Time Zone: UTC+2

LILLE CONFERENCES PROGRAM

ICACER 2024

2024 9th International Conference on Advances on Clean Energy Research

ICEEEP 2024

2024 8th International Conference on Energy Economics and Energy Policy

April 27-29, 2024 | Lille, France

CO-SPONSORED BY

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TABLE OF CONTENTS

NOTE

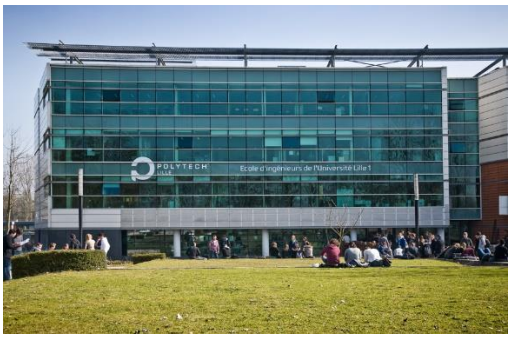
GENERAL INFORMATION

Onsite Conference Venue

Polytech Lille-CRIStAL-University of Lille

Address: Avenue Paul Langevin-59655 Villeneuve D'ascq Cedex, France
Web.: https://www.polytech-lille.fr/english/

Apr. 27	Onsite Registration	Louis Pasteur (Ground Floor)
Apr. 28	Keynote Sessions	Amphitheatre Migeon (Ground Floor)
	Parallel Sessions	Amphitheatre Appert (Ground Floor)



Onsite Registration

Go to the registration desk→ Inform the staff of your paper ID→ Sign-in→ Claim your conference kit.

Devices Provided by the Organizer

Laptops (with MS-Office & Adobe Reader) / Projectors & Screen / Laser Sticks

Materials Provided by the Presenter

Oral Session: Slides (pptx or pdf version). Format 16:9 is preferred.

Official language: English.

Duration of Each Presentation

Keynote Speech: 40min, including 5 min Q&A.

Oral Session: 15min, including 3 min Q&A.

Notice

- Please wear your delegate badge (name tag) for all the conference activities. Lending your participant card to others is not allowed.
- Please take good care of your valuables at any time during the conference. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants during conference day.

※ **UTC+2. Time in Lille, France. Please be aware of time difference between this and your region/country.**

Online Presentation Tips

Zoom Download

Meeting ID	Meeting Link
879 2732 1677	**https://us02web.zoom.us/j/87927321677**

Note:

- **Participants who are going to do an online presentation are required to join the rehearsal in ZOOM on Saturday, April 27. Duration: 3min apiece. Feel free to leave after you finish the test.**
- **We recommend to install the Zoom platform beforehand. New users can login the Zoom meeting without registration.**
- **Please set your display name before joining the online meeting. For instance,**
  Author/Presenter: Paper ID_Name < CE001_Lily >
  Listener: Listener_Name < Listener_Lily >

Contacts

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WELCOME MESSAGE

We are pleased to welcome you to attend the 2024 9th International Conference on Advances on Clean Energy Research (ICACER 2024), along with 2024 8th International Conference on Energy Economics and Energy Policy (ICEEEP 2024), which will be held in Lille, France during April 27-29, 2024.

This event will provide a unique opportunity for international scholars, researchers and practitioners working in a wide variety of scientific areas with a common interest in Advances on Clean Energy Research & Energy Economics and Energy Policy.

The conference will include discussions on topics such as Green Energy Transformation, Energy Storage, and Energy-Saving Technology, Energy Market, Energy Economics, and Energy Policy, Clean Energy Technology and Energy Related Environmental Impacts, Renewable Energy Generation and Power System Management, Energy Storage Technology, Energy Efficiency, and Carbon Reduction. The conference will be composed of 3 onsite sessions and 2 online sessions. In addition, 4 keynote speeches will be delivered by *Prof. Mohan Lal Kolhe* (Universitetet of Agder, Norway), *Prof. Carlo Alberto Nucci* (University of Bologna, Italy), *Prof. Mariusz Malinowski* (Warsaw University of Technology, Poland), and *Prof. Alain BOUSCAYROL* (Université de Lille, France).

We would like to deeply express our heartfelt appreciation to all our delegates, keynote speakers, invited speakers, session chairs, international reviewers as well as all the committee members involved in the technical evaluation of conference papers and in the conference organization for your time, effort, and great contributions. Apart from that, we'd like to extend our thanks to all the authors and external reviewers for your contribution. It is your high competence, enthusiasm, valuable time and expertise that have enabled us to prepare the final program with high quality and make the conference a great success.

I wish to thank all attendees for participating in the conference and hope you have a fruitful and memorable experience at ICACER 2024 & ICEEEP 2024!

Finally, we wish you a very successful conference! Hope you will enjoy your stay in Lille, France!

With Warmest Regards,

Conference Organizing Committee

ICACER & ICEEEP 2024

CONFERENCE COMMITTEE 2024

Conference Organizing Committees

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Belkacem Ouldbouamama, University of Lille, France

Conference General Co-Chair

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Mohammad Iman Farmahini Farahani, Universitat Politècnica de Catalunya, Spain
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Pavlo Herasymenko, Department of Transistor Converters, Institute of Electrodynamics, Ukraine
Milad Heiranipour, Politecnico di Torino (Polito University), Italy
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Ameera Mohammad, United Arab Emirates University, UAE
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Alagappan Pandian, Koneru Lakshmiah Education Foundation, India
Islam Al-Akraa, The British University in Egypt, Egypt
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S. Suresh, Maulana Azad National Institute of Technology Bhopal, India
N. Balasubramanian, Anna University, India

Laveet Kumar, Mehran University of Eng. & Technology, Pakistan

AGENDA OVERVIEW

April 27 | Saturday (UTC+2)		
14:00-17:00	**Onsite Registration**	**Room Louis Pasteur (Round Floor)**
14:00-15:30	**Online Pre-test Session in Zoom**	**Zoom ID: 879 2732 1677**
Zoom Test Timetable		
14:00-14:30	CE0042-A CE016 CE1004 CE026 CE020 CE027 CE032 CE013 CE1007	
14:30-15:00	CE012 CE0036 CE029 CE0043-A CE044 CE0041 CE1005 CE045 CE1006	
15:00-15:30	Alternative time for participants who are unavailable at allocated time. Other online participants, includes but not limited to plenary speaker, keynote speaker, session chair, committee member, listener.	

- Participants who are going to do an online presentation are required to join the rehearsal in Zoom on Saturday, April 27, 2024. Duration: 3min apiece. Feel free to leave after you finish the test.
- We will test control panel including screen sharing, audio, video and "Raise Hand" feature, etc. Please get your presentation slides and computer equipment prepared beforehand.

April 28 | Sunday (UTC+2)	
<Amphitheatre Migeon | Round Floor>	**ZOOM Room A: 879 2732 1677**

Chairman: **Prof. Belkacem Ouldbouamama,** University of Lille, France

09:00-9:10	Opening Remarks	**Prof. Belkacem Ouldbouamama,** University of Lille, France
09:10-09:50	<Keynote Speech I>	Unlocking Clean Energy's Potential: Decentralized Green Hydrogen for the Future **Prof. Mohan Lal Kolhe,** Universitetet of Agder, Norway
09:50-10:30	<Keynote Speech II>	Electromobility: Experience of the Cumin Programme for A More Sustainable Campus **Prof. Alain BOUSCAYROL,** Université de Lille, France
10:30-11:00		**Group Photo & Morning Coffee Break**
11:00-11:40	<Keynote Speech III>	Climate Neutral and Smart Cities in the Framework of the Energy Transition: The Role of Renewable Energy Communities **Prof. Carlo Alberto Nucci,** University of Bologna, Italy
11:40-12:20	<Keynote Speech IV>	Power Electronics and Hybrid Transformers in Distributed Energy System - Opportunities and Challenges **Prof. Mariusz Malinowski,** Warsaw University of Technology, Poland
12:20-14:00		**Lunch Time**

Time	Venue	Onsite Parallel Sessions
14:00-15:45	<Amphitheatre Migeon>	**Onsite Session 1:** Green Energy Transformation, Energy Storage, and Energy-Saving Technology *Chairperson: Prof. Mohan Lal Kolhe, Universitetet of Agder, Norway* CE0020-A CE0021-A CE0037-A CE017 CE022 CE036 CE0007
	<Amphitheatre Appert>	**Onsite Session 2:** Energy Market, Energy Economics, and Energy Policy *Chairperson: Prof. Bahia Bouchafaa, Ecole Nationale Polytechnique (National Polytechnic School) - ENP, Algiers* CE0027-A CE0028-A CE0024-A CE0039-A CE0012 CE0025-A CE0044
15:45-16:15	Afternoon Coffee Break and Networking	
16:15-18:00	<Amphitheatre Migeon>	**Onsite Session 3:** Clean Energy Technology and Energy Related Environmental Impacts *Chairperson: Prof. Jing Li, Miami University, USA* CE003 CE008 CE041 CE0006-A CE0001-A CE001-A CE043
18:00-20:00	**Dinner Time**	

AGENDA OVERVIEW

Time	ZOOM	Online Parallel Sessions
13:00-15:00	< 879 2732 1677 >	**Online Session 1:** Renewable Energy Generation and Power System Management *Chairperson: Prof. Eugen Rusu, Dunarea de Jos' University of Galati, Romania* CE0042-A CE016 CE1004 CE026 CE020 CE027 CE032 CE013
15:00-15:15	Break Time	
15:15-17:45	< 879 2732 1677 >	**Online Session 2:** Energy Storage Technology, Energy Efficiency, and Carbon Reduction *Chairperson: Assoc. Prof. Maisa El Gamal, Zayed University, United Arab Emirates* CE012 CE0036 CE029 CE0043-A CE044 CE0041 CE1005 CE045 CE1006 CE1007

Note

* Online Meeting conference room will be open 30 mins before scheduled time. Please enter your room 10-15 minutes early.
*All online attendees are required to join the pre-test on Saturday, April 27 Start from 14:00 (UTC+2).
*A paper not presented or presented by a non-author without prior written approval by the Conference TPC will be removed from the final conference proceedings.

INTRODUCTION OF KEYNOTE SPEAKER (UTC+2)

09:10-09:50
April. 28 (Sunday), 2024 **< Amphitheatre Migeon | Round Floor>**

Prof. Mohan Lal Kolhe

Universitetet of Agder, Norway

Speech Title: Unlocking Clean Energy's Potential: Decentralized Green Hydrogen for the Future

Abstract: The 9th International Conference on Advances in Clean Energy Research welcomes you to a keynote address exploring the exciting potential of green hydrogen production and utilization. This presentation will showcase a case study of a decentralized integrated renewable energy system (IRES). This innovative system utilizes electrolysis for hydrogen energy storage and fuel cells for clean energy utilization, all within a direct current (DC) microgrid framework. The keynote will delve into the following key aspects:

- **Green Hydrogen Production:** We'll explore the power of clean, renewable energy sources like solar and wind to generate green hydrogen through electrolysis, a sustainable alternative to traditional methods.
- **Energy Storage in Electrolytic Hydrogen:** Discover how hydrogen serves as a versatile energy storage solution, enabling efficient capture and utilization of renewable energy, even during intermittency.
- **Fuel Cell Utilization:** Learn how fuel cells effectively convert stored hydrogen back into clean electricity, powering homes, businesses, and communities within the DC microgrid.
- **DC Microgrid Approach:** We'll explore the benefits of a DC microgrid for efficient and localized distribution of clean energy generated from the IRES.

This presentation offers a compelling case study for the future of clean energy. By harnessing the power of green hydrogen and DC microgrids, we can create a more sustainable and resilient energy landscape.

Mohan Lal Kolhe is a full professor of smart grid, hydrogen energy and sustainable electrical energy systems at the University of Agder's Faculty of Engineering and Science in Norway. He is a leading renewable energy technologist with three decades of international academic experience, having previously held academic positions at world-renowned universities such as University College London (UK / Australia), University of Dundee (UK), University of Jyvaskyla (Finland), Hydrogen Research Institute, QC (Canada), and others. He was also a member of South Australia's first Renewable Energy Board (2009-2011) and worked on formulating renewable energy policies. He has been offered the positions of Vice-Chancellor of Homi Bhabha State University Mumbai (Cluster University of Maharashtra Government, India), full professorship(s) / chair(s) in 'sustainable engineering technologies/systems' and 'smart grid' from Teesside University (UK) and Norwegian University of Science and Technology (NTNU), respectively, for his enormous academic contributions to sustainable energy systems. Professor Kolhe is a distinguished worldwide research council expert assessor (e.g., European Commission: Erasmus+ Higher Education - worldwide Capacity Building, Royal Society London (UK), Engineering and Physical Sciences Research Council (EPSRC UK), Cyprus Research Foundation, and others). Furthermore, many international organizations have invited him to deliver keynote addresses, expert lectures, workshops, and other events. He has also served on a number of academic advancement committees. Professor Kolhe has been successful in obtaining competitive research funding from prestigious research bodies (such as the Norwegian Research Council, EU, EPSRC, BBSRC, NRP, etc.) for his work on sustainable energy systems. His work on energy systems and electrical & electronic engineering has been recognised in the top 2% of scientists worldwide consistently from 2020 to 2023, according to Stanford University matrices based on Elsevier data. His top 10 publications have received an average of more than 200 citations each, making him an acknowledged pioneer in his profession on a global scale.

INTRODUCTION OF KEYNOTE SPEAKER (UTC+2)

09:50-10:30
April. 28 (Sunday), 2024 **< Amphitheatre Migeon | Round Floor>**

Prof. Alain BOUSCAYROL

Fellow of IEEE

Université de Lille, France

Speech Title: Electromobility: Experience of the Cumin Programme for a More Sustainable Campus

Abstract: The transport sector is nowaday the only sector in Europe with an increase of the green houses gases (GHG). Electrification of transportation systems is thus a the key challenge to face the global warning. Since 2010, the University of Lille regularly estimates its green houses gases, and the communiting (home-university travels) are responsible of more than 50% of the total GHG of its 85,000 users (students and staff). To significanclty cut the GHG of the daily mobility, the University of Lille has developped an interdisiciplinary programme, CUMIN (Campus of University with Mobility based on Innovation and carbon Neutrality), with the aims to develop its campus "Cité Scientifique" as a demonstrator for electro-mobility. CUMIN is composed on several projects on different aspects of electromobility: energy consumption, economical models of vehicles and infrastructures, driver's habits and request, charging points with renewable energy, acceptability, public policies, etc. The CUMIN programme is composed of 3 research groups in Science & Technologies and 3 research groups in Social & Human Sciences. CUMIN has international collaborations with Canada (Univ. Trois Rivières), USA (Rochester Inst. Tech), and Belgium (Univ. Ghent) on some projects. An international associated laboratory has been developed between the University of Lille and the University of Trois-Rivières to extend the experience of Lille on a campus in North America. The keynote lecture will first introduce the context of the CUMIN programme. Several projects will then be presented such as EVE (Electric Vehicle, Estimation of mobility for an ecocampus), REMUS (Recovery of Energy from Metros in University based on Sustainability of an eco-campus), TESS (Technical-Economical Study of Sustainable campuses) or SARA (Social Acceptance of electric vehicles in Restricted Areas).

Alain BOUSCAYROL received Ph.D. degree in Electrical Engineering from Institut National Polytechnique de Toulouse, France, in 1995. From 1996 to 2005, he was Associate Professor at University of Lille, France, where he has been Professor since 2005. From 2004 to 2019, he has managed the national network on Energy Management of Hybrid Electric Vehicles (MEGEVH) France. Since 2015, he has been coordinator of the CUMIN (Campus of University with Mobility based on Innovation and carbon Neutrality) interdisciplinary programme of University of Lille (https://cumin.univ-lille.fr/). Since 2018, he has been co-director of the international research lab e-CAMPUS on sustainable mobility (France / Canada). From 2018 to 2022, he was coordinator of PANDA a European H2020 project on simulation and testing of electrified vehicles (https://project-panda.eu/). His research interests at the L2EP (Laboratory of Electrical Engineering) include graphical descriptions (Energetic Macroscopic Representation, http://www.emrwebsite.org/, etc.) for control of electric drives, wind energy conversion systems, railway traction systems, electric or hybrid electric vehicles and hardware-in-the-loop simulation. His collaborative works with industry on electrified vehicles include PSA Peugeot Citroen, Nexter Systems, Renault TR, Siemens Mobility, Siemens Software, SNCF and Valeo. From 2014 to 2019, he was nominated Chair of the Vehicle Power Propulsion technical committee by IEEE Vehicular Technology Society. From 2014 to 2018 he was appointed Associate Editor of IEEE trans. on Vehicular Technology. Since 2016, has been elected Distinguished Lecturer by IEEE VTS. Since 2019, he has been appointed general chair of the steering committee of IEEE VPPC (Vehicle Power Propulsion Conference).

INTRODUCTION OF KEYNOTE SPEAKER (UTC+2)

11:00-11:40
April 28 (Sunday), 2024

zoom
Meeting Room A: 879 2732 1677

Prof. Carlo Alberto Nucci

Fellow of IEEE

University of Bologna, Italy

Speech Title: Climate Neutral and Smart Cities in the Framework of the Energy Transition: The Role of Renewable Energy Communities

Abstract: The significance of smart cities in advancing climate neutrality is expected to markedly increase in the coming years. Globally, urban areas are responsible for over 70% of CO2 emissions and exceed 65% of total energy consumption. Cities function as experimental grounds for decarbonization strategies, covering energy, transportation, buildings, industry, and agriculture. Their dense infrastructure and usage offer considerable potential for integrating various sectors towards achieving a comprehensive smart grid paradigm. The EU Mission on Climate Neutral and Smart City aims to fuse climate neutrality with the Smart City model, and this seminar outlines key aspects of this Mission. The growing electrification of different sectors, driven by the increasing adoption of renewable energy sources, underscores the rising importance of the electricity system, particularly the smart grid, in this context. However, the utilization of renewable sources still faces limitations, presenting a challenge that demands significant and coordinated efforts, as discussed in this presentation. No single 'miracle solution' exists for accomplishing the energy transition, this is another aspect that will be covered in this presentation. The final segment of this keynote explores Renewable Energy Communities (REC), as detailed in the RED II and IEM European directives. These communities, comprised of citizens' associations, commercial entities, or companies, concentrate on producing and distributing electricity from renewable sources. They have the potential to make non-negligible contributions to the energy transition in numerous countries and act as the core for smart districts capable of evolving into Positive Energy Districts. The importance of smart Energy Management Systems to suitably coordinate the energy flows in an energy community is also discussed and illustrated by examples.

Carlo Alberto Nucci is a Full Professor and Scientific Responsible of the Power Systems Laboratory at the Department of Electrical, Electronic and Information Engineering "Guglielmo Marconi", University of Bologna. His research interests include lightning interaction with power systems, restoration processes after blackouts, power systems dynamics, smart grids, smart cities and renewable energy communities. He has received some best paper/technical international awards. Prof. Nucci is also a Fellow of CIGRE, and of the Chinese Society of Electrical Engineering, CSEE. He has served as Chairman of the International Steering Committee of the IEEE PES PowerTech (2002-2007, as Region 8 Representative per la "IEEE PES Region 8 (Europe, Middle East and Africa)" and member of IEEE PES Governing Board (2009-2010), as Chair of the Technical Program Committee of the IEEE Smart Grids World Forum, 2012, as Member of the IEEE-PES Fellow Committee (2014-2018) and of the IEEE Fellow Committee (2022, 2023). Prof. Nucci has also served as Editor-in-Chief of the EPSR journal, Elsevier (2010-2021). He is presently serving as the Italian Representative in the Horizon Europe Mission "Climate-Neutral and Smart cities". He is also serving as Chair of the International Conference on Lightning Protection, ICLP, and as co-chair of the International Conference on Power Systems Transients, IPST. Prof. Nucci is Doctor Honoris Causa of the University Politehnica of Bucharest, a member of the Academy of Science of the Institute of Bologna and a member of the Istituto Lombardo - Science Academy of Milan. He is also distinguished invited Professor at Tsinghua University, Beijing (2023-2026).

INTRODUCTION OF KEYNOTE SPEAKER (UTC+2)

11:40-12:20
April 28 (Sunday), 2024

zoom
Meeting Room A: 879 2732 1677

Prof. Mariusz Malinowski

Fellow of IEEE

Warsaw University of Technology, Poland

Speech Title: Power Electronics and Hybrid Transformers in Distributed Energy System - Opportunities and Challenges

Abstract: The fast development of distributed generation systems (DGS), including an increasing number of renewable energy sources (RES), demands the change of classical grids into smart grids (SG), integrating all new distributed elements, e.g., active loads/sources/energy storages. Currently used conventional transformers cannot fulfill all SG requirements. Therefore, a new solution is needed due to the highly different types of energy sources and loads and the frequent voltage disturbances occurring in DGS. The proposed modern solutions are the applications of multifunctional power electronics, fault-tolerant power electronics, and hybrid transformers that are able not only to meet the main requirements of SG but also respond to the future challenges defined by the constant progress of technology in all new fields (e.g., electromobility, energy store systems, etc.).

Mariusz Malinowski received the Ph.D. degree with honors in Electrical Engineering from the Warsaw University of Technology (WUT) in 2001. He then attained a habilitation in 2012 and professorship in 2019. Mariusz Malinowski has been granted the following awards and distinguishments: the Siemens Prize for his PhD thesis in 2002, a Polish Minister of Science and Higher Education award for his contribution to the book Control in Power Electronic in 2003, the Siemens Prize for research achievements in 2007, the Polish Minister of Science and Higher Education awards for research achievements in 2008, the Prime Minister of Poland award for habilitation in 2013, the first prize of the Prime Minister of Poland for his research team in 2017. Moreover, he received the prestigious international IEEE IES David Irwin Early Career Award for "Outstanding research and development of modulation and control for industrial electronics converters" in 2011 (Melbourne, Australia), IEEE IES David Bimal Bose Award for Industrial Electronics Applications in Energy Systems for „Contributions in control of industrial electronics converters applications in energy systems" in 2015 (Yokohama, Japan), IEEE IES Anthony J. Hornfeck Service Award for "Outstanding and Meritorious Service to the IEEE Industrial Electronics Society" in 2021 and Power Electronics and Motion Control Istvan Nagy Award "for his outstanding contribution to control in power electronics and for continuous support of PEMC conferences" in 2022. Mariusz Malinowski has published almost 200 journal and conference papers. He is the author of six patents (two implemented by industry) and co-author of six books. He has participated in over 20 research and industrial projects (12 in a leader role) and he has been a reviewer and PhD commission member for numerous PhD theses in Germany, Spain, Denmark, Australia, India, Switzerland, Italy and Poland. Mariusz Malinowski public service include activity in IEEE, where he was Chair of IEEE Poland Section. Mariusz Malinowski is currently President in IEEE Industrial Electronics Society and he has in IEEE highest Fellow status. Moreover Mariusz Malinowski is Vice Reactor for Research at WUT, Member of Polish Academy od Science and Member of Polish Council of Research Ecellence. Mariusz Malinowski participated in the development of technologies which received many prizes e.g. three times the recognition in the competition Polish Product of the Future organized by the Polish Agency for Enterprise Development (PARP), the Grand Prix of TECHNICON, the Gold Medal of Automaticon, the Grand Prix Exhibition of Innovations in Geneva (Gold Medal), the Exhibition in Brussels "Eureco" (Bronze Medal), International Exhibition of Inventions in Warsaw (Silver Medal) and special prize of Polish Ministry of Economy "eCO2 Innovation" for development of ecological innovative product. Mariusz Malinowski was visiting scholar and professor in following institutions: Aalborg University (Denmark), University of Nevada (Reno, USA), Technical University of Berlin (Germany), Universidad Tecnica Federico Santa Maria (Valparaiso, Chile),

University of Cergy-Pontoise (France), ENSEEIHT - Laplace, Toulouse (France) and ETH Zurich (Switzerland). He also cooperate with industry e.g. ABB Corporate Research Center (Poland), PSE Operator (Poland), TWERD (Poland), TRUMPF Huettinger (Poland), Wave Dragon (Dania), Danfoss Drives (Dania) and Vestas (Dania).

ONSITE SESSION 1 (UTC+2)

April 28 (Sunday) **14:00-15:45**	**<Amphitheatre Migeon | Round Floor>**
Onsite Session 1: Green Energy Transformation, Energy Storage, and Energy-Saving Technology **Chairperson**: Prof. Mohan Lal Kolhe, Universitetet of Agder, Norway	
14:00-14:15 CE0020-A	Economic, Environmental and Social Impacts of Green Mobility **Amela Ajanovic,** Vienna University of Technology (TU WIEN), Austria Abstract—Over the last few decades use of electric vehicles is continuously growing, reaching global stock of more than 26 million electric vehicles in 2022. Main reasons for such development are different supporting policies and measures for green mobility provided by governments. The core objective of this paper is to investigate economic, environmental and social concerns related to the increasing use of electric vehicles. Of special interest are the future cost developments of batteries as well as the development of carbon intensity of electricity mix used in electric vehicles. Moreover, the availability of raw materials, as well as environmental and social impact of their mining will be discussed. Economic impact of e-mobility is investigated considering total cost of ownership. Environmental analysis is based on the life-cycle assessment. Moreover, comprehensive discussion on energy and material consumption for car production in relation to environmental impacts is provided. Assessment of the social impacts is focusing on the health issues, mining of raw materials, water use and land degradation. Currently, electric vehicles are mostly used in courtiers with the high GDP per capita. Although, electric vehicles can eliminate tailpipe emissions, they can also create some new environmental and social challenges. Environmental benefits of electric vehicles are very dependent on electricity generation mix which is used in vehicles, and this mix is differ from country to country. Electric vehicles in combination with electricity from renewable energy sources can significantly reduce emissions from the transport sector on well-to-wheel basis. However, there is still huge uncertainty about negative environmental impact of raw material mining as well as regarding the environmental impact of battery recycling. Although, the performance of electric vehicles is rapidly improving, electric vehicles are still less convenient for use in comparison to conventional cars. Especially, charging time and infrastructure should be improved, as well as the balance between car price and driving range. In the future, electric vehicles could play a significant role only if the proper mix of different supporting policy measures is implemented, as well as if battery performances are improved and costs reduced. Intensified work is needed on new policies which should ensure sustainability in the whole electromobility supply chain. To ensure sustainable development of the transport sector it is important to implement avoid-shift-improve strategy in combination with green mobility.
14:15-14:30 CE0021-A	The Roles of Nuclear Power in the Chinese Agenda for Green Energy Transition **Chunmei Liu,** Southeast University, China Abstract—With the intensification climate crisis and the limitations of the Earth's nine boundary systems, to maintain a natural environment that is continuously suitable for human habitation, in accordance with the needs of the international energy transition and its national conditions, China has formulated its green energy transition agenda, which designed to support socio-economic development and to ensure a safe, low-carbon and affordable supply of energy. The advantages and disadvantages of nuclear power have been widely discussed globally, and nuclear power cannot be ignored to achieve the 1.5°C temperature rise target of the zero carbon pathway. By researching scientific data, comparing scenario simulations, and interviews with field visits to nuclear power plants, the position of nuclear power in China's green energy transition path and the opportunities and challenges it encounters are analyzed. After research and demonstration, we have obtained the following: (1) On the supply side of China's energy market, nuclear energy should not only be used for power and heat supply, but should also be used for desalination, hydrogen production, and the construction of a regional integrated energy system through the development of innovative linkage technologies; (2) Unswervingly pursuing the sustainable development strategy of China's nuclear power plants, which is based on the "hot reactor-fast reactor-fusion reactor" and the "separation and transmutation" nuclear

	fuel cycle technology;(3) The ultimate share of nuclear energy in China's future energy system needs to be balanced by multiple factors, including the development of inland nuclear power plants (INPPs), the acceptance of nuclear energy, the overall safety and economy of nuclear power, and the innovative development of other new energy technologies, etc. The results suggest clearly that nuclear energy should and must assume a more satisfying and important role in the future process of China's green energy transition.
14:30-14:45 CE0037-A	Problems of Co-production in Bio-based Energies: How Sustainable Aviation Fuels Development Influence Economic System ? **Anderson Camille,** University of Lille, France Abstract—While biofuel development and use continues with this aim of achieving carbon neutrality by 2050, the aviation sector, where the transition to all-electricity and/or the adoption of hydrogen engines is not feasible in the short term, is under increasing pressure to reduce its carbon footprint. Furthermore, commercial air traffic is expected to continuous growth experienced in the years to come, highlighting the need for reduced emissions. Then, the application of policy like Sustainable aviation fuel (SAF) quota plays a key role in achieving future emission goals, while also lowering the dependency on fossil fuels. In this paper, a partial equilibrium the oretical framework for aviation fuel substitution, considering SAF quota policy and its greenhouse gas emission reduction objective, has been developed. The model set agricultural residues, co-product from agricultural crop production, as feedstock for SAF production, and then it investigates the impact of this production process and the SAF quota policy on the choices and behavior of agents in the system, from land use to the use of SAF in aviation. The results suggest that the development of SAF production (by SAF quota policy) can have positive effect on food production, jet-fuel use and GHG reduction, but it may have adverse effects on land use and food prices, which may become too high as a result of the policy when the SAF quota becomes too high.
14:45-15:00 CE017	Effects of C-rate on the Thermal Behavior of Commercial Lithium-ion Pouch Cells with Different Aging Histories for a Successful Second-life Transition **Emanuele Michelini di San Martino,** Vehicle Safety Institute, Graz University of Technology, 8010 Graz, Austria Abstract—Second-life applications are becoming increasingly popular as they enable to enhancement of sustainability and economic efficiency. However, the transition from the first to the second life of batteries introduces safety challenges due to different operating conditions and previous degradation mechanisms. This study investigates the safety implications of high currents in aged cells. Thermal behavior upon cycling with different C-rates, ranging from 0.5 C to 4.0 C, was analyzed using commercial 50 Ah NMC/C pouch cells. The tested cells had dif-ferent aging histories, including minimal cycling and real aged. The results re-vealed a consistent thermal pattern upon cycling, particularly a significant heat generation phase occurring at the end of discharge (3.6-3.0 V), independent of battery age. At higher C-rates, heat generation intensified. While no direct corre-lation was found between aging and certain thermal parameters, such as absolute maximum temperature and temperature difference, direct correlations were iden-tified with the temperature increase rate and interquartile range. These correla-tions were linked to reduced thermal conductivity and battery state of health. This study highlights the critical role of considering C-rate, especially for aged cells, emphasizing the need to evaluate the expected current in the second-life applica-tion to avoid rapid temperature rises and ensure safety.
15:00-15:15 CE022	Numerical Analysis of the Flow Phenomena inside the Vortex Tube with Different Turbulence Models **Osama Ali Ahmed Awan,** The Sirindhorn International Thai-German Graduate School of Engineering, KMUTNB, Bangkok, Thailand; Institute of Power Plant Technology, Steam and Gas Turbines, RWTH Aachen University, Aachen, Germany Abstract—To accelerate progress towards sustainability, a fundamental shift from conventional to renewable energy sources is necessary, but insufficient on its own. Improving the efficiency of existing energy systems is equally important. One promising avenue for achieving this goal involves integrating previously overlooked devices, such as the vortex tube, into the current systems. Thus, there is a growing emphasis on overcoming its limitations, including limited development and suboptimal efficiency, to unlock its potential in diverse applications. The current focus is primarily on computational research rather than experimental approaches due to the advantages in terms of cost and time. Nevertheless, computational studies present their

	own set of challenges, with two prominent hurdles being the attainment of acceptable mesh and the selection of an appropriate turbulence model. This study aims to address these challenges. An acceptable mesh has been obtained by optimization, which involves refinement of mesh at the inlet and outlet regions, followed by a comprehensive assessment of mesh independence at each stage. Furthermore, achieving a y+ value of 1 in the most important regions of the vortex tube is crucial, particularly when employing low Re turbulence models, to accurately predict boundary layer behavior. Building on the mesh studies, the performance of different turbulence models is evaluated with reference data. Among the considered models, the standard k-ε turbulence model has the best performance, aligning closely with experimental results for almost the same geometric setup. As a result, the standard k-ε turbulence model is selected for further numerical investigations.
15:15-15:30 CE036	Indoor Solar Thermal Cook Stove Design **Nelushi Munasinghe, Chansi Mendis, Nalika Ilukpitiya,** University of Moratuwa, Sri Lanka Abstract—Cooking with local clean energy resources ensures breathable clean indoor air, reducing respiratory illnesses and adverse impacts on the environ-ment caused by greenhouse gas emissions. Harvesting solar energy for domestic applications is comparably economical in the long-term since it is free, renewable, clean, and richly available, in tropical countries. The proposed design is deviated from other types of solar cookers as it enables indoor cooking without having to be in direct sunlight, even in night and rainy weather. The proposed design was simulated, fabricated, and tested for its performance by boiling water. The main components of the system are solar collectors, thermal storage, a cooking stove, heat-carrying fluid, and a control panel. It is designed to have a comparable performance to the conventional stoves by considering different designs, including a spiral coil and a maze pattern plate. Computational fluid dynamics (CFD) simulations using ANSYS software were conducted to compare the thermal behavior with existing stoves and the design that closely matched was selected for prototype testing. A control panel was used to change the heating level as required and indicate the available solar cooking time in minutes based on the condition of the thermal storage.
15:30-15:45 CE0007	Energy Storage in the Smart Grid: A Multi-Agent Deep Reinforcement Learning Approach **Pawel Knap,** University of Southampton, UK Abstract—This paper introduces an energy storage system controlled by a reinforcement learning agent for smart grid households. It optimizes electricity trading in a variable tariff setting, yielding consumer savings averaging 20.91% annually without altering consumption habits. Integrated with solar panels, it offers even greater cost reductions. A Multi-Agent System simulation analyzes interactions between agents and identifies beneficial price-demand relationships. Moreover, it shows storage's positive impact on the energy market for operators and consumers. Deep Q Learning is identified as the most effective algorithm, efficiently managing high-dimensional, nonstationary, and stochastic aspects of the problem, bypassing the need for abstract modelling and deterministic rules. Furthermore, our ablation study explores various storage sizes and agent complexities.

ONSITE SESSION 2 (UTC+2)

April 28 (Sunday) **14:00-15:45**	**< Amphitheatre Appert | Round Floor>**
Onsite Session 2: Energy Market, Energy Economics, and Energy Policy **Chairperson**: Prof. Bahia Bouchafaa, Ecole Nationale Polytechnique (National Polytechnic School) - ENP, Algiers	
14:00-14:15 CE0027-A	A Methodology for Handling Non-existent Cash Flow History and Risks When Financing: The Case of Smart Local Energy Systems **Fabian Fuentes Gonzalez,** Universidad de Santiago de Chile, Chile Abstract—Smart local energy systems (SLES) are expected to contribute to meeting challenging environmental targets, while also addressing issues of decentralisation, democratisation and digitalisation. SLES comprise diverse assets that are owned and managed by varied private, public and third-sector actors typically organised via a consortium, and interrelated by means of physical and digital infrastructures. There are, however, unresolved questions about financing SLES. These emerge from difficulties to financially assess SLES due to non-existent cash flow history and intrinsic risks when implementing and operating such systems due to novelty and high degrees of localism and smartness. The above challenges conventional financing mechanisms based on risk-adjusted discount rates, as such rates should effectively reflect the risks of a project. We then propose and apply to a case study, a novel quantitative methodology that aims at managing non-existent cash flow history and diverse inherent risks, so that complex SLES can be priced and financed. This methodology relies on future cash flow securitisation and real options theory, via capital budgeting and stochastic processes models. Choosing specific parameters and following reasonable assumptions, initial results show that it is possible to utilise our methodology to support SLES valuation and financing; this provides chances to replicate and scale-up such complex energy systems. Yet, there is scope for improvement in unifying some criteria and selection of parameters for carrying out this methodology uniformly across any complex energy project.
14:15-14:30 CE0028-A	Cournot Competition in Electricity Markets with Correlated Capacitated Generators **Felix Ackon,** Princeton University, USA Abstract—After deregulating their electricity markets in the 90s, many countries adopted free market concepts, such as auctions, for wholesale trading to meet electricity demand at the lowest cost while preventing rationing. Achieving those efficien-cies depends directly on the equilibrium behavior of profit-maximizing power producers and the auction market design. Current works characterizing producers' strategies do not consider production cost heterogeneity, dependencies in produc-tion quantities, or abstract from replicating the market design, thus limiting the scope to homogenous producers and lacking concentration implications. In this paper, we model the day-ahead market as a static Cournot game model of delayed production, with firms committing to a desired production quantity and subsequently producing a feasible quantity. We classify renewable firms (e.g., solar farms) and conventional firms (e.g., coal plants) by their production cost and ability to fulfill their committed quantities with certainty to achieve production cost heterogeneity. We link renewable firms through arbitrarily dependent joint distributions of production capacity, underpinning the prevalence of concentration on their production decisions. Our main theorem specifies that with less concen-tration, a tradeoff between (1) total production and (2) reliability occurs. To bal-ance this, we implement a constant per-unit penalty on the production short-fall/surplus, reducing the incentive to overcommit while maintaining increased production. Finally, when faced with stochastically dominated distributions, the equilibrium results in renewable firms committing more, showing that delayed markets can provide hedging benefits to producers facing uncertain supply.
14:30-14:45 CE0024-A	On the Future Market Prospects of Electricity Storage **Reinhard Haas,** TU Wien, Austria Abstract—In recent in Europe electricity generation from variable sources such as wind and solar has been growing remarkably rate. To balance electricity supply over time calls for additional storage – short-term and long-term – has been launched. The core objective of this

	paper is to investigate the economics of short-term (batter-ies, pumped hydro) and long-term electricity storages as hydro pump storages, hydrogen and methane from power-to-gas (PtG) conversion technologies. In this context it is important to analyze Learning effects regarding the investment costs of all relevant technologies. The major results are: up to 2050 decreases in the prices of PtG technologies and batteries will take place mainly due to learning effects. For pumped hydro storag-es further prices will rather increase mainly due to a lack of sites with reasonable costs and lack of acceptance. By 2030 under favourable learning conditions the costs of hydrogen and methane for 2000 fulloadhours yearly will be between 0.15 EUR/kWh and 0.20 EUR/kWh. It will be hard for these long-term storages to compete in electricity markets. Other reasons are competition with demand re-sponse options, demand –side management, and decentralized batteries. The costs of the latter will not decline significantly faster but they will compete on end-user electricity price level which is (and will remain) remarkably higher. The major conclusions are: with respect to all centralized long-term storage tech-nologies the future perspectives will be much less promising than currently indi-cated in several papers. Yet, for hydrogen and methane there might be prospects in the transport sector.
14:45-15:00 CE0039-A	Driver Preferences for Investment in Flexible Electric Vehicle Charging **Brian Fowler,** University of Hasselt, Belgium Abstract—We explore consumer preferences and investment decisions for flexible charging of plug-in electric vehicles (PEVs) that can help balance electric grids. This includes smart charging, solar-charging, dynamic load balancing, and two-way charging. We use a discrete choice experiment to quantify preferences and determine the required discount rates for investment across purchasing scenarios. Findings suggest a preference for solar charging and a significant role of financial incentives in decision-making. We also find that varied discount rates are needed to offset the change in utility for each feature. This has implications for pricing and compensation levels required to encourage adoption and use of flexible PEV charging features.
15:00-15:15 CE0012	Energy-Food Commodity Prices Movement and Equa-tion in Kyoto (2006) Perspective: Factor Analysis and Non-Linear Framework **Aynur Pala,** Istanbul Okan University, Türkiye Abstract—Energy and food are two major commodities. From a macro point of view, the movement and the relation between commodity duos prices is highly concerned by researchers, policy makers and economists. This paper aims to investigate the link among energy and food price using nonlinear framework for the period of 1991-2020. For this purpose, we calculated proxy factor indexes variables instead of each commodity duos by factor analysis method using all contents of interna-tional commodity price indexes; FAO Food Price Index and IMF Commodity Energy Price Index. We applied Enders and Granger (1998) MTAR and KSS (2003) non-linear unit-root tests; KSS (2006) non-linear cointegration test and Diks and Panchenko (2006) non-linear causality test. The results of non-linear causality test indicated that there is a bi-directional relation from food to energy price in the full sample. Kyoto Protocol (2006), the most important treatment for decreasing carbon emission, caused to increase non-food use of agricultural pro-duction and this changed the relationship between energy and food prices. In Kyoto (2006) break perspective, the results show that there is no non-linear cau-sality relation between energy and food price in pre-Kyoto (2006) sub-sample. But, in post-2006 sub-sample, there is a non-linear uni-directional causal relation-ship running from energy to food price. The causal effect is fluctuant for energy and food price nonlinear causality, which requires us to identify different causality fields for solving a specific problem.
15:15-15:30 CE0025-A	Fulfilment of Safety Principles for New Nuclear Reactors: Insights from Molten Salt Reactors **Johanes Narasetu Widyatmanto,** Karlsruhe Institute of Technology, Germany Abstract—Given the unproven status of new reactors, how do we ensure their fulfilment of safety principles? While safety principles are popular in nuclear policy discourses[1], its analysis often relies on existing commercial reactors which assume established operational data. Future commercial reactors, however, are yet to have years of proven track records that their fulfilment of safety principles such as prevention of accidents and reduction of unregulated radiation risks[2] need to rely on the completeness of the reactor design. Molten Salt Reactors (MSRs) whose development has stopped for some time[3] are the case in point in this work. Among several MSR designs from several companies and research centres, the ARIS (Advanced Reactors

	Information System) database notes different degrees of design progress. While some are still conceptual, ThorCon US. Inc. comes up with an already detailed design[4,5]such that despite the absence of past reference to commercial MSRs, radioactive accident scenarios could already refer to this design. This reactor is modular, classifies as a supercritical reactor, moderated by graphite, and utilises a closed-fuel cycle with load-following capabilities[6]. Reflecting on these features could provide insights on adequate fulfilment of safety principles despite the lack of historical data. This work is a contribution from nuclear energy ethics to nuclear energy policymaking. By reflecting on ThorCon's detailed MSR design and its accident scenarios, we argue that it is possible for a new reactor design to adequately meet safety principles despite the lack of historical data. We do this by 1) showing how ThorCon's complete MSR reactor design reduce different levels of safety-related uncertainties classified under technical, human, and natural factors; 2) arguing for the adequacy of a detailed commercial reactor design to reduce safety-related uncertainties in core-melting events; to finally 3) propose standard of adequate fulfilment of safety principles for new commercial reactors design.
15:30-15:45 CE0044	State of Decision Making in the Baltic States: Nuclear Energy Past and for the Future **Guna Jakobsone-Snepste,** Riga Technical university, Latvia Abstract—Energy dependence is a very important issue on the energy agenda of the Baltic States. The shortage of electric energy has been affected by several factors, which began with the Chernobyl disaster, the closure of Ignalina and the suspension of the Visagina project. Decisions have been influenced by political situations involving other neighboring countries. Various speculations about technical data, as well as legitimate concern about safety, among other reasons, have influenced the attitude of electricity consumers towards nuclear energy for decades. It is important to remember the chronology of historical events and the validity of decisions to understand the public`s negative attitude towards nuclear energy. This is just as important as seeing the differences between the latest technology and previous generations of nuclear reactors. Important to start a dialogue about small modular reactors (SMRs) in the wider community to reduce doubt and eliminate the spread of fake news. Consumers should be allowed to evaluate current data, indicators, and an objective evaluation of the latest technological solutions should be encouraged to avoid other possible threats that could arise due to insufficient electrical energy. This research is also planned to be continued and expanded.

ONSITE SESSION 3 (UTC+2)

April 28 (Sunday) **16:15-18:00**	**<Amphitheatre Migeon | Round Floor>**
Onsite Session 3: Clean Energy Technology and Energy Related Environmental Impacts **Chairperson**: Prof. Jing Li, Miami University, USA	
16:15-16:30 CE003	Instillations of Solar PV to Prevent CO2 Emissions for Schools in the Hampshire **Berna Yigit,** Bursa Uludag University, Turkey Abstract—When it comes to renewable energy sources, solar power systems have received the most attention over the past ten years since they are believed to be an effective way to combat climate change. In this study, heat demand has been determined for selected two school buildings by using TRNSYS 18 and CO2 emissions life cycle assessment for solar panels have been calculated. It has been determined how much CO2 emissions would be avoided until 2050 if a PV with a 1 kWp capacity is constructed using data on the National Grid's CO2 intensity. As a result of the calculations, avoided CO2 is 1443 kg CO2 between 2020-2050. It is estimated that a PV farm built in China saves -890 kg of CO2, whilst a PV farm built in the EU saves -24 kg. After investigations, instillation of PV farm is not enough to prevent CO2 emissions in Hampshire region because of average number of sunny days are less.
16:30-16:45 CE008	Evaluation of the Performance of an Activated Carbon's Family for Biogas Upgrading Using the Adsorption Performance Indicator **Khaled Abou Alfa,** Univ Pau, Pays Adour/E2S UPPA, Laboratoire de Thermique, Energetique et Procedes-IPRA, EA1932, 64000 Pau, France Abstract—The ideal selection of adsorbents for a wide range of binary gas sepa-rations remains a critical challenge, but the combining of the primary key ad-sorption parameters, including adsorption capacity, selectivity, and heat of ad-sorption using the adsorption performance indicator (API), facilitates this selec-tion. The study applies the API to choose the selective adsorbent for separating CO2 from an equimolar CO2/CH4 mixture, representing a biogas stream. Three activated carbons (ACs) of the CNR family (CNR-115, CNR-115-ox, and CNR-115-ox-am) are discussed, highlighting their ability to selectively adsorb the carbon dioxide molecules while preserving the valuable methane compo-nent. Also, the heat of adsorption of CO2 indicated that the three ACs are re-generative as they are in the range of physisorption. The addition of chemical groups on the surface of the ACs plays an essential role in varying the adsorp-tion parameters. Although the three ACs belong to the same family, it was shown that the addition of the different chemical surfaces and varying the pres-sure changes the choice of the ideal adsorbent; CNR-115-ox showed a better overall performance than the others under the low-pressure region (< 1.5 MPa) due to the presence of oxygen groups, but CNR-115-ox-am is the preferred one for the separation of CO2 from CO2/CH4 mixtures under the high-pressure re-gion due to the presence of nitrogen groups.
16:45-17:00 CE041	Solar Energy Performance Prediction with Regression Al-gorithm in Machine Learning based on Weather Condi-tions: A Case Study **Atil Emre Cosgun,** Aksaray University, Turkey Abstract—The escalating global demand for electrical energy, propelled by population growth, modern lifestyles, and technological advancements, under-scores the necessity for transitioning towards renewable energy sources to miti-gate the adverse impacts of fossil fuel dependency, notably global warming. Among renewables, solar photovoltaic (PV) energy systems have emerged as a prominent choice due to their eco-friendliness, sustainability, and minimal maintenance costs. However, the inherent unpredictability of renewable energy sources poses a significant challenge, particularly evident in the fluctuations of solar PV power generation caused by varying solar radiation and meteorologi-cal factors. This variability necessitates precise forecasting of solar PV power generation to optimize grid integration, ensure stability, and maximize benefits. Machine learning techniques offer a flexible and data-driven approach, capable of capturing complex nonlinear relationships between variables for enhanced

	forecasting accuracy. This paper is focused on regression algorithm forecasting approaches in machine learning for predicting solar PV power output under diverse weather conditions. For this has been used the regression learner tool from Matlab's Machine Learning. By addressing key research questions, it aims to identify optimal forecasting approaches, assess their impact on solar energy production, and provide insights for policy formulation and regulation establishment, applicable to regions with limited research or data availability.
17:00-17:15 CE0006-A	Power Smoothing of an Airborne Wind Energy Farm **Rui Carvalho da Costa,** SYSTEC-ISR ARISE, Universidade do Porto, Portugal Abstract—Renewable energies are critical to preventing climate change and mitigating its most severe consequences. There are numerous clean and sustainable energies available to replace the demand for fossil fuels. Wind is one of the most prominent and important renewable energy sources for large-scale production. One emerging technology in the renewable energy area is Airborne Wind Energy (AWE) which harnesses the wind at higher altitudes through kites connected to a ground station to produce electricity. The low construction and maintenance costs and adaptability of AWE technology distinguish it from other conventional technologies, such as wind turbines. An AWE farm is a set of single units gathered to produce energy on a large scale. A key part of an AWE farm operation relies on the quality of the electrical output of the AWE units. However, the periodical behaviour of the system dynamics of individual units might cause electrical output irregularities, which have a greater impact on the stability and reliability of the grid connection when scaled up to the wind farm level. We study a certain phase shift between groups to smooth the fluctuations of the resultant power waveform. By optimising flight synchronisation, the AWE farm can achieve a more predictable and balanced electrical output, thereby improving the stability of the grid connection and eventually reducing costs in the infrastructure.
17:15-17:30 CE0001-A	Environmental Impact of 2011 Germany's Nuclear Shutdown: A Synthetic Control Study **Jing Li,** Miami University, USA Abstract—This paper contrasts trajectories of Germany's nitrogen oxides, sulphur oxides, particulate matter 2.5, and carbon dioxide emissions with a data-driven weighted average of several European countries. Synthetic Germany is constructed to reveal the counterfactual of what would have happened to Germany's environment in the absence of shutting down eight nuclear reactors in 2011. We find a negative environmental impact of the nuclear shutdown. For instance, from 2010 to 2015, the normalized nitrogen oxides emission in Germany fell from 100 to 92.72, while the emission in the synthetic Germany dropped from 100 to 85.75. One mechanism for the treatment effect is that after the nuclear shutdown, Germany had to use more fossil fuel to generate electricity relative to other countries.
17:30-17:45 CE001-A	Life Cycle Assessment of Renewable Methane Production Technologies **Hannah Hyunah Cho,** Macquarie University, Australia Abstract—This study aims to understand environmental impacts of renewable methane production from seven different technologies including wind- and solar-powered electrolysis and methanation with direct air-captured CO2, anaerobic digestion of sewage sludge, pig and dairy manure, and food waste, as well as landfill gas upgrade. Life cycle impact assessment using ReCiPe 2016 method and scenario analysis were performed. Sewage sludge system exhibited the highest global warming impact due to electricity consumption during digestate dewatering by centrifuge, whereas anaerobic digestion of pig manure in a covered lagoon with dewatering in Geotube® demonstrated the lowest impact. When centrifuge and Geotube® were compared for the same production system, Geotube® had 78% lower global warming impact than dewatering with centrifuge. In general, less energy and resource requirements of major processes led to lower impact together with environmental credits assigned to avoided products, such as NPK fertiliser and conventional manure management, as well as air-captured CO2. Significantly higher human toxicity and ecotoxicity impacts of wind- and solar-powered renewable methane systems were detected due to material and energy consumption during construction of the solar panels and wind farms. Increasing efficiency of wind and solar electricity appeared to be more sensitive than increasing efficiency of electrolyser, while transport distance of the landfill gas had significant effect on the global warming impacts. The potential for producing renewable methane from waste materials is dependent on various supports, such as carbon credits, construction of infrastructure and amendment of national gas standard to accelerate the production.

17:45-18:00 CE043	Recent Tools and Their Roles towards High-share Renewable Energy in the Climate-Changing World **Joseph Akpan,** Durban University of Technology, South Africa Abstract—With the growing presence of distributed renewable energy (RE) resources needed to decarbonise the high contributions of emissions from the dominant fossil fuel utilisation, there is an ongoing demand to assess and improve the planning and development towards increasing the share of renewable energy utilisation. The transition to a high-share renewable energy future requires robust planning and development strategies. This work explores the emerging suite of new tools that are crucial for navigating this transition, particularly in the context of long-term planning tools that can handle the complexities of climate indices and variable renewable energy sources. These tools include Global Atlas, SE4All, 100% RE Atlas, IEA Global Energy-Climate Tool, LUT ESM, WILLIAMS MEDEAS, EN-ROADS/C-ROADS, and Energy Policy Tracker play a vital role in informing policy decisions and setting national renewable energy targets in line with climate change indices. It emphasises the need for tools that can handle increasing data volumes and the continuous development of new modelling solutions. The discussion in this study acknowledges the implications of data and resource constraints. It suggests a strategic approach, starting with simpler tools and gradually building modelling expertise and capabilities. By exploring these emerging tools, informed decision-making that paves the way for successful high-share renewable energy development could be enhanced.

ONLINE SESSION 1 (UTC+2)

April 28 (Sunday) **13:00-15:00**	**ZOOM: <879 2732 1677>**
Online Session 1: Renewable Energy Generation and Power System Management **Chairperson**: Prof. Eugen Rusu, Dunarea de Jos' University of Galati, Romania	
13:00-13:15 CE0042-A	Facilitating the Energy Transition toward Distributed Energy Systems: Aligning Stakeholders with the Environment **Chaoxin Wen,** Chongqing University, China Abstract—In times of social change, how new niches survive in the environment is an important issue. This is especially true when aiming to develop a green and sustainable energy system. It is claimed that a favorable incubation environment can help to reduce the vulnerabilities associated with "being new" to the market. This article utilizes a comparative case study to illustrate how distributed energy systems (DES), as new entrants, can effectively coordinate legitimacy and joint value proposition (JVP) as strategic tools to align stakeholders for a favorable environment. The research has investigated and analyzed the environment and efforts of two DES developed for the local community. In conclusion, the results suggest that, in the era of the energy transition, embracing a "top-down" strategy can effectively alleviate pressure from the environment, while adopting a "clear-blueprint" strategy can proactively guide stakeholders. Simultaneously leveraging internal efforts and responding to external pressures is likely to smooth the transition to DES.
13:15-13:30 CE016	Estimation of Power Consumption in Screw Gas Compressor Installed on Natural Gas Power Plant **Suntiti Yoomak,** School of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand Abstract—The knowledge of the precise power consumption of screw gas com-pressors, which is the highest power requirement when compared with other equipment used in natural gas power plants, can be an indicator of energy effi-ciency in natural gas power plants and impact the construction cost of the pro-ject. This paper proposed a calculation method for the estimated power re-quirement of the screw gas compressor and verified the calculation model with data from 2 different natural gas power plants. The verification methodology has been done by comparing the result with the obtained power from the unit during 11 operation scenarios. The result has indicated that the proposed calcu-lation model can achieve an error less than 5% error on all of operation scenarios. Thus, the proposed estimation model can be used to simplify the calculation process for the power requirement of a screw gas compressor.
13:30-13:45 CE1004	Assessment of Wind and Wave Climate Dynamics in the Mediterranean and Black Seas for Renewable Energy Potential Analysis **Ana-Maria Chiroșcă,** Dunărea de Jos" University of Galati, 47 Domneasca St., 800 008 Galati, Romania Abstract—This study analyzes the potential for renewable energy potential in the Black Sea and Mediterranean Sea regions from wind and wave sources. With a growing emphasis on sustainable energy for climate change mitigation, these ma-rine environments hold significant promise. The study's primary objective is to conduct a comparative analysis of the spatiotemporal variations in wind and wave energy potential, contributing valuable insights for informed decision-making. The analysis focuses on future projections using wind fields provided by a Re-gional Climate Model, considering two Representative Concentration Pathway (RCP) scenarios: RCP4.5 and RCP8.5. These scenarios provide a basis for un-derstanding potential climate futures. The study spans a 30-year timeframe with projections into the distant future (2041-2070) and includes a comparative anal-ysis for a 30-years period with the recent past (1976–2005) for context. By ex-amining the long-term patterns and possibilities of renewable energy sources in the Black Sea and Mediterranean Sea regions, this thorough analysis aims to pro-vide insightful information.

13:45-14:00 CE026	Energy Evaluation of Photovoltaic Integration in Student Building with Different PV Technologies Juan Carlos Lata, Universidad Politécnica Salesiana, Universidad Boliviana del Ecuador, Ecuador Abstract. In recent years, the development and implementation of building-integrated photovoltaic systems (BIPV) has been increasing in developing countries, however, in Latin America it is a new technology without major contribution to the building generation market, the architectural flexibility for the different types of colored solar cells makes it attractive due to the surrounding aesthetics of the building. Stopping the use of traditional materials in the envelope and generating energy for the building contributes to the need to produce energy at the point where it is consumed, however, the comparison of energy production with opaque and crystalline solar panels in the same building is not known. The energy generated by each of the photovoltaic systems was calculated using two computer programs, the first Pvsite is used for the integration of photovoltaic glass in buildings, the second program is Pvsyst widely used for the design of photovoltaic systems with crystalline silicon panels. The results show that integrating photovoltaic glass in the front of the building can generate 6281 kWh/year, on the other hand placing crystalline silicon panels on the terrace of the same building can generate 63692 kWh/year.
14:00-14:15 CE020	An Approach for Voltage Drop Improvement in Distribution Line Using High Voltage Capacitor Bank **Atthapol Ngaopitakkul,** School of Engineering, King Mongkut's Institute of Technology Ladkrabang, Thailand Abstract—Distribution line voltage drops cause power losses and a general de-cline in the efficiency of the electrical power system. In this study, PSCAD software is used to evaluate the elements that impact the voltage drop in the distribution line, including distribution line length, electric load power factor, and electric load capacity, both with and without capacitor bank installation. The 22-kV overhead distribution line in Thailand served as the basis for the simulation model's creation. It has been suggested to install capacitor bank-based techniques to increase voltage on distribution lines. The findings show that the voltage drop is significantly influenced by the distribution line distance, electric load power factor, and electric load capacity. The voltage drop can be minimized to the greatest extent by properly arranging capacitor banks.
14:15-14:30 CE027	Technical-economic Evaluation of a Stand-alone Hybrid Renewable Energy System with Different Dispatch Strategies **Juan Carlos Lata,** Universidad Politécnica Salesiana, Universidad Boliviana del Ecuador, Ecuador Abstract—Rural electrification through hybrid renewable energy systems has had a significant growth in recent years, the technical dimensioning seeks to prioritize the reliability of the energy supply through the optimization of the microgrid at the lowest cost of energy. When it comes to optimal sizing, it is essential to use a dispatch strategy in order to improve reliability, reduce envi-ronmental contamination and minimize the economic cost of the system. The software used provides various dispatch strategies, among which the wide-ly used cycle load (CC) strategy stands out, but it seeks the proper functioning of the system in real time without planning for the future, another strategy is load tracking (LF), the research work seeks to evaluate technically and economically with different dispatch strategies a hybrid system made up of photovoltaic panels/diesel generator/battery bank implemented in an isolated community in the Gulf of Guayaquil in Ecuador. The results show that for a load of 14.37 kilowatt-hour (kWh)/day the optimal system is made up of a 10 kilowatt (kW) photovoltaic generator, a 2.8 kW diesel generator, a battery bank made up of 10 units of 140 Ah, the cost of implementation and energy with the LF strategy is 21,704 US dollars (USD) and 0.322 USD/kWh respectively, while with the CC strategy the respective costs are 22,584 USD and 0.335 USD, the load is fully satisfied by providing high reliability.
14:30-14:45 CE032	Technical-economic Modeling of a Microgrid Incorporating Renewable Photovoltaic Energy **Gary Omar Ampuño Avilés,** Universidad Politécnica Salesiana, Ecuador Abstract—In buildings, especially in coastal cities, the highest electricity con-sumption is due to the air conditioning of offices using air conditioners. Reducing excessive energy consumption is a topic of study worldwide. A key alternative is to support electricity distribution companies using renewable energies in microgrids. In this context, this paper explores the design process

	of a hybrid photovoltaic microgrid connected to the public grid for a university located south of Guayaquil, Ecuador, with more than 3,000 students. The design of the energy system seeks to satisfy the basic loads with a photo-voltaic system, and the lighting demands are covered with a battery storage system. The system is controlled by a bidirectional converter that dynamically adjusts the power distribution according to the solar irradiance output. In addition, an economic analysis of the equipment, such as panels and batteries, which account for most of the investment costs, was performed. This approach would not only result in a sustainable and environmentally friendly electrical system but would also reduce the need to build a substation by reducing approximately 25% of the energy consumption allocated to the building.
14:45-15:00 CE013	A Hybrid PEM Fuel Cell Degradation Model to Optimize the Hybrid Energy Storage Lifespan **Mukwanga Siti,** Tshwane University of Technology, South Africa Abstract—Enhancing the supply of power in terms of availability, dependability, and security are the current goals of the electricity industry. Incorporating renewable energy sources into the electrical grid to address the issue of energy scarcity has consequently garnered a great deal of attention. However, the utilization of hybrid energy storage systems (HESS) is required due to the high degree of electricity supply instability of renewable energy sources (RES) paired with variations in energy demand levels. HESS still faces issues with lifespan deterioration and the need to increase electricity availability. This research therefore suggests an improved PEM fuel cell degradation model to deal with the system's instability, which causes the HESS to age quickly. The comparison of the HESS with the proposed PEMFC model and the HESS model shows a huge improvement in the parameters that affect the lifespan predicted period. The system is modeled using MATLAB for coding and Simulink for system simulations.

ONLINE SESSION 2 (UTC+2)

April 28 (Sunday) **15:15-17:45**	**ZOOM: <879 2732 1677>**
Online Session 2: Energy Storage Technology, Energy Efficiency, and Carbon Reduction **Chairperson**: Assoc. Prof. Maisa El Gamal, Zayed University, United Arab Emirates	
15:15-15:30 CE012	Energy Storage Capacity of Microencapsulated Phase Change Materials **Rubén D. Santiago-Acosta,** ITESM-CEM, Mexico Abstract—The problem of phase change processes in confined systems for thermal energy storage has been addressed by several authors. Thermo-mechanical models have been developed to estimate key parameters such as melting times and energy storage capacity of confined phase change materials. Although, volume expansion is limited through encapsulation, the density changes during melting have a significant impact on latent heat storage physics. Recently it has been shown that within the incompressible limit: inner pressure, latent heat, energy density and melting times are ill-estimated. Melting rates are profoundly affected by the compressibility of the solid phase. In this work, two configurations of confined phase change materials are considered: microencapsulated salts in a shell with a free outer surface and microcapsules with a fixed shell-matrix interface. It is found that although, the latent and sensible heat absorbed decrease with the shell's thickness, the energy density is greatly improved when the proposed model is applied to salts with higher compressibilities. Finally, it is found that close to the isochoric limit, melting times are significantly increased, showing a major disadvantage in composite salt-matrix systems.
15:30-15:45 CE0036	Exploration on the Key Factors to the Successful Implementation of Carbon Capture and Storage (CCS) Projects based on a CCS Project Inventory **Xinyi Duan,** Beijing National Day School, China Abstract—Climate change has been a key global challenge in recent years. Carbon Capture and Storage (CCS), a quickly evolving technology crucial to the climate transi-tion, by far still have a lot of limitations and therefore not put in large-scale use. Some CCS projects have failed eventually. In this study, I used the Carbon Cap-ture, Utilization, and Storage global database provided by the International Ener-gy Agency (IEA, 2023) to study the progress of development of CCS projects worldwide, aiming to understand the main factors to these failures. Specifically, I analyzed key features of CCS projects of more than 400 CCS projects in exist-ence, finding only a few projects entered the later phase of development. The small portion of completed CCS projects have an average cost dramatically lower than the average cost of active, hold, potential and terminated phase project. Among active and potential CCS projects, costs diverge significantl. I also found that a rise in the scale of capture and storage of CCS projects by 1% requires 3% more costs, indicating intense requirement for capital. By far, CCS projects in ac-tive phase appear to have the highest capture amount. This further underscore the importance of capital in future development of CCS projects. Finally, I studied reasons of failed CCS projects, and concluded that financial stress, permitting and legislation challenges, and unclear political support have been three main reasons of project failure. These understanding of success and failure of CCS projects can be considerations on implementation and developing CCS projects in future.
15:45-16:00 CE029	Technical-economic Implementation of a Control and Supervision System in Air Conditioning Systems through BACnet for Energy Efficiency in Buildings **Gary Omar Ampuño Avilés,** Universidad Politécnica Salesiana, Ecuador Abstract—In coastal areas, the highest consumption of electricity is due to the use of air conditioners due to the high temperatures. Avoiding air conditioners being on when there are no personnel in the air-conditioned areas is one of the options that serve as a strategy to reduce electricity consumption. But turning the ACs on and off generates compressor start-up peaks and this also generates an increase in electricity consumption. Therefore, in the present work the con-trol of the ACs through BACnet communication is used for optimal control in various

	scenarios of the use of ACs. The test was implemented in the offices of a university showing savings in dollars of up to 55.6%, demonstrating energy efficiency in buildings because it is possible to adapt old technology equipment whose compressors start directly.
16:00-16:15 CE0043-A	Energy Efficiency Capitalization **Davidmac Olisa Ekeocha,** University of Liverpool, United Kingdom Abstract—Energy efficiency plays a pivotal role in the attainment of other sustainable development goals. This paper studies the impact of the national energy efficiency strategy (NEES), the largest energy efficiency programme in South Africa, targeting low-income households. Using difference-in-differences methods on South African generalized household survey data, the variations in NEES eligibility conditions are exploited to evidence significant adoption of energy efficiency and modern energy usage that persists in the long-term. Moreover, there are significant capitalizations in house prices and rents, with sizable pollution and non-chronic morbidity reductions. This study argues that pollution reductions, especially in air, water, littering and asbestos exposure are only but conduits for non-chronic morbidity reductions in respiratory diseases, diarrhea and tuberculosis. The study documents evidence of mental health gains due to efficient modern energy usage for low-income individuals. The heterogeneous characterizations of these effects are explored, discussing policy insights. Energy efficiency adoption among Blacks and Asians and modern energy usage are more urbanized in both low- and densely populated provinces, causing rising house prices and rents in these locations. Albeit, there are ubiquitous pollution reductions; it is more pronounced in the densely populated metropolitan provinces. Thus, causing public health gains for both adults, youths and children, across all genders, race and locations in Gauteng, Kwazulu-Natal and Western Cape provinces. Reassuringly, the results subsist across different robustness checks and falsification exercises.
16:15-16:30 CE044	Towards Sustainable CO2 Reduction and Brine Utilization: Investigating Alkaline-Enhanced Solvay Processes **Maisa El Gamal,** Zayed University, United Arab Emirates Abstract—The pressing environmental challenge of carbon dioxide (CO2) emissions necessitates efficient CO2 sequestration methods, while managing concentrated brine from desalination plants remains critical. This study investi-gates the efficacy of modified Solvay processes for brine desalination manage-ment and CO2 capture, beginning with ammonia and subsequently replacing it with other alkaline materials including calcium hydroxide, potassium hydrox-ide, aluminum oxide, and carbide lime. Experimental analyses in a semi-batch reactor assessed the impact of different process parameters on CO2 capture effi-ciency and ion removal. Optimum conditions yielded peak sodium removal (25.0%) and CO2 capture efficiency (76.0%) using ammonia. Subsequently, calcium oxide replaced ammonia, achieving 33% sodium reduction and 86.2% CO2 capture efficiency. Additionally, potassium hydroxide and carbide lime demonstrated substantial brine desalination efficiencies of 44.1% and 47.1% respectively, with carbide lime exhibiting superior CO2 capture efficiency (80%). Conversely, aluminum oxide showed low reactivity but effectively recovered 24.0% of magnesium ions from reject brine, indicating potential use as a coagulant. These findings underscore the potential of modified Solvay processes for addressing CO2 capture and brine management challenges while reducing environmental impacts of ammonia. Further research is warranted to optimize these processes for enhanced CO2 capture and sustainable brine desalination. This study contributes valuable insights into CO2 capture mechanisms and offers pathways toward more sustainable CO2 capture and brine desalination technologies.
16:30-16:45 CE0041	The Transition to 100% Renewable Energy Versus the Global Temperature Scenarios: A Perspective Analysis **Joseph Akpan,** Durban University of Technology, South Africa Abstract—This study examines the role of renewable energy (RE) in reducing greenhouse gas emissions and managing global temperature rise. It uses the EN-ROADS model to quantify four scenarios based on emission reduction targets and mitiga-tion options, including electrification, energy efficiency, deforestation, and green-house gas (GHG) abatement. The study reveals both challenges and opportunities for achieving a high-level renewable energy supply system globally. Four differ-ent scenarios are hypothesised to compare how different emissions targets and mitigation strategies impact global temperature scenarios. An integrated assess-ment model is used to analyse these hypotheses and their implications on factors such as global temperature, GHG emissions, and energy storage breakthroughs. The findings are valuable in

	developing policies towards the 100% RE vision. The analysis shows that with an increasing renewable share, the global tempera-ture can be achieved at 100, 89, and 70% RE by 2100 for 1.5, 2.0, and 1.1oC, while the baseline scenario would likely keep the global average temperature at 3.3°C. Energy storage is also crucial in the global primary energy mix, as provid-ing between 14% and 17% of final energy consumption and 7-9% of electricity generation would facilitate the 100% renewable energy goal.
16:45-17:00 CE1005	Research on the Performance of Positive Electrode Modified with Fluorinated Carbon Based on Silver Coating **Sun Haitao,** Shijiazhuang Campus of Army Engineering University, China Abstract—In order to address the problem of poor conductivity of fluorocarbon prepared at high temperature, selecting metal materials with good conductivity to be coated on the surface of fluorocarbon can improve the conductivity of the material and thus improve the electrochemical performance of the battery. In this experiment, Ag is co-precipitated on NCM811, a cathode material for lithium-ion batteries, and through a series of performance test experiments, the mechanism of Ag on the electrochemical performance of fluorocarbon is investigated to analyze the influence of Ag coating on the electrochemical performance of fluorocarbon, so as to determine the optimal capping strategy.
17:00-17:15 CE045	Sustainable Construction Materials from Industrial By-products **Sawsan Dagher,** Abu Dhabi Polytecnic, United Arab Emirates Abstract—The development of sustainable construction materials is crucial for addressing environmental concerns and advancing eco-conscious building practices. In this study, we investigate the potential of sulfur-containing concrete formulations, aiming to enhance durability, reduce environmental impact, and meet the growing demand for eco-friendly building materials. The creation of sustainable concrete blends integrating sulfur, fine aggregates, and industrial waste materials. Through a process of heating, mixing, molding, and testing, the mechanical strength of the resulting Fume Treatment Plant (FTP) and Direct Reduction Irion (DRI) with lime (L) samples is assessed, revealing heightened compressive strength compared to traditional concrete. Chemical analysis corroborates low chloride and sulfate content, fortifying the concrete's resilience against environmental stressors. These findings underscore the potential of sulfur-infused concrete for diverse construction needs, offering both durability and sustainability benefits. With applications spanning infrastructure, urban development, and marine projects, this innovative material aligns with the industry's shift towards eco-friendly building practices and addresses growing environmental concerns.
17:15-17:30 CE1006	Research on the Positive Electrode Performance of Lithium Battery Based on the Mixture of Carbon Fluoride and the Manganese Dioxide **Cui Kaibo,** Shijiazhuang Campus of Army Engineering University, China Abstract—In this paper, α-manganese dioxide (MnO_2) with good electrical conductivity was selected as the cathode material of lithium batteries. Fluorocarbon/MnO_2 composites were prepared by solid phase method. The phase structure, microstructure and electrochemical properties of the composites were characterized and analyzed. Manganese dioxide is one of the most widely used cathode materials in primary lithium batteries. It has the characteristics of low cost, good ion exchange and molecular adsorption properties, and excellent electrochemical properties. The purpose of this study was to further explore the effects of different manganese dioxide content composites on the electrochemical performance of lithium batteries.
17:30-17:45 CE1007	Research on Preparation Process of Graphene Oxide of Negative Electrode Materials **Deng Huiyong,** Shijiazhuang Campus of Army Engineering University, China Abstract—Graphene oxide(GO) is a highly stable and charge/discharge stable negative electrode material. When preparing GO using the Hummers meth-od, GO prepared by KMn4 instead of $NaNO_3$ was studied and analyzed. Spec-tral analysis, structural analysis, thermogravimetric analysis, and structural integrity analysis were conducted on GO prepared by KMn4. The experi-mental results showed that compared to GO prepared by KMn4 to traditional methods had little difference in terms of degrees of oxidation, the stable dis-persion in water and thermogravimetric analysis, but it has higher structural stability and fewer permanent defects compared to GO prepared by tradition-al method.

DELEGATE LIST

#1	**Bahia Bouchafaa,** Ecole Nationale Polytechnique (National Polytechnic School) - ENP, Algiers
#2	**Chen Li,** National Innovation Institute of Defense Technology, China
#3	**Li Guigen,** National Innovation Institute of Defense Technology, China
#4	**Li Wenliang,** National Innovation Institute of Defense Technology, China
#5	**Meng Binbin,** National Innovation Institute of Defense Technology, China
#6	**Zhao Yangfan,** National Innovation Institute of Defense Technology, China
#7	**Shifeng Guo,** National Innovation Institute of Defense Technology, China
#8	**Luís Tiago Paiva,** SYSTEC-ISR ARISE, Universidade do Porto, Portugal

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