SpringerBriefs in Energy

Gabriel Winter-Althaus · Antonio Pulido-Alonso · Lourdes Trujillo · Enrique Rosales-Asensio

EU Islands and the Clean Energy Transition

Springer

SpringerBriefs in Energy

SpringerBriefs in Energy presents concise summaries of cutting-edge research and practical applications in all aspects of Energy. Featuring compact volumes of 50 to 125 pages, the series covers a range of content from professional to academic. Typical topics might include:

- A snapshot of a hot or emerging topic
- A contextual literature review
- A timely report of state-of-the art analytical techniques
- An in-depth case study
- A presentation of core concepts that students must understand in order to make independent contributions.

Briefs allow authors to present their ideas and readers to absorb them with minimal time investment.

Briefs will be published as part of Springer's eBook collection, with millions of users worldwide. In addition, Briefs will be available for individual print and electronic purchase. Briefs are characterized by fast, global electronic dissemination, standard publishing contracts, easy-to-use manuscript preparation and formatting guidelines, and expedited production schedules. We aim for publication 8–12 weeks after acceptance.

Both solicited and unsolicited manuscripts are considered for publication in this series. Briefs can also arise from the scale up of a planned chapter. Instead of simply contributing to an edited volume, the author gets an authored book with the space necessary to provide more data, fundamentals and background on the subject, methodology, future outlook, etc.

SpringerBriefs in Energy contains a distinct subseries focusing on Energy Analysis and edited by Charles Hall, State University of New York. Books for this subseries will emphasize quantitative accounting of energy use and availability, including the potential and limitations of new technologies in terms of energy returned on energy invested.

Gabriel Winter-Althaus · Antonio Pulido-Alonso ·
Lourdes Trujillo · Enrique Rosales-Asensio

EU Islands and the Clean Energy Transition

Springer

Gabriel Winter-Althaus
Department of Mathematics
University of Las Palmas de Gran Canaria
Las Palmas de Gran Canaria, Spain

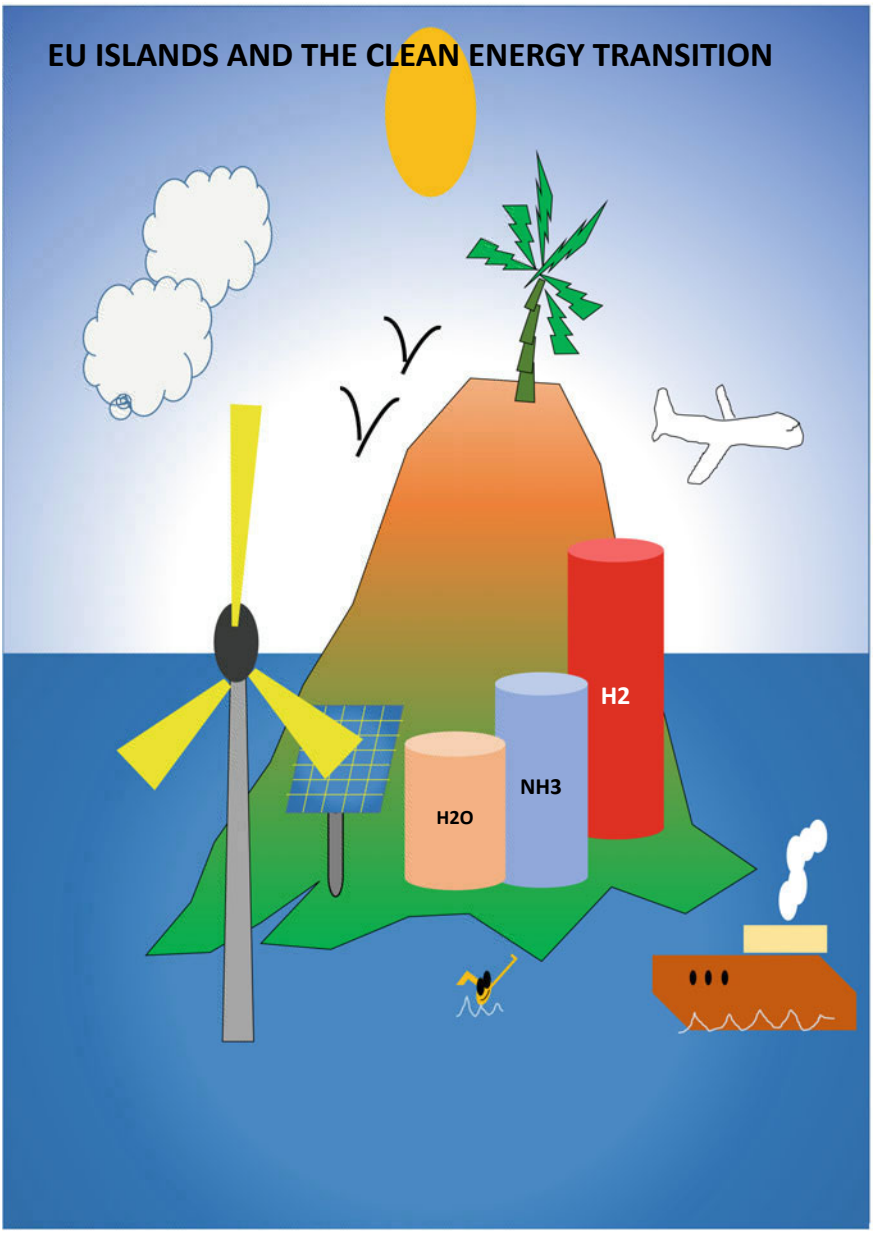
Antonio Pulido-Alonso
Department of Electrical Engineering
University of Las Palmas de Gran Canaria
Las Palmas de Gran Canaria, Spain

Lourdes Trujillo
Department of Applied Economics
University of Las Palmas de Gran Canaria
Las Palmas de Gran Canaria, Spain

Enrique Rosales-Asensio
Department of Electrical Engineering
University of Las Palmas de Gran Canaria
Las Palmas de Gran Canaria, Spain

ISSN 2191-5520 ISSN 2191-5539 (electronic)
SpringerBriefs in Energy
ISBN 978-3-031-23065-3 ISBN 978-3-031-23066-0 (eBook)
https://doi.org/10.1007/978-3-031-23066-0

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland


EU ISLANDS AND THE CLEAN ENERGY TRANSITION
H2
NH3
H2O

Preface

Isolated energy systems face specific challenges related to their energy supply. These specific challenges include high dependence on imported fossil fuels; a more restricted energy supply due to the absence of electricity and gas interconnections; greater difficulty than continental energy systems in balancing supply and demand; higher energy costs than continental systems due to the use of more expensive fuels and the lower efficiency of power plants. As a consequence of all this, isolated energy systems need specific measures to mitigate this situation. In this sense, the use of renewable energy resources could represent an opportunity to, among other things, secure their energy supply, limit the need to import energy, or reduce the cost of such energy, and achieve the search and difficult decarbonization of these territories. The creation of clean electricity and fuels, such as hydrogen and ammonia, would mark a path toward the decarbonization of society as a whole. The seasonality of natural energy resources (sun and wind) requires seasonal storage, which could be avoided by trading energy abroad using ammonia as a hydrogen carrier energy vector, facilitating the storage and transport of hydrogen.

This book will contextualize the islands of the European Union and their energy systems, as well as review the research projects carried out in these isolated energy systems. Specifically, this book will present the feasibility of using in isolated territories of the European Union schemes based on reverse osmosis desalination plants, electrolyzers, ammonia synthesizer, fuel cells, nitrogen generators, electric batteries, recharging stations for electric vehicles, hydrogen and/or ammonia combustion generators, ammonia crackers, and complementary installations such as tanks, pumps, compressors, and auxiliary elements.

With the production of these green fuels, not only full decarbonization is achieved, but also energy independence and geopolitical influence. The islands have sea (water), therefore hydrogen and oxygen; air (nitrogen); with its movement and the sun, renewable energy is obtained. In short, the use of conventional energy sources would not be necessary.

This work involves a transfer of knowledge and technology in sectors and applications hitherto unexplored. In addition to the social benefit projected to society, it also demonstrates that its implementation is economically viable despite the lack

of aid or economies of scale linked to this technology compared to other technologies that are more widely implemented. It opens up a range of possibilities for new sustainable business models based on hitherto minority energies. Depending on the environmental conditions, the results of exploration and the technical feasibility, but always with a great commercial potential of the innovations presented here, which, if they also had public funding, would achieve greater business development.

In each island, it would be necessary to determine what natural energy resources and what energy demand it has. The islands have an advantage in obtaining water, which is the availability of seawater. Although it can be obtained from the humidity of the air, the energy expenditure would be much higher. In the case of the Canary Islands analyzed here, water is scarce, and an osmosis plant has been considered in the process. In other cases, it may not be. But it will always be possible to connect various flexible production processes, save the variability of resources, and try to find a solution to save seasonality.

Las Palmas de Gran Canaria, Spain

Gabriel Winter-Althaus
Antonio Pulido-Alonso
Lourdes Trujillo
Enrique Rosales-Asensio

Contents