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The 8th International Conference on Energy and Environment Research ICEER 2021, 13–17 September

ICEER 2021: Developing the World in 2021 with clean and safe energy

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Abstract

The World pandemic situation that started in 2020 brought important limitations to live events. In spite of the fast response provided by the scientific community, with researchers from all over the World committed to the development of vaccines to prevent the dissemination and effects of the corona virus, in 2021 it was not yet possible to organize the 8th International Conference on Energy and Environment Research (ICEER) under live mode. Therefore, the *ICEER 2021* occurred online for the second consecutive year, from 13–16 September 2021. The Authors, Participants and the Conference organization understood how important it is to discuss matters related to Energy and the Environment Research, as it was demonstrated by the huge changes introduced by travel and work limitations. Not only the energy consumption was affected during the pandemic, but also the environment was positively impacted by the reduction of human individual travel, both for working and for amusement purposes. These facts highlighted even more the importance of the development and use of energy sources and systems that are reliable, affordable and, above all, environment friendly, towards Sustainable Development, which motivated the theme adopted for the current edition of *ICEER 2021*: "Developing the World in 2021 with clean and safe energy". The *ICEER 2021* recovered some participants who preferred the live version but were committed not to give up on their research in these important topics, and the full three working days demonstrated the resilience of this community. This editorial paper summarizes the *ICEER 2021*, briefly reporting the main conclusions and the most impacting sessions, presentations and interventions that allowed to strengthen the interaction among experts and young researchers in the energy and environment field.

Peer-review under responsibility of the scientific committee of the 8th International Conference on Energy and Environment Research, ICEER, 2021.

Keywords: Advanced energy technologies; Energy efficiency; Energy markets & policy; Renewable energy; Sustainable buildings

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1. Introduction

Organized by the SCIence and Engineering Institute (SCIEI) and the School of Engineering (ISEP) of P. Porto, in collaboration with the Dipartimento di Ingegneria of the Università degli studi "Roma Tre", the CIETI and LEPABE research groups, the 8th International Conference on Energy and Environment Research (*ICEER 2021*) confirmed its success, even under constrained conditions. Due to the unpredictability of the World pandemic situation, and of the restrictions imposed to travelling and live meetings, the *ICEER 2021* was planned from the beginning as a virtual event, held from 13 to 16 September 2021.

Even in an online format, the original spirit of the Conference was maintained, where serious and deep debates on energy and environment research occurred under an informal process, with experts sharing their valuable knowledge with younger researchers, freely and without any kind of barriers.

Under this format, the *ICEER 2021* was a highly successful conference, thanks not only to the participants, but also to the support of CIETI and LEPABE research laboratories, and the University of Roma Tre, whose researchers devoted significant part of their time to the organization of the conference. Moreover, *ChemEngineering*, *Energies* and *Processes* journals gave their support as media or publication partners, improving the Conference attractiveness.

Three highly reputed keynote speakers delivered very interesting and timely presentations that catalyzed intense and interactive debate among the participants of *ICEER 2021*. These presentations covered different fields of research, from the use of artificial intelligence in renewable energy systems, to energy storage as compressed hydrogen, including the production of advanced biofuels through thermochemical processes, and the management of flexibility in distribution electricity networks, all of them well aligned with the conference theme.

This Special Issue of Energy Reports offers 94 full papers presented at *ICEER 2021*, and serves as the Proceedings of ICEER2021 — The 8th International Conference on Energy and Environment Research, 13–16 September 2021.

2. Conference topics

In the *ICEER 2021*, the 125 accepted contributions were grouped in 11 thematic sessions where 82 authors made oral presentation, plus one session where 28 authors made oral flash presentation in a miscellaneous of topics, and finally one session devoted to posters discussion. The sessions were organized in small blocks of 3–5 presentations followed by 10–15 min breaks, that allowed not only to briefly relax from the three long days of work, but especially to break the ice, extend the discussion and share additional experience, as well as to remember previous live editions of the ICEER. Most of the sessions were highly multidisciplinary with participants from different fields of knowledge. Thus, in *ICEER 2021*, the presented works were arranged in Oral, Oral flash and Poster sessions in the following topics:

- Advanced Control & Monitoring Systems
- Advanced Energy Technologies
- Education for Sustainable Development
- Energy
- Energy Efficiency
- Energy Policy, Economics, Planning & Regulation
- Environment
- Life Cycle Analysis Methodologies
- Modelling, Simulation and Forecasting of Energy & Carbon Markets
- Renewable Energy
- Sustainable Buildings

3. Committees

The *ICEER* series includes several committees, with different tasks allocated to each one. Thus, besides the Organizing Committee, that includes Conference and Program Chairs and the SCIEI staff, there is one international Scientific and Technical Committee (STC), that includes the Conference and Program Chairs and a list of internationally active researchers. Additionally, there is a Publication Committee that includes the STC Chairs and additional invited members, who are responsible to validate the quality of the papers recommended for publication

in *Energy Reports*, and to invite some of their Authors to submit an extended version of the manuscript to special issues to publish in selected journals.

From its very beginning, the *ICEER* series has heavily relied on the kindness and expertise of the members of the Scientific and Technical Committee (STC), who take the huge task of *peer reviewing* the manuscripts submitted for presentation, often in a very short period of time. Their recommendations are fundamental to improve the quality of the final manuscripts, to be published in the journal that will serve as the Proceedings of the conference, once more *Energy Reports*. The STC of *ICEER 2021* was comprised of long time members, and some new members who brought additional expertise and diversity. Thus, on behalf of the organization, the Conference, Program and STC Chairs are proud to acknowledge and thank the long list of expert researchers who made the *ICEER 2021* such an outstanding and intellectually challenging event.

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Last, but not least, our recognition to the Staff of SCIEI who made this online edition run smoothly, always with a smile.

The SCIEI Staff

Tina Wong // Jennifer Law // Maggie Hsu // Cindy Lau // Amanda Wu	SCIEI	CN

4. Conference statistics

147 contributions were submitted to *ICEER 2021* by 358 authors from 34 countries in the five continents, showing the relevance and attractiveness of *ICEER 2021* as a forum for discussion of research in the fields of energy and environmental research.

Fig. 1 shows the detail about the origin of authors, showing about 35% were from Portugal, 6% from China, 5% from Spain, 4% from Egypt, Qatar, India, Indonesia, and the Czechs Republic, 3% from Russia, Ecuador, Australia, France and Italy, as the main contributors, and the remaining countries contributed with less than 2% each.

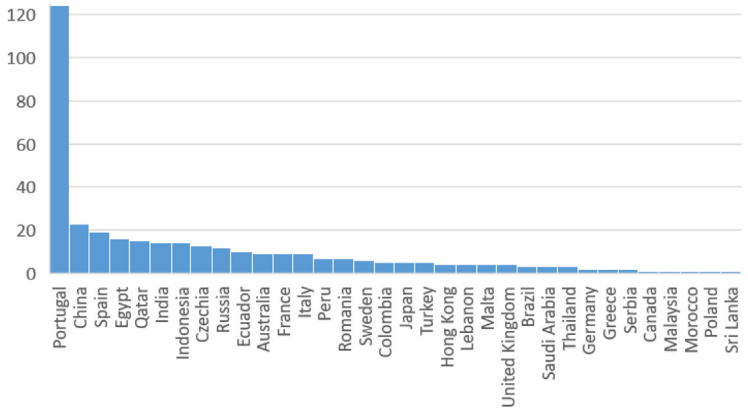

Fig. 1. Distribution of authors in ICEER 2020 by country.

After a thorough revision process where each paper was reviewed by at least two experts from the STC members, 125 submissions have been accepted for presentation under different formats, according to the relevance and quality of the research and the preference of the Authors. In the end, these pieces of research were presented and discussed by about 150 young and experienced researchers from 41 countries, from five continents. Along the three days of intensive work, only a few parallel sessions had to be planned to accommodate all these presentations. Special attention was paid to time zone of each participant, with sessions organized to maximize the participation of conference attendees. Fig. 2 shows the distribution of papers presented by topic.

As shown in Fig. 2, six topics represented 70% of the presentations, with research related with Life Cycle Analysis Methodologies (applied to energy and/or environmental impact) the most hotly presented and debated by researchers who attended *ICEER 2021*. This topic was followed almost evenly by presentations related to Environment, Modelling, Simulation and Forecasting of Energy & Carbon Markets, Energy, Energy Efficiency and Energy Policy, Economics, Planning & Regulation. Advanced Energy Technologies and Education for Sustainable Development were represented by 8 and 7% each, respectively. The remaining three topics, Advanced Control & Monitoring Systems, Sustainable Buildings and Renewable Energy, represented each 5% of the presentations. However, it must be noted that the classification of some of the presentations in a particular topic is sometimes difficult, due to their multidisciplinary nature.

In addition, the audience debated all the themes enthusiastically, irrespective the number of papers in the topical session. To this respect, the role of the Session Chairs was of the highest relevance, as they were one of the main drivers of the discussions, with the hard task of stopping the debate in order to prevent huge delays.

The *ICEER 2021* community is still growing, with new participants joining others that are now frequent participants. This multicultural community is an inclusive forum, where researchers freely share their knowledge as well as their doubts related to the topics of the conference.

5. Keynote and invited speakers and lectures of *ICEER 2021*

The quality and attractiveness of a Conference depends, not only on the quality of the submissions received and on their Authors' expertise, but also on the expertise and willingness of their Scientific and Technical advisors.

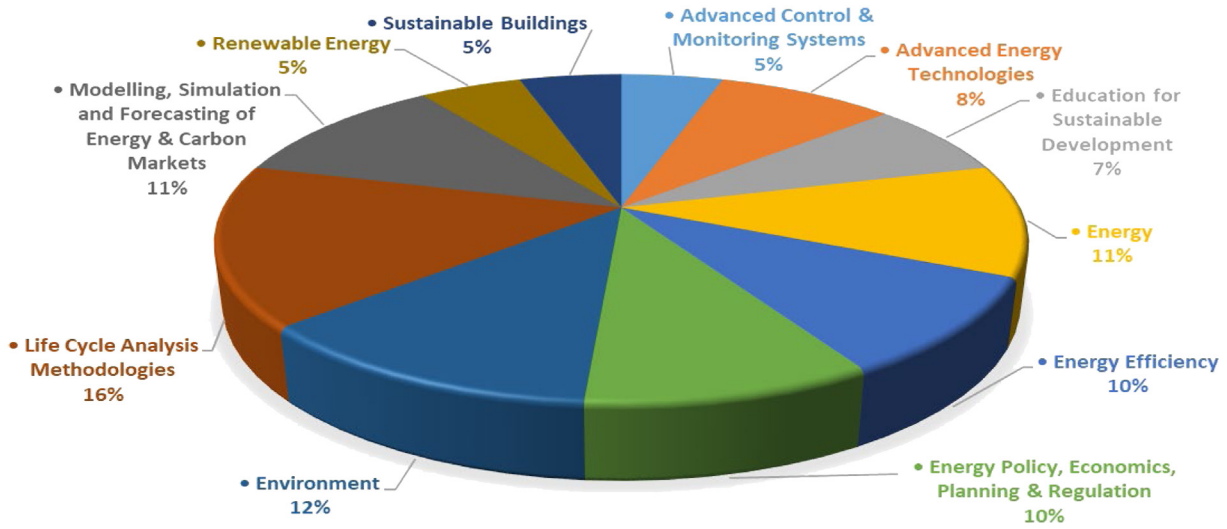

Fig. 2. Distribution of papers presented at *ICEER 2021* by topic.

Notwithstanding, the expertise of the Keynote and Invited speakers can be a driver of the conference dynamics, making their choice one of the most difficult and relevant tasks in program definition.

In *ICEER 2021* there were three Keynote lectures and one Invited speech, held in the three days of the conference. Four internationally recognized experts kindly accepted the invitation to share their knowledge on four key topics in the field of Energy and Environment research. Their lectures boosted a vivid debate and interaction among participants. Senior and young researchers had the opportunity to meet these experts, and discuss with them the future trends in the energy sector, and the importance of performing research related to the provision of energy that causes lower negative impacts on the environment, is available when needed, and at a fair cost. Interestingly, participants proceeded the debate even during the breaks. The *ICEER 2021* Conference and Program Chairs are deeply grateful to Prof. Weihao Wu, Dr. Claudio Corgnale and Prof. Hector Ruiz, who presented keynote lectures, and Prof. Pablo Arboleya, who presented an invited speech. Our very best Thank you for the inspirational presentations, for sharing such valuable expertise with the conference participants.

Weihao Wu is a Full Professor and the Director of Institute of Smart Power and Energy Systems (ISPES) at the University of Electronics Science and Technology of China (UESTC). He was an Associate Professor at the Department of Energy Technology, Aalborg University, Denmark and the Vice Program Leader of Wind Power System Research Program at the same department. Received the B.Eng. and M.Sc. degrees from Xi'an Jiaotong University, Xi'an, China, in 2004 and 2007, respectively, both in electrical engineering, and Ph.D. degree from Aalborg University, Denmark, in 2012. He has led/participated in more than 15 national and international research projects and he has more than 200 publications in his technical field. He served as the Technical Program Chair (TPC) for IEEE Innovative Smart Grid Technologies (ISGT) Asia 2019 and as the Conference Chair for the Asia Energy and Electrical Engineering Symposiums (AEEES 2020 and 2021). He is currently serving as Chair for IEEE Chengdu Section PELS Chapter. He is a Fellow of the Institution of Engineering and Technology, London, U.K. and an IEEE Senior Member. His research interests include artificial intelligence in modern power systems and renewable power generation.

In the lecture titled *Applications of Artificial Intelligence in Renewable Energy Systems*, Prof. Weihao Wu introduced briefly the concept of Artificial Intelligence (AI), followed by the application of deep learning in fault diagnosis and image recognition, and AI in renewable energy systems, including multi energy systems with largescale wind power and distribution network voltage control with large-scale PV power. Prof. Wu demonstrated how advanced AI approaches can promote the development of renewable energy systems, and achieve a substantial improvement in predicting the optimal solutions of design and scheduling variables. Regression techniques learn

patterns from massive data, so they can be used to monitor and predict renewable energy generations. Additionally, advanced classification techniques can be applied to assess the security and stability of renewable energy-based power systems, while reinforced learning techniques can provide operators with emergency control actions amid the uncertainties of renewable energy systems. Therefore, this lecture was perfectly aligned with the conference theme.

Claudio Corgnale is the Chief Technology Officer of Greenway Energy, LLC (Aiken, South Carolina, USA). He is a mechanical engineer, renowned internationally for his experience and expertise in hydrogen energy systems and thermal energy storage systems. He has been involved in the design, assessment and testing of hydrogen production systems, developing process and detailed transport models for thermochemical and electrochemical hydrogen production plants. Dr. Corgnale has also been working on hydrogen storage, thermochemical energy storage systems and hydrogen compression systems. He has been carrying out transport modelling activities, material development research and has coordinated experimental tests for cryogenic adsorbent systems, high temperature materials and high-pressure hydrogen absorption systems. He was part of the US Department of Energy (DOE) Hydrogen Storage Engineering Center of Excellence, where he developed techno-economic analysis models for solid state hydrogen storage systems and detailed transport models for carbon and metal organic framework adsorption materials. He has been the principal investigator of several DOE funded projects in the field of renewable energy, hydrogen compression and catalyst development for thermochemical hydrogen production systems. He was an invited speaker at the 2019 Hydrogen-Metal Systems Gordon Research Conference. He is PhD in mechanical and industrial engineering from the University Roma Tre (Italy) and is currently a visiting research assistant professor at the University of South Carolina.

Dr. Claudio Corgnale delivered a lecture on a hot topic related to clean energy, titled *High-Pressure Hydrogen Compression Using Alternative Efficient and Low-Cost Approaches.* In fact, currently hydrogen delivery represents one of the main barriers to achieve a world hydrogen economy. The US Department of Energy (DOE) identified three main approaches to transport and deliver hydrogen at large scale, requiring high-pressure hydrogen compression systems. However, current mechanical compressors cannot achieve the DOE targets, showing additional drawbacks when operating at the required pressures and conditions, especially in terms of reliability, efficiency and investment and lifetime costs. Valid alternatives are represented by electrochemical compression (EC) and thermal compression (TC) systems, exploiting the properties of suitable hydrogen absorption materials. Therefore, Dr. Corgnale discussed a two-stage hybrid compressor system, with a first stage (lower pressure) EC unit, coupled in series with a second stage (higher pressure) metal hydride (MH) TC system. After a description of the main fundamental properties of MHs, a comprehensive presentation of the second stage of the system, operating at higher pressures and integrated with the electrochemical unit, was given. Dr. Corgnale discussed the results obtained from a project funded by the DOE, involving Greenway Energy LLC, Savannah River National Laboratory and Skyre Inc., having proposed improvements, both in terms of material properties and system performance, and highlighted the required research and development activities to fabricate and commercialize a full scale system. This lecture was a clear demonstration of the importance of energy research on the developments of clean and safe energy systems.

Pablo Arboleya received the M.Eng and Ph.D. degrees from the University of Oviedo, Gijon, Spain un 2001 and 2005 respectively, both in electrical engineering. Prof. Arboleya is an Associate Professor at the University of Oviedo. He is co-founder of the LEMUR research group in which he carries out his research activities related to the modelling and analysis of electrical systems and the implementation of operation and energy management techniques. Pablo holds the SmartCities Chair at University of Oviedo funded by the city of Gijón. Aligned with the target of this chair he participated in the development of the Gijón DemoLab in which an IoT infrastructure at city level is being tested and developed. He is also co-founder of Plexigrid, a University of Oviedo spin-off technology-driven company, that develops software tools specially designed for grid operators, aggregators and energy communities. He is managing editor of the International Journal of Electrical Power & Energy Systems, Elsevier, and associated editor of eTransportation journal, Elsevier.

Prof. Arboleya presented the invited speech titled *Flexibility in Electricity Systems as the Key to Decarbonization of the Energy System*. In his speech, Prof. Arboleya highlighted that the success in the face of the challenges posed by the change of model towards a low-carbon economy is closely linked to innovation and technological development in the field of energy. Moreover, in the process of energy transition towards a sustainable energy system, efficiency and savings measures are complemented by efforts in technological innovation, guided, in turn, by the need to produce more sustainably, efficiently and at competitive prices, reducing external dependence and

making it possible to combat climate change. Various technologies such as electric vehicles, photovoltaic generation systems, storage systems and heat pumps have been reducing their costs exponentially, making them more accessible to end users. The massive deployment of these technologies means that what were previously only customers who consumed electricity have become prosumers, customers who produce electricity or consume it flexibly. The role of prosumers and the flexibility they can provide to the system will be key in the decarbonization process as set out in the package of measures that will derive from the European guidelines established in the so-called "Clean Energy Package for all Europeans". Being electrification one of the keys to the decarbonization process, an increase in both generation and demand at low voltage distribution network level is expected, leading to high levels of stress on the distribution grids, which will act as real bottlenecks in the penetration of the aforementioned technologies. The only way to promote the electrification process in the low voltage grid without incurring disproportionate investment costs in the grid is through the management of the so-called flexible loads (those that can be modified, brought forward or delayed without any loss of comfort to the end user). However, managing flexibility in distribution networks is not a trivial task due to technical and regulatory aspects, that were reviewed in this talk.

Hector Ruiz is a Full Professor in the Faculty of Chemistry Sciences, founder of Biorefinery Group and manager of the biorefinery pilot plant at AUC (Saltillo, Coahuila, Mexico) since February 2013, and leader of the biomass pretreatment stage in the Cluster of Bioalcoholes in the Mexican Centre for Innovation in Bioenergy in Mexico. Prof. Ruiz obtained his B.S in Chemical Engineering (Hons) from the Autonomous University of Coahuila (AUC) (2004, Mexico) and his Ph.D. in Chemical and Biological Engineering from Centre of Biological Engineering at the University of Minho, Portugal in 2011 and was a postdoctoral researcher at University of Minho (Portugal) and University of Vigo (Spain), 2012. Dr. Ruiz worked as lead operating engineer in the chemical industry at Magnelec Industries (Mexico, Feb 2005–Sep 2007). Dr. Ruiz has intense editorial activity being the Editor-in-Chief of BioEnergy Research Journal (Springer). Dr. Ruiz is member of the Mexican Academy of Sciences, and member of the Academy of Engineering, Mexico since 2021. Member of the National Researchers Council in Mexico (CONACYT, Level 2 distinction of 3), with several important award. Dr. Ruiz works to advance lignocellulose and (micro & macro) algal biomass biorefining science and technology for the production of high added-value compounds and biofuels (bioethanol), biomass fractionation using hydrothermal processing, biochemical and sugar platform approaches to biomass conversion and bioreactor design. Dr. Ruiz has an impressive track of authored publications in the related fields, plenary talks by invitation on biomass conversion into biofuels in scientific events.

Due to environmental considerations concerning sustainable development in the last years, the renewable resources currently attract increasing interest as raw material for industry in the production of advanced transport biofuels as bioethanol. Thus, in spite of the current trend to electrify vehicles, it is still needed to provide advanced biofuels that will replace fossil derived fuels. Therefore, in the closing Keynote lecture titled *Hydrothermal Processing for Advanced Transport Biofuels Production from Biomass,* Prof. Ruiz presented the concept of "biorefinery" of lignocellulosic materials from agricultural residues and aquatic biomass (macro–micro algae), an analogous to the classical petroleum refinery concept that refers to biomass conversion into biofuels and chemicals with high added value through the integration of clean processes. Moreover, the concept of biorefinery demands efficient utilization of all components of these raw materials. Hydrothermal processing is a potential clean technology to convert raw materials such as biomass into bioenergy and high added-value chemicals. In this technology, water at high temperature and pressure is applied for hydrolysis, extraction, and structural modification of materials. In his presentation, Dr. Ruiz focused on providing the fundamentals, modelling, new technologies and scale-up of hydrothermal processing for the application and conversion of the main components of biomass into advanced transport biofuels and high value-added products in terms of the biorefinery concept. This lecture demonstrated another possibility of providing clean and secure energy, with an additional important potential for self-provision of the energy requirements.

6. *ICEER 2021* at a glance

The Keynote and Invited sessions kicked-off debate in specific topics related to clean, safe and secure energy. Thus, the oral, oral flash and poster presentations were arranged in blocks of 60–90 min, with 15 min breaks to allow participants recover concentration. The first day of the conference was devoted to registration and testing, followed by three long days of a very intense work, with only a few parallel sessions in two days.

At least one conference member from academia was invited to chair each session. The Session Chairs were in charge of evaluating the presentations for their quality and promoting the debate, while keeping the conference within the schedule.

Keynote and invited speakers inspired the participants of *ICEER 2021* to actively discuss different matters related to energy and environment research, with a deeper focus on the contribution of clean and safe energy to the sustainable development of the World. To this respect, it was highlighted the relevance of renewable and distributed energy sources towards the security in energy provision, while also contributing to reducing the environmental impacts that are associated with fossil derived energy. Furthermore, it was also highlighted the need to develop more energy efficient processes and of using energy more efficiently.

6.1. Best presentation awards

Both the full papers and the oral presentations were assessed for their quality, novelty, ability to cause debate, assisted by the Session Chairs, and the members of the STC, being the STC Chairs the final jury.

Thus, the 11 best oral presentations in each topic were awarded as follows:

- Efficiency Assessment of Technologies Implementation in Vietnam Power Transmission System, presented by Le Quang Khai (Japan), in the topic Energy Efficiency;
- Performance of Silver, Alumina & Graphene Oxide Nanofluid Over the Microporous Surface in Nucleate Pool Boiling, presented by Shoukat A. Khan (Qatar) in the topic Advanced Energy Technologies;
- Dynamic Remuneration of Electricity Consumers Flexibility, presented by Tiago Pinto (Portugal), in the topic Energy;
- Electric Vehicles Local Flexibility Strategies for Congestion Relief on Distribution Networks, presented by José Almeida (Portugal), in the topic Advanced Control and Monitoring Systems;
- Algae-Based Bioenergy Production Aligns with the Paris Agreement Goals as A Carbon Mitigation Technology, presented by Monique Branco (Brazil), in the topic Renewable Energy;
- Life Cycle Analysis of A Combined Electrolysis and Methanation Reactor for Methane Production, presented by António A. Martins (Portugal), in the topic Life Cycle Analysis Methodologies;
- Clustering and Exploring University Students' Knowledge and Attitude towards Energy Sustainability, presented by Divya Chandrasenan (India), in the topic Education for Sustainable Development;
- Lessons Learned from PCM Embedded Radiant Chilled Ceiling Experiments in Melbourne, presented by Mostafa Mousavi (Australia), in the topic Sustainable Buildings;
- The Nexus Between CO_2 Emissions from Electricity Generation, GDP and Energy Intensity Using A Complete Maximum Entropy Approach: the Case Of Iran, presented by Zeinab Zanjani (Iran/Portugal), in the topic Energy Policy, Economics, Planning & Regulation;
- How Much More Evidence do we Need to Invest in Sustainable Energy Sources and Stop Global Warming? An Answer from Maximum Entropy by Pedro Macedo (Portugal), in the topic Environment;
- Electricity Demand Prediction for Sustainable Development in Cambodia Using Recurrent Neural Networks with ERA5 Reanalysis Climate Variables, presented by Karodine Chreng (Japan), in the topic Modelling, Simulation and Forecasting of Energy and Carbon Markets.

The best oral flash, and the best poster presentation awards were assigned respectively to:

- A Statistical Review of A Decade of Residential Energy Research in Egypt presented by Sara Alsaadani (Egypt), the best oral flash presentation;
- Quality of Seeds and Crude *Jatropha* Oil (CJO) Based on Various Hybride of *Jatropha curcas* L. as a Biodiesel Source, presented by Maftuchah (Indonesia), the best poster presentation.

6.2. Best paper awards

The Best Paper award assigned in each of the categories (a) Sustainable Development, (b) Environment and (c) Energy, was assigned by the STC Chairs, assisted by the STC Members and the Session Chairs. These papers were assessed for their novelty, the quality of language, contribution to the field, as well as for their potential for further development.

In the category Sustainable Development, the Best Paper was awarded to the paper *Identification of Potential Landfill Sites in Bengaluru Metropolitan Region, India through GIS-AHP Framework*, presented by A.A. Devendran. In this paper the Authors identified the most potential landfill sites proposed by the Government in Bengaluru

Metropolitan Region, Karnataka state, India using Geographic Information System enabled Analytical Hierarchy Process based multi-criteria evaluation technique. Several criteria and constraints as recommended by the local authorities along with the proximity to the solid waste processing plants were used to identify the potential landfill sites in the study region. The study identified three highly suitable sites (Neraluru, Gudhatti, Madivala) for landfills which are not only environmentally sustainable but also economically attractive, as they are closer to the solid waste processing plants minimizing the transportation cost involved in the disposal of solid waste from the source to the final disposal sites in the study region.

In the category Environment, the Best Paper was awarded to the paper *Life Cycle Assessment of Bioethanol from Corn Stover from Soil Phytoremediation*, presented by António Martins. This work aimed to evaluate the potential environmental impacts of bioethanol production from corn stover from soil phytoremediation, comparing four different acids (Sulfuric, Nitric, Hydrochloric, and Acetic acids), to perform the biomass pretreatment. The study follows a life cycle thinking perspective, accounting for all the life cycle stages from corn stover grinding, to biomass pretreatment, enzymatic hydrolysis, fermentation, filtration and ethanol distillation, on a gate-to-gate approach. It was shown that in general, the sulfuric and hydrochloric acids have a better environmental performance than the acetic and nitric acids. Furthermore, the pretreatment, followed by enzymatic hydrolysis are the process steps with the highest relative contribution to the potential environmental impacts. Thus, an improvement analysis should focus on these process steps, for example to reduce fossil energy consumption by implementing renewable energy sources. Noteworthy the fact the paper awarded as the best in the category Environment was mainly focused on addressing the issue of energy consumption and origin as the main contributor for the environmental impacts, showing the multidisciplinarity of LCA studies.

In the category Energy, the Best Paper was awarded to the paper *Lessons Learned from PCM Embedded Radiant Chilled Ceiling Experiments in Melbourne*, presented by Seyedmostafa Mousavi. In this paper, the Authors presented a field study conducted on a newly-developed phase change material (PCM) embedded radiant chilled ceiling (RCC) installed in a stand-alone cabin located in Melbourne. The study evaluated the thermal and energy performance of the system through investigation of the transient thermal behaviour of PCM panels in charging–discharging cycles, the indoor comfort conditions, and the electricity peak demand. This research is particularly relevant when considering sustainable buildings, as buildings are responsible for over a third of energy consumption worldwide, particularly for the increasing demand of air-conditioners needed due to increasing extreme heat events around the globe. Therefore, the research on more energy-efficient space cooling alternatives, of which the integration of PCM with a RCC is a promising technology, is of high relevance.

6.3. Closing remarks

Ending a conference can cause mixed feelings of sadness, because “it is already over!”, and joy, because it was fun, inspiring, while sometimes exhausting. The closing session of *ICEER2021@Online* was a vibrant and interactive session, with participants demonstrating their satisfaction in being present and cheering the awardees, with maybe a bit of sadness for not being awarded. It was impressive how, late in the evening, the participants came back to attend the closing session, that was one of the most participated sessions.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Dear participant in *ICEER 2021@Online*,

For the second year, *ICEER 2021* was held online.

We must acknowledge and thank all those who attended the Conference and shared the results of their work and their ideas – thank you for the resilience in these times of difficulties, and for having been there with and for us!

The Keynote speakers, Prof. Weihao Hu, Dr. Claudio Corgnale and Prof. Hector Ruiz, and the Invited speaker, Prof. Pablo Arboleya, were challenged to join online the *ICEER 2021*, which they promptly accepted. They attended the conference from different countries and time zones (China, United States, Mexico and Spain, respectively), making their kind collaboration even more generous. Our biggest THANK YOU for having shared with us your relevant expertise, ideas and research results.

To our research group coordinators, who recognize the importance and encourage our efforts in dissemination in conferences, goes another big Thank you. They allowed us to spend part of our precious time preparing the conference.

To the SCIEI organization goes our next Thank you. We are all in debt for your commitment and efforts to make *ICEER 2021* go on, and to improve ICEER quality, supporting the Conference and Program Chairs, the Invitees, and all the participants. The kind and helpful staff in this edition – Tina, Jennifer and Maggie, from China. Without them, there would not have been *ICEER* online. And not to forget Cindy and Amanda, the SCIEI coordinators of ICEER series. What a great Team!

This Editorial wraps up *ICEER 2021* in the Conference Proceedings published in *Energy Reports*.

With your help, we could contribute to increase the scientific relevance and impact of ICEER series.

The next ICEER (*ICEER 2022*) will take place in 12-16 September 2022 @ Online and Coimbra, Portugal – **Save the Date**!

We are eager to meet you once more, preferably alive – website is already available with details and news.

Thank you all for having been online with us.
Next event will be unforgettable!!!
We hope to meet you soon (again) in… ***ICEER2022@Online&Coimbra***

The ICEER2021 Conference & Program Chairs

Nídia & Ambra
Coriolano & Carlos