Foreword

Energy consumption is one of the principal indicators of progress and welfare in a society, and thus, there is great concern regarding its different stages of development. World energy is currently fundamentally sustained by crude oil and its derivatives. In the wake of many years of price increases and due to the importance that it has in the manufacturing industry and transportation, nations and researchers have been pushed to think about creating alternative energy sources.

The concept of “energy crisis” appears when the energy sources on which the society is supplied—coal, oil, natural gas, etc.—run out, or if their prices are so high that it is no longer viable to continue using them; this is the situation in which we find ourselves in today’s world. Additionally, one must consider that from the start of the 20th century, people began to suspect that natural changes had occurred in the Earth’s climate conditions, and the greenhouse effect was first identified.

Climate change causing variations in the planet is nothing new, nor is the idea that humans contribute to increase this every day. The constant increase in CO2, principally due to burning coal, oil, and natural gas, which liberates the carbon stored in these fossil fuels, makes the current atmospheric warming inevitable.

Although older data existed, it was not until around 1975-1980 when scientists started to have enough evidence of the effect that the Greenhouse-type gases were having on the climate. They were in possession of the tools, knowledge, and techniques to initiate the in-depth study of the complex climate system: satellites to observe the Earth; worldwide networks measuring temperatures, winds, precipitation, and currents; as well as very powerful computers to develop climate models. Public opinion began to gain knowledge of the problem alerted by ecology groups, and governments posed the problem and started to reach international agreements driven by the ever more worrying results that the scientists were developing.

With the aim of establishing levels of emissions, in the summit held in December 1997, the Kyoto Protocol was elaborated, which indicated the limits in net emissions of greenhouse effect gases for the principal developed countries.

With the necessary containment of growth in greenhouse effect gas emissions and the problem of global warming, one must add, as we have stated, the continual upward spiral in the price of fossil fuels, such as crude oil and natural gas, which led the different nations to develop and promote the introduction of renewable energy facilities. For all of the above, we can categorically state that the production of clean/renewable energies is not only an attempt to improve the environment but is also a necessity that we must face.

If the term “renewable energy” is entered into the SCOPUS database, we can see that there are around 70,000 records, but if the time frame is set to the period (2005-2014), there are 50,683, and between (2010-2014), there are 32,490, which shows that the real development of the theme has occurred in the
last 10 years. This demonstrates the enormous development in the area of renewable energies and their impact among researchers, not only at the level of technological development but also in publications. Of these, many are related to Soft Computing: there are 1,870 that use Neural networks, 2,153 fuzzy, 516 multicriteria decision models, and 524 heuristics, which are concepts related to the topic of this book.

Given the importance of the topic at hand, located on the interface between Soft Computing and Renewable Energies, this book seeks to provide a series of contributions that will give interested readers up-to-date access to the most recent research topics in this scientific field.

The suitability and relevance of the themes selected is due to the quality and prestige of the editors of the current volume, who although they are young researchers in the field, already have professional curricula vitae of great quality. All of them are members of the Models of Optimization and Decision (MODO) Working Group of the University of Granada and have developed different research projects in the context dealt with here in distinct geographical areas at regional, national, and international level. It is specifically this great variety of projects, applied methodologies, and results obtained by them that guarantees that the contents of this book will allow interested readers to approach this thematic area from a professional, scientific, and innovative perspective, which will help them to undertake subsequent research and technological transfer tasks.

More concretely, the book presents 14 chapters, where different Soft Computing tools are applied and which, as already mentioned, will be of interest for researchers and students who wish to be introduced into these new techniques.

As a final word, we would like to acknowledge our gratitude to the editors for giving us the opportunity to write this foreword for their book. Given the close relationships as disciples that they have had with us for many years, it shows that science is a wheel that moves forward over the work that others have previously done for us.

María Teresa Lamata
University of Granada, Spain

José Luis Verdegay
University of Granada, Spain

María Teresa Lamata is a Full Professor at Department of Computer Science and Artificial Intelligence, University of Granada, Spain, and lead the Models of Decision and Optimization (MODO) Research Group. She has published more than 150 papers in leading scientific journals and has been Advisor of 4 PhD dissertations. She has served on many international program committees and has been Principal Researcher in a variety of research projects. She also is a member of the Editorial Board of the International Journal of Uncertainty, Fuzziness, and Knowledge-Based Systems. Her current scientific interests are soft computing, fuzzy sets and systems, OWA operators, decision support systems, and linguistic labels.

José Luis Verdegay is a Full Professor at Department of Computer Science and Artificial Intelligence, University of Granada, Spain, and member of the Models of Decision and Optimization (MODO) Research Group. He has published 11 books and more than 300 papers in leading scientific journals, and has been Advisor of 14 PhD dissertations. He has served on many international program committees and has attended numerous national and international conferences, congresses, and workshops. He has been Principal Researcher in a variety of national and international research and educational projects. His current scientific interests are soft computing, fuzzy sets and systems, decision support systems, metaheuristic algorithms, nature-inspired systems, and bioinformatics.