energies

Editorial

New Research Trends and Topics for Achieving Energy Efficiency in Buildings: Both New and Rehabilitated

Sergio Gómez Melgar * and José Manuel Andújar Márquez

CITES Research Center, TEP192 Control y Robótica, Escuela Técnica Superior de Ingeniería, Universidad de Huelva, 21007 Huelva, Spain; andujar@diesia.uhu.es
* Correspondence: sergomel@uhu.es

1. Introduction

In the Special Issue of *Energies* entitled *Energy Efficiency in Buildings Both New and Rehabilitated* that was published in 2019, a broad spectrum of research teams from around the world provided their latest findings on how to reduce energy consumption in the building sector. In this second Special Issue, we continue to advance the knowledge of relevant scientific proposals aimed at reducing the carbon footprint of the building sector.

2. Contributions in This Issue

In this second Special Issue, five contributions have been selected from researchers with extensive experience and scientific solvency from Spain, Kuwait, and Poland. Each of them carries out a specific analysis in their geographic area (the Mediterranean, Central Europe, and the Middle East) so the variety of approaches contributes to enriching the scientific discussion related to energy efficiency.

In *Renewable Energy Technologies for Energy Efficient Buildings: The Case of Kuwait* [1], the most relevant energy efficiency technologies applicable in countries traditionally dependent on fossil fuels, such as Kuwait, are identified. Prof. Bader Alshuraiaan concludes in his research that introducing hybrid photovoltaic–wind systems, flat plate thermosiphon units, and solar collector booster technologies can produce energy savings in Kuwait's building sector of 39–42% by 2030 and 48–53% by 2040.

The paper *Impact of Global Warming in Subtropical Climate Buildings: Future Trends and Mitigation Strategies* [2] shows how building energy simulation software tools used by building designers could be underestimating the problem of air conditioning needs in the subtropical zone. They mathematically complemented projected climate data on four time periods (historical, the 2020s, 2050s, and 2080s) and four emission scenarios defined by the Intergovernmental Panel on Climate Change (IPCC) to obtain data for closer time frames (2025 and 2030). They conclude by proposing different mitigation strategies to counteract the impact of climate change in the distant future.

In *Matching Energy Consumption and Photovoltaic Production in a Retrofitted Dwelling in a Subtropical Climate without a Backup System* [3], an in-depth analysis of the energy use and renewable energy production of a social dwelling was performed from data measurements. The paper proposes a strategy that involves rescheduling energy demand by modifying occupants' habits in terms of domestic hot water (DHW) consumption (for cooking and washing) to increase the use of renewable energy produced on-site, reduce energy misused from 52.84% to 25.14%, and reduce electricity costs by 58.46%.

In the paper *Analysis of the Relationship of the Improvement of Façades and Thermal Bridges of Spanish Building Stock with the Mitigation of Its Energy and Environmental Impact* [4], an evaluation of the effect of the improvement of building façades and thermal bridges in different climate zones of Spain is carried out, both in current and future scenarios, considering operational patterns from the COVID-19 pandemic. The study shows that the application of energy conservation measures to improve façades can reduce carbon dioxide

check for updates

Citation: Melgar, S.G.; Andújar Márquez, J.M. New Research Trends and Topics for Achieving Energy Efficiency in Buildings: Both New and Rehabilitated. *Energies* **2022**, *15*, 851. https://doi.org/10.3390/en15030851

Received: 17 January 2022
Accepted: 21 January 2022
Published: 25 January 2022

emissions but is far from achieving the 90% reduction set by the European Union by 2050. Consequently, these measures should be combined with other measures.

Finally, the paper *Maintenance of Passive House Standard in the Light of Long-Term Study on Energy Use in a Prefabricated Lightweight Passive House in Central Europe* [5] is an experimental study on different parameters: the orientation that maximizes heat gains from solar radiation, thermal insulation of partitions, heat provided by a geothermal heat pump, and a mechanical ventilation system with a heat exchanger. The research concludes that the maintenance of the passive house standard is highly negatively conditioned by human impact and the fact that the high energy expenditure comes from non-renewable primary energy. The article also presents recommendations on how to restore the passive house standard in the building.

3. Future Trends and Scopes

From the total of 21 articles published in these two Special Issues of *Energies*, it can be concluded that the current state of the art in architecture and engineering allows us to align the design, construction, and renovation of buildings with the goals of efficiency and a reduction in energy consumption. To this end, net zero energy buildings (nZEBs, i.e., those that use less than 80 kWh/m^2y of primary energy to operate) are good, zero energy buildings (ZEBs, i.e., those nZEBs that produce the energy they need to operate by integrating on-site renewable sources) are better, but only plus zero energy buildings (+ZEBs, i.e., those ZEBs that produce more energy than they need to operate) make a net contribution to solving the problem of reducing the building sector's contribution to global warming.

Then, if the state of knowledge and the maturity of available technologies allow it, what can go wrong? Why are we not moving as quickly as we need to to reach our goals? It is clear that new professionals in the field of architectural design and engineering are needed to make +ZEB the norm rather than the exception over the short term in the building sector.

Both in new designs and in the rehabilitation of existing buildings, both in large tertiary buildings and in residential ones, each building should be able to erase its own carbon footprint in energy terms and contribute to partially offset those of others already built. Public administrations should provide free advice to individuals and companies to carry out realistic, binding, and cost-effective energy efficiency. This should be the road map for new regulatory policies in the construction sector. Since the science has spoken, politicians and citizens now need to do their part to achieve the shared goal of a more sustainable and energy efficient building sector.

Funding: This paper is framed in the project "Integracion y control de una planta piloto basada en hidrogeno para suministro energético en aplicaciones residenciales (PID2020-116616RB-C31)", funded by the Science, Innovation and Universities Spanish Ministry by means of the Spanish Research Agency.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Alshuraiaan, B. Renewable Energy Technologies for Energy Efficient Buildings: The Case of Kuwait. *Energies* **2021**, *14*, 4440. [CrossRef]
2. Videras Rodríguez, M.; Sánchez Cordero, A.; Gómez Melgar, S.; Andújar Márquez, J.M. Impact of Global Warming in Subtropical Climate Buildings: Future Trends and Mitigation Strategies. *Energies* **2020**, *13*, 6188. [CrossRef]
3. Gómez Melgar, S.; Sánchez Cordero, A.; Videras Rodríguez, M.; Andújar Márquez, J.M. Matching Energy Consumption and Photovoltaic Production in a Retrofitted Dwelling in Subtropical Climate without a Backup System. *Energies* **2020**, *13*, 6026. [CrossRef]
4. Bienvenido-Huertas, D. Analysis of the Relationship of the Improvement of Façades and Thermal Bridges of Spanish Building Stock with the Mitigation of Its Energy and Environmental Impact. *Energies* **2020**, *13*, 4499. [CrossRef]
5. Wąs, K.; Radoń, J.; Sadłowska-Sałęga, A. Maintenance of Passive House Standard in the Light of Long-Term Study on Energy Use in a Prefabricated Lightweight Passive House in Central Europe. *Energies* **2020**, *13*, 2801. [CrossRef]