

CONFERENCE ABSTRACTS



September 14-17, 2020

The 7th International Conference on Energy and Environment Research

“

*Driving energy and environment
in 2020 towards a sustainable future*

”



COVID-19

PENSA POSITIVO
Think Positive

ICEER2020

2020 The 7th International Conference on Energy and Environment Research –
Driving Energy and Environment in 2020 towards a Sustainable Future

Publisher

Instituto Superior de Engenharia do Porto

Editors

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Ambra Giovannelli, Carlos Felgueiras

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WELCOME MESSAGE



ICEER 2020 conference is in its 7th edition and has been strengthening as an event of increasing interest in the areas of Energy and Environment.

In previous editions, we characterized this event as “a privileged space to discuss current matters related to Energy and the Environment Research,” in which “the coffee-breaks served not only for a brief relaxing pause in the hard work, but also to discuss...”. The aim of ICEER is, in fact, to be a privileged space for face-to-face discussion, in which we speak directly with each other, agreeing or disagreeing, but always in deep mutual respect, while indirectly overcoming educational or cultural differences.

Unfortunately, this year we cannot speak face-to-face due to COVID-19. This is an urgent matter that will certainly be overcome in the short term through a vaccine. Nevertheless, the World fast spread of this disease has raised increased challenges in the health fields that extended to the energy, environment and sustainable development areas. The sudden cut on long-distance travel and changes on work models have shown how significant is the impact of transportation on the fuels and energy consumption, and on the air quality. Thus, the fundamental issues in our era remain climate change, energy and environment protection.

We must continue to discuss and deepen the solutions of tomorrow, through research and educational changes, so we decided to keep this year's edition of ICEER2020, even though in an online format.

ICEER 2020 aims to continue to be a privileged space to discuss current issues related to Energy and the Environment.

ICEER 2020 continues to be a particularly multicultural event.

ICEER 2020 continues to work closely with editors of International Journals to consider publishing extended versions of a selection of papers.

Welcome to

ICEER2020@online - Driving Energy and Environment in 2020 towards a Sustainable Future.

The Conference Chairs

CONFERENCE PROGRAM



September 14th — Test Session

September 15 th		September 16 th		September 17 th	
Meeting ID: 67844808665		Meeting ID: 67844808665		Meeting ID: 67844808665	
08:45-09:15	Log In	09:00-09:30	Log In	08:45-09:15	Log In
09:15-09:30	Opening Ceremony	09:30-10:15	KN2: Francesco Asdrubali	09:15-09:30	Poster E023
09:30-10:15	KN1: Saad Mekhilef				
10:15-10:30	Coffee Break	10:15-10:30	Coffee Break		
Session 1A - Biomass & Bio-based Products		Session 8A - Sustainable Buildings		Session 7C - Environmental Pollution, Prevention & Pollution Control	
10:30-10:45	E064	10:30-10:45	E042	09:30-09:45	E009
10:45-11:00	E038	10:45-11:00	E033	09:45-10:00	E061
11:00-11:15	E071	11:00-11:15	E075	10:00-10:15	E047
11:15-11:30	Coffee Break	11:15-11:30	Coffee Break	10:15-10:30	Coffee Break
Session 2A - Energy Efficiency		Session 9A - Advanced Control & Monitoring Systems		Session 6B - Modelling, Simulation & Forecasting of Energy & Carbon Markets	
11:30-11:45	E035	11:30-11:45	E081	10:30-10:45	E036
11:45-12:00	E046	11:45-12:00	E043	10:45-11:00	E016
12:00-12:15	E054	12:00-12:15	E059	11:00-11:15	E057
12:15-12:30	E049	12:15-12:30	E037	11:15-11:30	E019
12:30-13:30	Lunch & Break	12:30-13:30	Lunch & Break	11:30-11:45	Coffee Break
Session 3A - Energy Policy, Economics, Planning & Regulation		Session 3B - Energy Policy, Economics, Planning & Regulation		Session 4C - Renewable Energy	
13:30-13:45	E045	13:30-13:45	E044	11:45-12:00	E063
13:45-14:00	E013	13:45-14:00	E007	12:00-12:15	E028
14:00-14:15	E010	14:00-14:15	E004	12:15-12:30	E074
14:15-14:30	Coffee Break	14:15-14:30	Coffee Break	12:30-13:30	Lunch & Break

CONFERENCE PROGRAM



September 15 th		September 16 th		September 17 th	
Meeting ID: 67844808665		Meeting ID: 67844808665		Meeting ID: 67844808665	
Session 4A - Renewable Energy		Session 4B - Renewable Energy		Session 12A - Education for Sustainable Development	
14:30-14:45	E024	14:30-14:45	E053	13:30-13:45	E060
14:45-15:00	E015	14:45-15:00	E072	13:45-14:00	E014
15:00-15:15	E029	15:00-15:15	E055	14:00-14:15	E069
15:15-15:30	Coffee Break	15:15-15:30	Coffee Break	14:15-14:30	E017
				14:30-14:45	Coffee Break
Session 5A - Life Cycle Analysis Methodologies		Session 10A - Biomass and Bio-Based Products		14:45-15:30	KN3: Obulisamy Parthiba Karthikeyan
15:30-15:45	E020	15:30-15:45	E027		
15:45-16:00	E078	15:45-16:00	E012	15:30-15:45	Coffee Break
16:00-16:15	E018	16:00-16:15	E068	Session 3C - Energy Policy, Economics, Planning & Regulation	
16:15-16:30	Coffee Break	16:15-16:30	Coffee Break		
				15:45-16:00	E058
Session 6A - Modelling, Simulation & Forecasting of Energy & Carbon Markets		Session 7B - Environmental Pollution, Prevention & Pollution Control		16:00-16:15	E062
16:30-16:45	E011	16:30-16:45	E066	16:15-16:30	E021
16:45-17:00	E041	16:45-17:00	E073	16:30-16:45	E051
17:00-17:15	E022	17:00-17:15	E076	16:45-17:00	E067
17:15-17:30	Coffee Break	17:15-17:30	Coffee Break	17:00-17:30	Closing Ceremony & Awards
Session 7A - Environmental Pollution, Prevention & Pollution Control		Session 11A - Advanced Energy Technologies			
17:30-17:45	E056	17:30-17:45	E048		
17:45-18:00	E077	17:45-18:00	E025		
18:00-18:15	E003	18:00-18:15	E065		

TEST SESSION AT A GLANCE

September 14th



Time	Session	Paper ID	Meeting ID
13:30-14:30	1	E064 E038 E071 E035 E046 E054	67844808665
		E049 E042 E033 E075 E081 E067	
	2	E059 E037 E009 E061 E047 E079	61021308354
		E036 E016 E019 E045 E013 E069	
15:00-16:00	3	E010 E044 E007 E004 E060	67844808665
		E014 E017 E024 E015 E029	
	4	E053 E072 E055 E063 E028	61021308354
		E074 E020 E078 E018 E027	
16:30-17:30	5	E012 E068 E058 E062 E021	67844808665
		E051 E011 E041 E022 E066	
	6	E073 E076 E056 E077 E003	61021308354
		E048 E025 E065 E043 E057	

Voice Control Rules

- The host will mute all participants while entering the meeting.
- The host will unmute the speakers' microphone when it is turn for his or her presentation.
- Q&A goes after each speaker, the participant can raise hand for questions, the host will unmute the questioner.
- After Q&A, the host will mute all participants and welcome next speaker.

Oral Presentation

- Timing: a maximum of **15 minutes** in total, including 3 minutes for Q&A. Please make sure your presentation is well timed.
- It is suggested that the presenter email a copy of his/her video presentation to the conference email box as a backup in case any technical problem occurs.

Poster Presentation

- All the posters will be shown for **5 minutes** in the poster presentation room. Q&A goes after each poster shown.

*Conference Recording

The whole conference will be recorded. We appreciate you proper behavior and appearance.

- * The recording will be used for conference program and paper publication requirements. The video recording will be destroyed after the conference and it cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose. It will only be recorded by the staff and presenters have no rights to record.

PRESENTATION PREPARATION



Time Zone

Portugal Time (GMT+1)

You're suggested to set up the time on your computer in advance.

Platform

ZOOM

Video Tutorials:

<https://support.zoom.us/hc/en-us/articles/206618765-Zoom-Video-Tutorials>

GIF Tutorial:

<http://iceer.net/zoom.html>

Test before Formal Meeting

Date: September 14th, 2020

Prior to the formal meeting, presenters shall join the test room to ensure everything is on the right track. Please check your test time at page 5.

Equipment Needed

A computer with internet connection and camera

Headphones

Environment Needed

A quiet place

Stable internet connection

Proper lighting and background

Q&A Room

If you have any problems about the online operating during the conference days, please enter the Q&A room

Meeting ID: 61021308354 (9:00-18:00, Sep. 15-17)

Meeting Room Linkage

<https://zoom.com.cn/j/67844808665>

<https://zoom.com.cn/j/61021308354>

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Zita Vale	<i>GECAD/ISEP/P. Porto</i>	PT

CONFERENCE CHAIR



PROF. CORIOLANO SALVINI

University of ROMA TRE, Italy

Research Interests: energy system design and optimization, optimum management of complex plants, power production planning

Coriolano Salvini received M.S. in Mechanical Engineering (1991) and Ph.D. in Energetics (1997) from “La Sapienza” University of Roma. He is currently Associate Professor in Systems for Energy and Environment in the Department of Engineering at "Roma Tre" University. He is involved in research mainly focused on energy system design and optimization, optimum management of complex plants, power production planning.

CONFERENCE CHAIR



PROF. CARLOS FELGUEIRAS

Department of Electrical Engineering, School of Engineering (ISEP), Polytechnic Institute of Porto (IPP), Porto, Portugal

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Research Interests: energy quality; energy and buildings; energy and environmental Indicators; renewable energy systems; sustainable energy systems; engineering education

Manuel Carlos Felgueiras received the B.S. and Ph.D. degrees in electrical and computer engineering from the Faculty of Engineering, University of Porto, Porto, Portugal, in 1987 and 2008, respectively. He started his professional career in 1987 as electronic designer for automation systems. Later was invited to supervise a test laboratory for verifying the accomplishment of European Standards in thermoelectric household appliances. He started the teaching activity in 1994 as Assistant Professor and later on as Adjunct Professor and researcher with the Department of Electrical Engineering, School of Engineering, Polytechnic Institute of Porto (P.Porto), Portugal. His research interests include design for debug and test of mixed-signals, remote experimentation in e-learning, renewable energy sources and smart buildings.

Prof. Felgueiras is member of the Portuguese Engineers Association and the Global Online Laboratory Consortium (GOLC). He has published around 90 papers and includes the scientific committee of several conferences.

PROGRAM CHAIR



PROF. AMBRA GIOVANNELLI

Scopus web page: www.scopus.com/authid/detail.uri?authorId=22934006800

ORCID: 0000-0003-4991-173X

Ambra Giovannelli has been working as Assistant Professor of Fluid Machinery and Energy Conversion Systems at the Department of Engineering - University of Roma Tre. Lecturer of Turbomachinery (MS degree) and Applied Thermodynamics and Fluid-dynamics (BS degree), she received the MSc degree cum laude in Mechanical Engineering (2004) and a PhD in Mechanical and Industrial Engineering (2008).

Author of many papers and technical reports, her research work is focused on turbomachinery modelling (Supercritical CO₂ Turbomachines, Gas Turbines (GTs) fuelled with syngas, Solar GTs, Hybrid GTs), power production from Concentrated Solar Power (high-temperature solar concentrators, reactors and TGs), waste heat-to-power systems, storage systems (PCM storage systems and CAES) and energy-saving in refrigeration and cryogenic plants.

Member of the Editorial Board of the International Journal “Processes”, she, currently, serves as a reviewer for several indexed scientific journals (e.g. Elsevier, Wiley, Springer, MDPI) and international conferences in the field of mechanical and industrial engineering (ICEER, ASME, IEEE).

She is member of IEC (International Electrotechnical Commission), ISES (International Solar Energy Society), ASME (American Society of Mechanical Engineers) and AIMSEA (Italian Society of Fluid Machinery and Energy Conversion Systems).

She has been local PI of some national projects related to the design and analysis of supercritical CO₂ turbomachines, and she was involved in several European (FP7-308952, 2013-17 "OMSoP", FP7-239349, 2009-2013 "H2-IGCC", FP6-502704, 2004-2007, STREP, “HYTECH”) and Italian projects.

PROGRAM CHAIR



PROF. NÍDIA DE SÁ CAETANO

Coordinator Professor at the School of Engineering (ISEP) of the Polytechnic Institute of Porto (P.Porto); Subject Editor for Biomass section of *Renewable Energy* journal; Editorial Board Member of *The Open Microalgae Biotechnology Journal*; Guest Editor of Special Issues in *Frontiers*, *Energies*, *Waste and Biomass Valorization*, *Sustainability* and *ChemEngineering* journals. Editor of Conference Proceedings in *Energy Reports* and *Energy Procedia*.

Nidia Caetano is Coordinator Professor at the School of Engineering (ISEP) of the Polytechnic Institute of Porto (P.Porto), where she is the sub-director of the MSc in Sustainable Energies (Mechanical Engineering Department, 2010-2013 and from June 2018). She was the director of the MSc in Sustainable Energies (March 2013-June 2018). Sub-Director of the Chemical Engineering Department of ISEP for the Infrastructures and Facilities (2014-2016). Laboratory Director (2001-2011). She received her graduation and Ph.D. in Chem. Eng. in FEUP, 1987 and 1996, respectively.

For over 25 years, she has been actively involved in the research in renewable and sustainable fuels, biomass and biowaste valorization, biological wastewater treatment. Additionally, from 2010, she has also been involved in research related to life cycle assessment of energy, biomass and biofuel processes/systems. Presently she is involved in microalgae biorefinery projects, including the whole value chain LCA.

She has contributed +100 journal papers and +200 conference with referee process, 14 book chapters, and was the invited lecturer of several conferences.

Subject Editor for Biomass section of *Renewable Energy* journal (from March 2020). Editorial Board Member of *The Open Microalgae Biotechnology Journal* (from November 2019).

Guest Editor of Special Issues in *Frontiers*, *Energies*, *Waste and Biomass Valorization*, *Sustainability* and *ChemEngineering* journals. Editor of Conference Proceedings in *Energy Reports* and *Energy Procedia*.

Member of Organizing Committee and Scientific & Technical Committee of JTIR, ISWA/APESB Beacon Conference (Lobito), 2nd ISWA/APESB Beacon Conference (Luanda). She was the Conference or Program Chair of ICEER conferences since 2016. Member of the Scientific Committee of Wastes.

Technical expert for the *Agência Nacional de Inovação*, USDOA (SBIR program), the Israeli Dep. Agriculture, and the European Commission. Reviewer for over 60 International journals.

She has been member of The Portuguese Board of Engineers and of the APESB (Portuguese Sanitary and Environmental Engineering Association), being Vice-President of APESB from March 2020.

KEYNOTE SPEAKER



PROF. SAAD MEKHILEF

Faculty of Engineering, University of Malaya

The Role of Power Electronics in Providing A Sustainable Energy Supply for the Future Generation

September 15 | 9:30-10:15

Meeting ID: 67844808665

BIOGRAPHY Prof. Dr. Saad Mekhilef is a Chartered Engineer (CEng) and Fellow of The Institution of Engineering and Technology (IET), and a Senior Member of The Institute of Electrical and Electronics Engineers (IEEE). He is an Associate Editor of various top journals such as IEEE Transactions on Power Electronics and the Journal of Power Electronics.

He is a Professor at the Department of Electrical Engineering, Faculty of Engineering, University of Malaya, since June 1999. He is currently the Dean of the Faculty of Engineering, and the Director of Power Electronics and Renewable Energy Research Laboratory (PEARL).

A total of 116 Philosophy Doctorate (Ph.D.) and Master Degree candidates have successfully graduated under his supervision. He has filed six Intellectual Property (IP) in his expertise.

He is frequently invited as honorary keynote lecturer at international conferences, congress, meetings, and symposiums.

He authored and co-authored more than 400 publications in academic journals and proceedings including 253 International Scientific Indexing, ISI publications, and five books with more than 22,500 citations and 74 H-index.

Saad Mekhilef has been listed by the Thomson Reuters (Clarivate Analytics) as one of the Highly Cited (Hi.Ci) engineering researchers in the world, and included in the "Thomson Reuters' The World's Most Influential Scientific Minds: 2018 and 2019". He is actively involved in industrial consultancy for major corporations in the Power Electronics and Renewable Energy projects. His research interests include Power Conversion Techniques, Control of Power Converters, Maximum Power Point Tracking (MPPT), Renewable Energy, Energy Efficiency, Smart Grid, Microwave and Wireless Technologies.

KEYNOTE SPEAKER



PROF. FRANCESCO ASDRUBALI

Roma Tre University, Italy

Life Cycle Assessment of Energy Efficient Buildings

September 16 | 9:30-10:15

Meeting ID: 67844808665

BIOGRAPHY Francesco Asdrubali is a full professor of Building physics and building energy systems at the University of Roma Tre since 2015. Previously he served as Assistant Professor and Associate Professor at the University of Perugia. Graduated in Civil Engineering in 1990, he obtained a PhD in Thermophysical properties of materials in 1995 and served as Director of CIRIAF, an Inter-University Research Center in the field of environment and pollution, based at the University of Perugia, from 2004 till 2013.

His teaching activities include the courses of Environmental Acoustics, Applied Thermodynamics and Heat Transfer, Energy systems and Environment, Renewable Energies in the Universities of Perugia and Roma Tre.

The areas of scientific research cover a wide range of topics, such as renewable and alternative energies, heat transfer, energy and buildings, Life Cycle Assessment, acoustical properties of materials, environmental noise, natural and artificial lighting, sustainable mobility.

Francesco Asdrubali is author of more than 200 scientific papers in the abovementioned areas, member of the Editorial Board of various international Journals and Editor in Chief of Building Acoustics and Noise Mapping.

The international activities include the coordination of various national and EU-funded Projects (LIFE, Intelligent Energy Europe, VII FP; Horizon 2020) and the participation to international networks such as COST Actions.

Member of the Scientific and Organizing Committees, Session Organizer and Keynote speaker at several international conferences, such as ICSV 16 (2009), ICAE International Congress on Applied Energy (2011), ECOS (2012), EAA Euroregio (2013), ICSV22 (2015), Euronoise (2015), ICSV23 (2016), ICSV 24 (2017), Internoise (2017), Building Simulation 2019, ICCHMT 2019.

SPEECH ABSTRACT The Paris agreement requires the 195 subscribers' countries to hold global temperatures to a maximum rise of 1.5 °C above pre-industrial levels. In order to meet the Paris requirements, the retrofit of the building stock becomes a key issue since it is responsible for a significant share of the world's energy consumptions and greenhouse gas emissions. When analysing traditional buildings, between 60% and 90% of the total impacts are imputable to the operational energy demand. Energy efficiency has recently led to a considerable reduction in the environmental burdens of the use stage, cutting the energy and carbon emissions associated with this period but causing a burden shifting towards other life cycle stages of the constructions. As a matter of fact, when a very low energy building with embedded renewable systems is considered, such as an NZEB (Nearly Zero Energy Building), the relevance of the use stage in life cycle analysis decreases and, at the same time, the embodied components acquire more importance.

The Life Cycle Assessment (LCA) approach can be a very useful tool to evaluate the environmental impacts of the different life cycle stages of a building and to estimate the pros and cons of different retrofit options of an existing building. To this extent, some indicators, like energy and environmental payback times, have to be added to economic payback times in order to obtain a more comprehensive analysis.

During the Keynote lecture, thanks to some significant case studies, the methodological approach of LCA applied to energy efficient buildings will be discussed, along with the importance of evaluating the energy and carbon payback times of different retrofit scenarios supposed for an existing building. Since buildings are long-lasting artefacts, and during their life cycle energy scenarios may change, the so-called dynamic LCA will be also discussed.

KEYNOTE SPEAKER



DR. PARTHIBA KARTHIKEYAN

University of Houston, Texas, USA

Microalgae Biorefinery and Circular Bioeconomy

September 17 | 14:45-15:30

Meeting ID: 67844808665

BIOGRAPHY Dr. Parthiba Karthikeyan is Research Assistant Professor at Department of Engineering Technology, University of Houston, Texas, USA. He has over 12 years of international research experience in the field of environmental microbiology and biotechnology. He has achieved few meritorious awards such as Australia-Thailand Early Career Research Exchange Award-2014, Sêr Cymru National Research Network for Low Carbon Energy and Environment Writing Fellowship and Award-2018 (UK), and Ramalingaswamy Re-Entry Fellowship-2018 (India).

Dr. Karthikeyan is a peer review member assessor for the United States Department of Agriculture (USDA)-USA, Agriculture and Agri-Food Canada, Canada, Horizon H2020-Marie Sklodowska-Curie Individual Fellowships-Europe, Australian Research Council-Australia, and the Research Foundation – Flanders (FWO)- Belgium. He is serving as an associated editor for the Frontiers of Microbiotechnology journal and edited few special issues for Elsevier, Springer and MDPI journals. He has published number peer reviewed research and review articles, book chapters and edited few books on specific topics.

Specialties & interests:

- Greenhouse gas mitigation
- Sustainable solid waste management
- Bioprocess engineering and bioproduct developments
- Bioremediation of metals
- Molecular engineering

SPEECH ABSTRACT Microalgae, a photosynthetic organism, is one of the promising resources for meeting the future global demands on food-energy-fuel. They are considered as mini-biological factory and produce number of value chemicals from CO₂ that support bio-based economy. As we know microalgae are very versatile and adapt to varying environmental conditions, while it does not require arable lands for cultivation, freshwater resources and nutrients. In this keynote lecture, the multifaceted applications of microalgae will be discussed, as detailed below:

- Bioenergy and Biofuels:** Microalgal biomass as third generation biofuels that could reduce the demand for fossil resources and associated greenhouse gas emissions.
- CO₂ remediation:** Microalgae act as a potential biofiltering agent to reduce the industrial CO₂ emissions and sequester atmospheric CO₂ to reduce the global climate change impacts.

- (c) Nutrient recovery from urban sewage: Application of microalgae to recover nitrogen and phosphorous from sewage to reduce the fertilizer productions.
- (d) Bioremediation of wastewater pollutants: Microalgae grow in industrial wastewater mainly to remove toxic metals and environmental pollutants to meet with the final discharge limits.
- (e) Food and Feed: Microalgae is a very good source to meet the global demand for food and animal feed.
- (f) Biomedical applications: Microalgal platform is highly-flexible to produce numbers of bio-molecules, proteins and amino-acids for pharmaceutical and nutraceutical use.
- (g) Space Exploratory research: Microalgae foster to develop a complete carbon recycling and zero-emissions space research exploration, while with limited available resources.
- (h) High-tech Industrial Engineering: Microalgae will be very useful in developing bioelectronics and innovative bioengineering technologies

I will also be presenting our research experiences in developing integrated algal biorefinery concepts to improve the process economics and genetic engineering to improve their capacities for industrial applications. At the end, the existing knowledge gaps and future research directions will also be discussed.

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