the work of environmental economists from Germany and the UK). Tax Credits for Renewable Energy Investments in California and the results of the ExternE Project of the European Union are the main reasons for the initial steps for the transition to renewable energy. Support from governments for clean coal technologies and nuclear energy through harmful subsidies have delayed the transition to renewable energy and end use efficiency. By learning from the mistakes of energy policies supporting polluting and inefficient technologies, and after becoming aware of the social costs of energy production and consumption, countries which industrialized early have started to support development and implementation of renewable energy technologies and end use efficiency.

Wind and solar electricity, electric vehicles and LED lighting technologies have become commercially available and competitive. Beginning in the 2010s, electricity production from renewables, even without internalisation of externalities of conventional energy production (health problems, agricultural product losses, natural capital destruction and climate change effects), has become the cheapest option.

Due to the high entropy nature of renewable fuels (kinetic energy of the moving air, potential energy of the water molecules, chemical energy stored in biomass and the heat stored in geothermal resources) renewable energy technologies can supply

process heat and electricity locally. Efficient management and supply of the locally produced energy to other consumers requires construction of microgrids and smart grids with storage options. The intermittent nature of renewable energies requires storage of renewable energies for backup when there is no wind or sun available.

Chemical energy stored in biomass and renewable energy stored as process heat or electricity and their conversion to liquid and gases fuels make the transition to 100% renewable energy possible without relying on conventional fossil fuels. This makes renewables independent from fossil fuels, or, the energy solution independent from the energy problem.

Extensive availability of renewable energies locally necessitates the involvement of communities, municipalities and cooperatives as part of the decision making process, and as owners of their renewable energy investments for sustainable energy solutions.

The implementation of renewable energy as community power would mean equity, freedom, peace and local employment. Increasing the number of such applications will result in renewable energy regions and, finally, with 100% Renewable Energy Cities.

We hope that this book provides an academic platform for the interaction of experts and scientists working in different fields of renewable energy research, development and implementation.

Handling global problems threatening human life and our common living space requires that human activities be carried out in harmony with nature. We must understand and digest the reality that living in harmony with nature is not a favour for nature, but a prerequisite for human beings and nature to coexist in peace on this planet. Since nature cannot negotiate, the only solution available for human beings is to take into account natural constraints on human activities.

Relations and interaction of human beings with nature also teach us to respect the information, expectations and demands of other individuals in our society, in order to find the correct definition of our problems and to find solutions that can be implemented. Ecologically-sound societies can only evolve from democratic societies where everyone struggles together in solidarity.

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