



European Association
for the Development of
Renewable Energy,
Environment and
Power Quality

ICREPQ'22

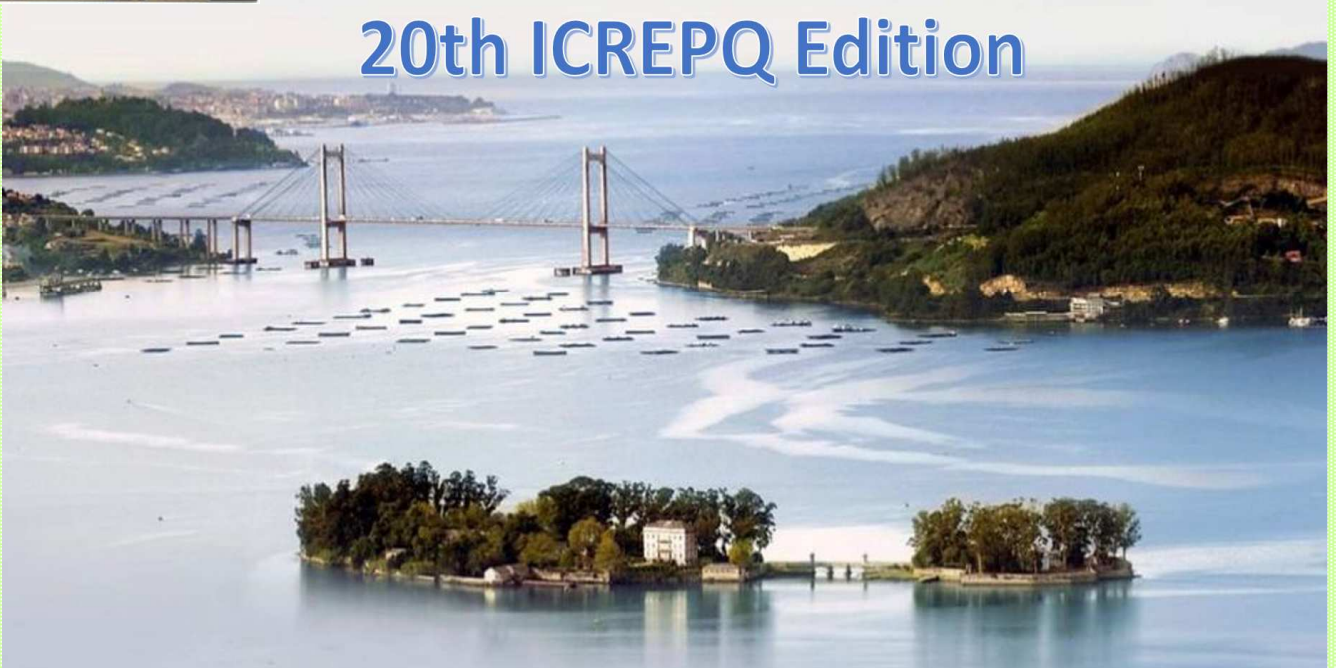
INTERNATIONAL CONFERENCE ON RENEWABLE ENERGIES AND POWER QUALITY

Vigo, July 27-29, 2022

PROGRAM OF ACTIVITIES



20th ICREPQ Edition



**20th INTERNATIONAL CONFERENCE
ON RENEWABLE ENERGY AND
POWER QUALITY
(ICREPQ'22)**

PROGRAM



INTERNATIONAL CONFERENCE ON RENEWABLE ENERGY AND POWER QUALITY (ICREPQ'22)

WELCOME TO ICREPQ'22

On behalf of the Steering Committee and the Local Organizing Committee we want to give you a very warm welcome to ICREPQ'22 and to Vigo.

The safety and health of our participants is our number one priority for that reason we have permitted that many of the presentations can be online.

Our International Programme Committee has selected a high quality 155 papers (among 230 proposals) from which 148 will be presented at the Conference, 54 at oral sessions and 94 at poster sessions, during the three days of the conference. All of these papers are included in the final program. Also six keynotes will be presented in plenary sessions by seven speakers and we'll have also two exhibit spaces of OPAL-RT Technologies and MegaResistors.

ICREPQ'22 covers the whole range of problems and solutions especially concerning with renewable energies and power quality and all the papers have direct relationship with these two fields of research and practical work.

We would like to thank all the authors, session chairmen, participants without papers and the International Scientific Committee members who have made important contributions by reviewing the proposals.

In addition to the technical sessions, a number of social events have been arranged. On Wednesday evening, July 27th, at about 21:00 H, we'll can enjoy the **Welcome Civic Reception** and on Thursday, July 28th, 20:30 H, the **Conference Dinner** in the Parador of Baiona. On Wednesday from 18:00 H to 21:00 H, we will have one **Cultural Visit to Vigo**, on Thursday, July 28th, from 18:00 to 20:30 H we will have one **Cultural Visit to Baiona and** and on Friday, July 29th, after the Farewell Lunch, from 15:00 H to 21:00 H we will enjoy one **Cultural Visit to Santiago de Compostela**, the Cathedral and other monuments of the City.

We hope that you will find the conference intellectually stimulating and that you will make many fruitful personal contacts during the conference.

Best regards,

Prof. Manuel Pérez-Donsión
Chairman of the Steering Committee
Chairman of the Local Committee



ORGANISED BY:

The “20th International Conference on Renewable Energies and Power Quality (ICREPQ'22)”, is organized by:

- European Association for the Development of Renewable Energy, Environment and Power Quality (EA4EPQ)
- AEDIE (Asociación Española para el Desarrollo de la Ingeniería Eléctrica)
- University of Vigo



CONFERENCE LANGUAGE

The Conference language is English. All papers and presentations should be made in English.

OBJECTIVES AND TOPICS

The intention of the organisers is to give an opportunity to academics, scientists, engineers, manufacturers and users from all over the world to come together in a pleasant location to discuss recent development in the areas of Renewable Energy and Power Quality.

The “20th International Conference on Renewable Energy and Power Quality (ICREPQ'22)”, is structured in:

- **Plenary Sessions:** Presentations of about 45 minutes (35 minutes for the presentation and 10 minutes for questions).
- **Oral Sessions:** Presentations in-person or on-line of about 15 minutes for each paper (12 minutes for the presentation and 3 minutes for questions). Simultaneously in two rooms.
- **Posters Sessions:** In 45-minute in-person and also on-line.

SOCIAL EVENTS

- **Civic Reception: 27th of July**
- **Conference Dinner: 28th of July**

VENUE

The “20th International Conference on Renewable Energies and Power Quality (ICREPQ'22)” will be held at the University of Vigo. Escuela de Ingenieros Industriales. Campus Universitario de Lagoas-Marcosende. 36310 Vigo. Spain



TOPICS 1. RENEWABLE ENERGY:

- Wind Energy, Small Hydro Energy, Solar Energy, Photovoltaic Energy, Ocean Energy, Geothermal, Biomass, Cogeneration,...
- Classical and special electrical generators: Theory, design, analysis, losses, efficiency, heating and cooling, vibration and noise, modelling and simulation, control strategies, protection systems, maintenance, mechanical behaviour, new methods of testing, parallel operation, transmission system, stability,...
- Power plants. Distributed generation. Fuel cells. Co-generation. Hybrid Systems. Microgrids. Smart grids. Original solutions,...
- Energy conversion, conservation and energy efficiency.
- Energy saving policy. Energy storage. Batteries....
- Energy and the environment. Ecological balance. Ecosystem,...
- Application of the renewable energy. Best practice projects.
- Legislation in the area of renewable energies.
- Biomass combustion techniques. The energy use of agricultural and forest residues. Production and the energy exploitation of bio-gas. Environment. Social importance...
- Interconnection and transport problems.
- Planning and control of the power system take into account the renewable energy. Stability. Protection...
- Economic analysis of the power system take into account the renewable energy.
- Electricity Market Structures. Regulation/des-regulation of the power market. Influence of the renewable energy.
- Models and simulation of the power systems. Models and estimation of loads. Software tools.
- Application of the communications, internet, artificial intelligence for the renewable energy.
- Security assessment and risk analysis in renewable energy.
- Electric vehicles.
- Electrical Machines & Drives, Power electronics and Control strategies for renewable energy applications.
- Monitoring and Diagnostics of electrical machines & drives, Tools for Diagnostics, Test for Predictive Maintenance in Renewable...
- Sensors and actuators for renewable energy applications.
- Renewable Energies Teaching.

TOPICS 2. POWER QUALITY:

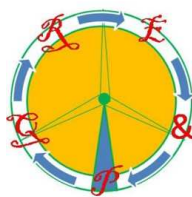
- Electromagnetic compatibility (EMC).
- Power Quality in Transport and Distribution. FACTS
- Economic Studies of the Power Quality.
- Low-frequency conducted disturbances: Voltage deviations, voltage fluctuations-flicker, voltage dips and short interruptions, harmonics and inter-harmonics, transient over-voltages, voltage unbalance (imbalance), temporary power-frequency variations.
- Sources, effects and mitigation methods of the disturbances.
- Measurements of the power quality in networks, industrial installations and Laboratories. Equipment, procedures and measurement methods. Standards.
- Modelling and simulation of the power quality. Software tools.
- Transmission of the disturbances.
- Filtering techniques.



- Power factor compensation. Capacitor switching techniques.
- Optimization techniques.
- Communication, internet and artificial intelligence.
- Permanent monitoring techniques and online diagnosis.
- Intelligent energy delivery systems. Uninterrupted power supplies.
- Expert systems applications.
- Devices, equipment and power systems. Control centres.
- Specific problems and studies cases.
- Power quality influence in deregulated markets.
- High frequency disturbances (radiated).
- Data security and electromagnetic pulses.
- Protection against natural and intentional EMI.

SPONSORSHIP

Sincere thanks are expressed to the organisations listed below who have given valuable support to ICREPQ'22: EA4EPQ (European Association for the Development of Renewable Energy, Environment and Power Quality), E&Q Journal (Energies and Power Quality Journal), University of Vigo, OPAL-RT TECHNOLOGIES, RE&PQJ (Renewable Energy and Power Quality Journal), MegaResistor and AEDIE (Asociación Española para el Desarrollo de la Ingeniería Eléctrica).



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Juan Pardo Frojan
Gerardo Pelaez Lourido
Filipe T. Soares Oliveira



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Ghita, Constantin (Romania)	Vokony, István (Hungary)
	Zobaa Ahmed (UK)



Wednesday July 27, 2022						
9:00 – 9:30	Welcome & Registration “ICREPQ’22 Secretariat”					
9:30 – 10:15	Opening Ceremony ROOM A “University of Vigo”					
10:15 - 11:00	ROOM A “University of Vigo”. Plenary Session PL1					
	Green Hydrogen: Present and Future role in the energy transition and decarbonization by Julio Hidalgo , Head of Hydrogen Business Development, Univergy					
	EXTRA TIME FOR DISCUSSION					
11:00 – 11:45	Posters Session at ROOM C “AEDIE” (Session P1) Coffee Break	<i>Poster Session P1</i>				
		206	209	211	212	215
		218	220	221	226	233
		235	238	240	242	245
		248	254	435		
11:45 – 13:00	ROOM A “University of Vigo”			ROOM B “OPAL-RT”		
	<i>Oral Session A1</i>			<i>Oral Session B1</i>		
	227	250	287	255	277	352
	292			431		
	EXTRA TIME FOR DISCUSSION			EXTRA TIME FOR DISCUSSION		
13:00 -- 15:00	Welcome Lunch					
15:00 – 15:45	ROOM A “University of Vigo”. Plenary Session PL2					
	Promoting the Accelerated Replacement of old electric motors in the European Union by Fernando Nuño , Clean Energy Transition of the International Copper Association					
	EXTRA TIME FOR DISCUSSION					
15:45 – 16:30	Posters Session at ROOM C “AEDIE” (Session P2)	<i>Poster Session P2</i>				
		210	257	258	260	262
		263	264	267	273	275
		276	278	281	282	284
		288	290	294	400	
16:30 – 18:00	ROOM A “University of Vigo”			ROOM B “OPAL-RT”		
	<i>Oral Session A2</i>			<i>Oral Session B2</i>		
	229	266	304	207	214	252
	308	335		340	379	
	EXTRA TIME FOR DISCUSSION			EXTRA TIME FOR DISCUSSION		
18:00 -- 21:00	Cultural Visit to Vigo					
21:00 -- 23:00	Civic Reception Welcome Dinner Hotel Ciudad de Vigo					

ROOMS: Room A: "University of Vigo". Room B: "OPAL-RT". Room C: "AEDIE".



Thursday July 28, 2022

9:00 – 12:30	Registration “ICREPQ’22 Secretariat”					
9:00 – 9:45	ROOM A “University of Vigo” . Plenary Session PL3					
	PL3	Islanded Operation of Distribution Grid with High Penetration of Renewable Energy Sources By Prof. Luis Rouco, Universidad Pontificia Comillas, Madrid, Spain				
	EXTRA TIME FOR DISCUSSION					
9:45 – 11:00	ROOM A "University of Vigo"			ROOM B "OPAL-RT"		
	<i>Oral Session A3</i>			<i>Oral Session B3</i>		
	236	241	298	364	386	391
	443			423		
	EXTRA TIME FOR DISCUSSION			EXTRA TIME FOR DISCUSSION		
11:00– 11:45	Poster Session at ROOM C "AEDIE" (Session P3) Coffee Break	<i>Poster Session P3</i>				
		300	305	307	310	315
		316	318	319	320	324
		325	330	336	339	343
		345	346	348	349	
11:45 – 13:15	ROOM A "University of Vigo"			ROOM B "OPAL-RT"		
	<i>Oral Session A4</i>			<i>Oral Session B4</i>		
	270	285	302	202	217	296
	350	425		312	430	
	EXTRA TIME FOR DISCUSSION			EXTRA TIME FOR DISCUSSION		
13:15 – 15:00	Lunch					
15:00 --15:45	ROOM A "University of Vigo". Plenary Session PL4					
	PL4	A few direction in the development of Electromagnetic Compatibility by Prof. Mircea Ion Buzdugan, Technical University of Cluj-Napoca. Romania				
	EXTRA TIME FOR DISCUSSION			EXTRA TIME FOR DISCUSSION		
15:45 – 16:30	Poster Session at ROOM C "AEDIE" (Session P4)	<i>Poster Session P4</i>				
		357	360	361	368	370
		371	373	375	376	377
		380	382	383	384	387
		388	392	402	436	449
16:30 -- 18:00	ROOM A "University of Vigo"			ROOM B "OPAL-RT"		
	<i>Oral Session A5</i>			<i>Oral Session B5</i>		
	223	397	406	332	338	344
	410	419		367	420	
	EXTRA TIME FOR DISCUSSION			EXTRA TIME FOR DISCUSSION		
18:00 - 20:30	Cultural Visit to Baiona					
20:30 - 21:30	Appetizer in Parador de Baiona with Galician music and dance					
21:30-23:00	Conference Dinner (Optional) Parador de Baiona					

ROOMS: Room A:"University of Vigo". Room B:"OPAL-RT". Room C:"AEDIE".



Friday July 29, 2022						
9:00 – 12:30	Registration “ICREPQ’22 Secretariat”					
9:00 - 9:45	ROOM A "University of Vigo". Plenary Session PL5					
	PL5	<i>Developing a 100% renewable energy system: the challenge of efficient decarbonization</i> by Dr. Juan J. Alba Vicepresident, Regulatory Affairs, Endesa				
	EXTRA TIME FOR DISCUSSION					
9:45 - 10:30	ROOM A "University of Vigo". Plenary Session PL6					
	PL6	<i>A new approach to estimate technical losses in distributing utilities in the presence of distributing generation in its concession area</i> by Prof. Reinaldo Castro Souza, PhD, PUC-Rio; Brazil and Prof. Fernando Cyrino, PhD, PUB-Rio; Brazil				
	EXTRA TIME FOR DISCUSSION					
10:30 -- 11:15	Poster Session at ROOM C "AEDIE" (Session P5) Coffee Break	Poster Session P5				
		333	353	354	395	405
		408	409	412	414	415
		418	422	426	440	445
		446	448	450		
11:15 – 12:30	ROOM A "University of Vigo"			ROOM B "OPAL-RT"		
	Oral Session A6			Oral Session B6		
	328	342	358	249	329	394
	390			442		
	EXTRA TIME FOR DISCUSSION			EXTRA TIME FOR DISCUSSION		
12:30– 13:00	ROOM A "University of Vigo". CLOSING SESSION					
	Conclusions and time for the next conference (ICREPQ'23)					
	Awards for the three best posters					
13:00 – 15:00	Farewell Lunch					
15:00 – 21:00	Cultural Visit to Santiago de Compostela					

ROOMS: Room A: "University of Vigo". Room B: "OPAL-RT". Room C: "AEDIE".

AUTHORS

Oral Presentations (A, B)

Each speaker of one oral presentation, in-person or on-line, has an available time of 15 minute (12 minutes for the presentation and 3 minutes for questions) and the speaker must be stay in the session room 10 minutes before of the beginning of the session. The face-to-face speakers will need to test the audiovisual equipment and surely to exchange opinions with the Session Chairman. We suggest that the speakers of one oral presentation prepare their material in Power Point or, in the case of on-line presentations the speakers can prepare a video that they can send to the organizing



committee before of the session for to check it, but we suggest that they present their paper on-line but in real time using Power Point.

Poster Presentations (P)

IN-PERSON. The posters presented in-person must be numbered, on the up left corner, with the number of the paper and it will be put, about 15 minutes before of the beginning of the session, on the pin board that you previously can chose and it must be taken out 15 minutes after of the end of the session. The author(s) must be stay near the poster during the 45 minutes of the session duration for to answer all the questions that the audience or the chairmen could formulate. The maximum available surface for each poster will be 900 mm x 1500 mm (width x high). You must select your poster size take into account this maximum available surface (Perhaps an A0 size, 841×1189 mm, could be appropriate). Put on the pin board separated sheets of the paper are not allowed.

ON-LINE. The posters presented on-line must be numbered, on the up left corner, with the number of the paper and we suggest that the authors send us their posters in PDF format before July 1st. Then we will put the posters in the web and all the interested and registered people can send us questions about each of the posters that we will send to the authors for their answers and during their Poster Session the authors will have the opportunity of to present on-line the most relevant aspects of their research during 5 or 6 minutes and then the audience can make questions to each poster and the chairman of the session will organize the answers.

SESSION CHAIRMEN

On behalf of the International Scientific Committee, Steering Committee and the Organising Committee of the ICREPQ'22 and take into account their eminent position in the world of science we have selected 33 session chairmen. It is an honour for us their collaboration for to chair the sessions of ICREPQ'22 and their contribution would be greatly appreciated. We wish to express our warmest thanks.

Traditionally the Chairmen of each Session are independent in organising the Session. Nevertheless it is of special importance that the different session chairmen prepare some questions about the papers of their session in order to get a more dynamic one. Furthermore we expect of the session chairmen the following:

Oral sessions

Each oral paper presentation should not exceed 15 minutes including presentation and discussion (12 minutes for presentation and 3 minutes for questions).

Poster sessions

The author(s) of a poster presentation in-person must be stay near to their poster during the 45 minutes of the session duration and in order to get a more dynamic session it is important that along this period of time each of the chairmen of the poster sessions will formulate questions to the authors in-person or online through E-mail and check that all is OK. The chairmen of each of the poster sessions file up one sheet, with punctuations for each of the presented poster in that session and then, take into account these evaluations, the Organizers will deliver during the Closing Session one silver plate and one diploma to the three best posters selected.



Chairmen Session distribution

Wednesday 27 th July, 2022		
HOOR	SESSION	CHAIRMEN
9:30 – 10:15	Opening Ceremony	
10:15 - 11:00	PLENARY SESSION PL1	Inmaculada Zamora Belver
11:00 - 11:45	POSTER SESSION P1	Laura Díaz Rodríguez
		João Esteves
		Marcelo Mezaroba
11:45 – 13:00	ORAL SESSION A1	Wolf-Gerrit Früh
	ORAL SESSION B1	Laura Castro Santos
13:00 – 15:00	Welcome Lunch	
15:00 – 15:45	PLENARY SESSION PL2	Gorazd Štumberger
15:45 – 16:30	POSTER SESSION P2	Boštjan Polajžer
		Miguel García Gracia
		Daniel Rosas Cervantes
16:30 - 18:00	ORAL SESSION A2	István Vokony
	ORAL SESSION B2	Julio Tafur Sotelo
Thursday 28 th July, 2022		
9:00 - 9:45	PLENARY SESSION PL3	Alfredo Alcayde García
9:45 - 11:00	ORAL SESSION A3	Milan Bélik
	ORAL SESSION B3	Rudolf Mecke
11:00 - 11:45	POSTER SESSION P3	Herminio Martínez García
		Eduardo García Martínez
		Fernando Aznar Dols
11:45 - 13:15	ORAL SESSION A4	Luis Sainz Sopera
	ORAL SESSION B4	Valery Vodovozov
13:15 - 15:00	Lunch	
15:00 - 15:45	PLENARY SESSION PL4	Péter Kádár
15:45- 16:30	POSTER SESSION P4	Ovidio Rabaza Castillo
		João Sanches Galvao
		Andrés Meana Fernández
16:30 - 18:00	ORAL SESSION A5	Abdullah Al-badi
	ORAL SESSION B5	Benjamín González Díaz
Friday 29 th July, 2024		
9:00 - 9:45	PLENARY SESSION PL5	Santiago Arnaltes Gómez
9:45 - 10:30	PLENARY SESSION PL6	Gianpaolo Vitale
10:30- 11:15	POSTER SESSION P5	Helmut Votzi
		Adelino Pereira
		Miguel Á. González Cagijal
11:15 - 12:30	ORAL SESSION A6	Pablo Eguía López
	ORAL SESSION B6	Abdullah Alwadie
12:30 - 13:00	Closing Session	
13:00 - 15:00	Farewell Lunch	

NOTE: In some cases the Chairman of one Oral Session, in-person or online, need to present his own paper in that session, then we suggest that he present his paper at the first or at the end of the session.

ICREPQ'22 KEYNOTES

PL1. *Green Hydrogen: Present and Future role in the energy transition and decarbonization*

by **Julio Hidalgo**, Head of Hydrogen Business Development, Univergy

Decarbonizing our economy with the goal of "neutral emissions" in the EU by 2050 is much more challenging than we imagine.

75% of CO₂ current emissions are associated with transport, industry, and residential uses. Less than 25% of emissions come from the generation of electricity, so it is not just a matter of stopping coal, fuel or natural gas power plants.

In other words, the consumption of energy from fossil fuels is 3 times higher than the consumption of electricity, which leaves us with two complementary alternatives: electrifying as much fossil fuel applications as we can and using "neutral emission" alternative fuels.

Green hydrogen, due to its versatility and "easy" obtention using renewable energies, will certainly play a key role in the decarbonisation of our economy. The "modularity" of the electrolysis systems will allow the possibility of "in situ" green hydrogen generation, close to the points of consumption. Green hydrogen will also play a very important role in energy storage systems.

Short biography of Mr. Julio Hidalgo



He joined Univergy in 2021 to set up the Green Hydrogen Division.

Univergy Group is a relevant player in the development and construction of big renewable energy facilities and is present in more than 20 countries.

Julio Hidalgo is a professional with more than 25 years of experience in engineering, operations and business development in companies from various sectors like Biotechnology, Pharma, Chemical and Renewable Energy.

Julio Hidalgo has a MSc in mechanical engineering from Universidad Pontificia de Comillas in Madrid.

PL2. *Promoting the accelerated replacement of old electric motors in the European Union*

by **Fernando Nuño**. Clean Energy Transition of the International Copper Association

Motor lifetime is usually considered to be in the 10-20 years timeframe depending on motor size (larger motors having longer lifetimes). However, it is influenced by many factors including number of operating hours, load factor including possible overloading, frequency of start/stop cycles, power quality and environmental conditions (temperature, vibrations, humidity, chemical

pollutions). Recent studies (in Switzerland and the US), have shown that the real lifetimes can be much greater, sometimes by a factor of two. This means that there is still a significant percentage of operating IE1 (or even below IE1) motors.

The first tier of EU motor standards was enforced from July 2011 at IE2 level. This was 10 years ago so we can expect that 70% of motors were purchased before that date and are still IE2 level or below. By taking swift action, at least part of the expected the savings enabled by the regulation, as well as the ones achieved by the introduction of the updated motor Ecodesign regulation (Ecodesign Regulation (EU) 2019/1781) could be anticipated making it possible to harness their benefits in a nearer future. Moreover, motor technologies have witnessed significant developments in terms of efficiency and promoting the adoption of these improved technologies could bring even larger savings. Therefore, the uptake of different policy options could play an important role in motivating the early replacement of old electric motors, with significant economic and environmental impacts.

We have analysed different policy options that can contribute to the accelerated replacement of old inefficient motors still in use in the European Union, as well as the environmental impacts of such policies.

Short biography of Dr. Fernando Nuño



Fernando Nuño works at the International Copper Association as Clean Energy Transition Portfolio Manager. He is in charge of copper products and markets related to the Energy Transition, notably electric motors, transformers and cables. He is also responsible for innovation and has led several EU publicly funded projects.

He graduated as an Energy Engineer in 1998 from Bilbao Engineering School (Spain) and IFPEN (France). Since then, he has worked in international companies, the public sector and industry associations.

PL3. *Islanded Operation of Distribution Grid with High Penetration of Renewable Energy Sources*

By **Prof. Luis Rouco**, Universidad Pontificia Comillas, Madrid, Spain

Renewable energy sources are being connected not only to transmission but also to distribution grids. Medium voltage distribution grids are meshed grids that are operated radially. Their reliability is determined by their reconfiguration capability. However, portions of medium distribution grids can lack of supply in case of specific disturbances or abnormal operating conditions.

An alternative to the lack of supply in medium voltage distribution grids is the use of the available renewable energy resources. The feasibility of the use of renewable energy sources depends on their ability to control both voltage and frequency to guarantee the quality of the electrical supply.

This contribution will show from real life tests [1] that stable operation islanded operation of medium voltage distribution grids is not feasible due to the limited control capability of renewable energy sources connected through power electronic converters under grid feeding control scheme. It will show that medium voltage distribution grids can run properly while isolated from the main grid if they incorporate battery energy storage systems. Records of real life tests will prove it.

In addition, this contribution discusses the conditions for parallel operation of several battery energy systems under grid forming control scheme with inverter based generation under grid feeding schemes [2]. Stability conditions will be drawn.

References

- [1] C. Utrilla Bustamante, L. Sigrist, L. Rouco, A. Barroso, F.J. Ballesteros, A. Santamaría, Islanding tests in medium voltage distribution systems with synchronous and non-synchronous generation, CIREP Workshop - CIREP Workshop 2020, Berlin (Germany). 22-23 September 2020.
- [2] L. I. de la Barba, L. Sigrist, L. Rouco, R. Ávila-Martínez, A. García-Cerrada, Analysis of the effect of control bandwidth on inverter interactions using small-signal stability analysis, 28^o Seminario Anual de Automática, Electrónica industrial e Instrumentación - SAAEI 2021, Ciudad Real (Spain). 07-09 July 2021.

Acknowledgements

This contribution is based on the results of project (RTC-2017-6074-3) funded by FEDER, Spanish Ministry of Science, Innovation and Universities, State Agency of Innovation under the leadership of i-DE.

Short biography of Prof. Luis Rouco Rodríguez



Luis Rouco Rodríguez obtained the titles of Industrial Engineer and Doctor Industrial Engineer for the Technical University of Madrid in 1985 and 1990 respectively. He is a Professor of the Technical School of Engineering (ICAI) of the University Pontificia Comillas of Madrid. He has been The Director of the Department of Electrotechnics and Systems in the period 1999-2005. He teaches courses of Electrical Machines in the studies of Industrial Engineer and of Advanced Analysis of Systems of Electric power and of System stability of Electric power in the Program of Postdegree in Electric power School.

He has been The Director of the Specialist's Course in Operation of the Electrical System REE-ICAI in the period 2004-2007 and of the Master in Electrical Technology ENDESA-ICAI in the period 2007-2011. Prof. Rouco Rodríguez develops his activities of research in the Institute of Technological Research (IIT) where it has supervised numerous projects of research and consultancy for the public Spanish administrations (Department of Education, Department of Promotion, GIF, etc.), the principal electrical Spanish companies like Endesa, Iberdrola, Natural Gas, Electrical Network of Spain, Union Fenosa and Viesgo and other industrial companies as ABB, Iberian AEG of Electricity, Ardanuy Ingeniería, Babcock and Wilcox Española, Hard Felguera, Eliop, Grouped Businessmen, Indra, Initec Energía, To hoist, SEMI, Sener and Assembled Technologies. Also it has developed projects for companies and foreign institutions as Alstom (Switzerland), University of La Plata and CAMMESA (Argentina), RTE-France and INESC - I Carry (Portugal). The areas of work of the Prof. Rouco Rodríguez are the shaped one, analysis, simulation and control of the systems of electric power.

Prof. Rouco Rodríguez has published great number of articles in conferences and national and foreign magazines. Prof. Rouco Rodríguez is member of the IEEE and of CIGRÉ, President of the Spanish Chapter of the Power and Energy Society of the IEEE and member of the Executive Committee of the National Committee of CIGRÉ's Spain. He has been an investigative visitor in Ontario Hydro (Toronto, Canada), MIT (Cambridge, Massachusetts, The United States) and ABB Power Systems (Vasteras, Sweden).

PL4. *A Few Directions in the Development of Electromagnetic Compatibility*

by Prof. Mircea Ion Buzdugan. Technical University of Cluj-Napoca. Romania

According to its definition, electromagnetic compatibility, EMC, means the ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that electromagnetic environment. Therefore, EMC became a concept that accompanies all processes and technologies in the electromagnetic environment around us, as well as the ecosystem itself. Beyond the qualitative aspect of the definition, it must be admitted that the notion of electromagnetic compatibility, in all its aspects, is increasingly insinuated in the more general concept of quality of life.

Several directions in which the concept of electromagnetic compatibility should evolve have been identified. Some of these will be detailed.

One of them is what we have called "electromagnetic biocompatibility" and should be defined as the ability of a functional device, equipment, or system to allow the safe and healthy development of life in general and of human beings in particular. If electromagnetic compatibility, very often called the "science of electric/electronic systems coexistence", deals with an interaction in which every system can be both aggressor and victim, in electromagnetic biocompatibility we are talking about the interaction between technical systems as aggressors and the living beings, as victims (note that humans, as generators of manmade electromagnetic fields, are not totally blameless).

The second direction consists in the analysis of the dichotomy, respectively of the syncretism between the power quality events determined by harmonics, low frequency events, which essentially influence the equipment up to 5 kHz frequency (100th order harmonic component) and the conducted electromagnetic interference, whose study is generally performed in the range from 100 kHz to 30 MHz.

The third direction is the almost "no man's land" at this moment, namely the gray zone between 5 kHz and 100 kHz, for which not enough analysis or dedicated measuring equipment has been yet developed.

Short biography of Prof. Mircea Ion Buzdugan



Mircea Ion Buzdugan received his MSc in Electrical Engineering from the Technical University of Cluj-Napoca, Romania and his MSc in Economics from Babes-Bolyai University of Cluj-Napoca, Romania. He received a PhD and the Habilitation degree in Electrical Engineering from the Technical University of Cluj-Napoca, Romania.

Until 1989 he worked in the electrical and electronics engineering state industry, afterwards being CEO of a few companies. In 2004 he joined higher education at the Technical University of Cluj-Napoca, in different educational degrees, until the position of full professor. Between 2012 and 2020 he was Dean of the Faculty of Building Engineering. He is also member of different national and international associations and committees.

He teaches courses of Electrotechnics Fundamentals and Power Quality and Electromagnetic Compatibility Technical at bachelor and master levels.

His main research interests are in electromagnetic compatibility and power quality. He is the author of seven books, several book chapters and more than a hundred relevant research papers and twenty-four research projects.

PL5. *Developing a 100% renewable energy system: the challenge of efficient decarbonization*

by Dr. Juan J. Alba Vicepresident, Regulatory Affairs, Endesa

Well-functioning energy markets are critical for an efficient and fast development of renewables. So far, our market and regulatory arrangements are slowly delivering the renewable generation that we need, but are frequently failing to provide the right framework for the deployment of carbon free flexible and firm resources to complement renewable generation. The talk will be structured on two different but related parts. i) The challenges posed by the development of a 100% RES system, where security of supply is provided by resources such as storage and demand response, as well as the relevance of the coupling of the electricity and hydrogen systems to bring a carbon free energy system. We will look at what a fully decarbonized system could look like for a country like Spain. ii) The current energy price crisis has intensified the debate about market design, and will have a sustained impact on the energy transition process. We will briefly discuss how the crisis has been dealt with, what can we learn from it, and describe some aspects of the debate that is now taking place in the EU institutions and national governments and in society at large.

Short biography of Dr. Juan J. Alba



He joined Endesa in July 1997. He is currently in charge of regulatory affairs, where he is involved in all the aspects of the business: wholesale and retail market regulation, remuneration of distribution, tariffs and grid access charges, capacity payments, etc., as well as European legislation.

Between 2000 and October 2004 he was the managing director of the European trading unit of Endesa, and was in charge of the Joint Venture with Morgan Stanley to develop this activity. Before 2000 he was in charge of regulatory affairs of the generation business at Endesa.

Between 1986 and 1997 he was a researcher at the Instituto de Investigación Tecnológica (IIT), where he worked on regulation, modelling electricity markets and application of computer techniques to power systems and equipments.

Juan J. Alba is member of the Management Committee of aelec (the association of the Spanish electricity industry), he has been chairman of the Markets and Investments Committee of Eurelectric, member of the board of directors of EFET (the European Federation of Energy Traders), and co-chairman of its WG on financial regulation. He has been a member of the Supervisory Boards of Powernext (French Power Exchange) and Gielda Energii S.A. (Polish Power Exchange). He has a PhD in electrical engineering from Universidad Pontificia Comillas in Madrid.

PL6. *A new approach to estimate technical losses in distributing utilities in the presence of distributing generation in its concession area*

by Prof. Reinaldo Castro Souza, PhD, PUC-Rio; Brazil and Prof. André Marcato, PhD, UFJF; Brazil

The Distributing Utilities in Brazil have target percentages for their technical and non-technical losses. Such percentages are set by the Brazilian Electrical Energy Regulator (ANEEL for short) accord with the mean observed in a given reference year. Through this strategy, the ANEEL press the distribution utilities to increase their efficiency whose are pushed to renew their assets with new technologies. These technical losses percentages limits are reviewed every four years by ANEEL. These percentages can be passed through to the consumers energy tariff according to the regulations stablished by ANEEL. So, these percentages are kept frozen and are reviewed by the Regulator every four years when the Distributing Utilities have a revision of their concession area. And this is the main problem, by frozen these percentages for 4 years, some utilities that have in their concession areas renewable generation plants (particularly wind power, solar, biomass and small hydroelectric plants) may have their technical losses varying from year to year, depending on the inputs that feed these plants (wind speed, solar radiation, sugar cane bagasse and river inflows). To perform the computation of a more realistic technical losses percentage target, the historical hourly power generation dataset is used to compute a stochastic process behind this realization. After that, hundreds of synthetic scenarios of power generation are created. Finally, it is possible to compute a lot of optimal power flows considering high, medium and low voltage on an hourly basis. From these computations, it is possible to get statistically technical loss targets more suitable to a distribution system with a high-level renewable source penetration. In this talk we show the results of an R&D project where it was developed a new approach to estimate these technical losses considering the stochastic variation of the inputs that feed these distributed generation plants. In this new method the technical losses are estimated yearly considering what was the real generation of these distributing generation plants in each year allowing the correction of the distortion of frozen percentages on a yearly basis. The success of the results obtained is now being considered by the regulator to be included in the official technical losses estimation approach for the distributing utilities that have such kind of distributed generation in their concession areas. A very friendly computer tool, written in Python, was developed to implement the findings of the project.

Short biography of Prof. Reinaldo Castro Souza



Graduated in Electrical Engineering from UFJF in 1971, Master in Systems Engineering from PUC-Rio in 1975, PhD in Statistics from Warwick University, Coventry, England in 1979 and post-doctorate in statistical and econometric models at London School of Economics, England in 1986. He is currently na Emeritus Professor at PUC-Rio. He is an expert in time series analysis and forecasting (the subject of his doctoral thesis) and has developed statistical and time series models in several areas, such as market research, electoral forecasts, applications in the energy sector and econometric models. He is also interested in the area of energy efficiency and rational use of energy, with research works for several electric energy distributors as well as Government Energy Institutions. He served from 2014 to 2020 as an elected member of the Board of Directors of the IIF (International Institute of Forecasters). He has been an elected member of ANE (National Academy of Engineering) since 2012. He has supervised over 100 master dissertation and 50 doctorate thesis.

Short biography of Prof. Fernando Cyrino



Fernando Cyrino is Professor of Operational Research and Head of the Graduate Studies Program at the Industrial Engineering Department at Pontifical Catholic University of Rio de Janeiro (PUC-Rio), Brazil, which he joined in 2014. He holds a Ph.D. in Electrical Engineering (Operations Research and Time Series) from PUC-Rio in 2013. Prof. Cyrino also serves as Director of both The International Institute of Forecasters and The Brazilian Operational Research Society (SOBRAPO). He is Associate Editor of the Production and the Forecasting journals. His research contributions cover the development of forecasting and statistical methods with general applications. His publications include articles in Energy Economics, European Journal of Operational Research, International Journal of Forecasting,

Production and Operations Management, Business Strategy and the Environment, Renewable and Sustainable Energy Reviews, among others. He has accumulated industrial experience working in a range of forecasting and operations research projects funding by the industry and governmental agencies.

Link: www.ind.puc-rio.br/fcyrino

Wednesday July 27th, 2022

9:30– 10:15

Opening Ceremony ROOM A “University of Vigo”

10:15-11:00 Plenary Session PL1

ROOM A “University of Vigo”

Chairwoman: Inmaculada Zamora Belver

PL1. *Green Hydrogen: Present and Future role in the energy transition and decarbonisation*

by **Julio Hidalgo**, Head of Hydrogen Business Development, Univergy



Wednesday July 27th, 2022

Wednesday July 27th, 2022
11:00-11:45 Poster Session P1 – Coffee Break **ROOM C "AEDIE"**

Chairmen: **Laura Díaz Rodríguez, João Esteves, Marcelo Mezaroba**

- 206 State of the art of Multiport Electrical Machines and Magnetic Gears with respect to Wind Power Generation Application**
Claudia V. Pop, D. Fodorean
Department of Electrical Engineering, Technical University of Cluj Napoca. Romania
- 209 Performance of a protection system for DC grids**
M. J. Pérez-Molina, P. Eguia, D. M. Larruskain, I. Aranzabal, E. Torres
Department of Electrical Engineering, University of the Basque Country UPV/EHU. Bilbao. Spain
- 211 Optimization of Offshore Wind Farms Configuration Minimizing the Wake Effect**
B. Jesus(1), A. Cerveira(2,3), J. Baptista(1,3)
1. Department of Engineering
2. Department of Mathematics
3. INESCTEC UTAD Pole
University of Trás-os-Montes and Alto Douro. Portugal
- 212 A Centralized Shifted Power Control Scheme for Isolated Bidirectional DC-DC Converter in Standalone DC Distribution System**
Minh-Duc Pham(1), Tuyen D. Nguyen(2), Hong-Hee Lee(3)
1. Department of Electrical Engineering, University of Ulsan. Korea
2. Faculty of Electrical and Electronics Engineering, Ho Chi Minh City University of Technology. Vietnam
3. Vietnam National University Ho Chi Minh City. Vietnam
- 215 Hydrogen capacity for use in public transportation using the excess electricity generated by photovoltaics from rooftops in the urban area of Cuenca, Ecuador**
A. Ma Antonia Cevallos Escandón(1), B. Edgar Antonio BarraganEscandón(1) Esteban Zalamea-León(2), Xavier Serrano-Guerrero(1)
1. Grupo de Investigación en Energía, Universidad Politécnica Salesiana, Cuenca. Ecuador
2. Facultad de Arquitectura y Urbanismo, Universidad de Cuenca. Ecuador

- 218 Two-Stage Step-up Converter with Different Voltage Transformation Ratios depending on the Duty Cycle**
Felix A. Himmelstoss, Helmut L. Votzi
Faculty of Electronic Engineering and Entrepreneurship
University of Applied Sciences Technikum Wien. Austria
- 220 Simulation of Energy Consumption in Jaw Crusher Using artificial intelligence models**
Khaled Ali. Abuhasel
Mechanical Engineering Department, College of Engineering, University of Bisha.
Kingdom of Saudi Arabia
- 221 Control Strategy for Power Generation from a Capacitive Mixing Cell and Grid Injection**
Armel A. Nkambi(1), Alberto M. Pernía(1), Miguel J. Prieto(1), Ana Arenillas(2) J. R. Álvarez(3)
1. Department of Electrical Engineering, Universidad de Oviedo, Gijón. Spain
2. Instituto de Ciencia y Tecnología del Carbono (INCAR-CSIC) Oviedo. Spain
3. Department of Chemical Engineering and Environmental Technology
Universidad de Oviedo. Spain
- 226 Analysis of the environmental, economic, thermal and energy performances of green building technologies**
R. Caponetto(1), C. Di Mari(2), G. Giuffrida(3), F. Nocera(3)
1. Department of Civil Engineering and Architecture, University of Catania. Italy
2. Freelance engineer
3. Department of Civil Engineering and Architecture, University of Catania. Italy
- 233 MPPT algorithm based on Multiple Linear Regression model for Solar PV systems**
D. Gómez-Lorente, F. Aznar, O. Rabaza
Department of Civil Engineering, E.T.S.I.C.C.P., Granada University. Spain
- 235 Daylighting system based on single-axis polar heliostat**
L. M. Fernández de Ahumada, M. Torres-Roldán, M. Osuna-Mérida, J.C. Ramírez-Faz, R. López- Luque, M. Varo-Martínez
Physics for Energy and Renewable Resources Research Group. University of Cordoba.
Spain
- 238 Electrical design of a smart control and monitoring system for small horizontal-axis wind turbines**
J. Vilà(1,4), N. Luo(1), L. Pacheco(3), T. Pujol(2), J. R. González(2), I. Ferrer(1), A. Massaguer(2), E. Massaguer(2)
1. Department of Electrical Engineering, Electronics and Automation, University of Girona.
2. Department of Mechanical Engineering and Industrial Construction, University of Girona.
3. Department of Computer Architecture and Technology, Polytechnic School, University of Girona. Spain
4. AULA ECOGranja Vilà, sustainable engineering, Girona. Spain



- 240 TRNSYS Modeling of flat plate and vacuum tube solar collector systems for residential use under equatorial middle altitude climate condition**
Doménica Larriva-Arévalo(1), Marco A. Torres-Jara(1), Edgar A. Barragan-Escandón(1), Esteban Zalamea- León(2), John Calle-Sigüencia(1)
1. Grupo de Investigación en Energía, Universidad Politecnica Salesiana. Ecuador
2. Facultad de Arquitectura y Urbanismo, Universidad de Cuenca. Ecuador
- 242 Continuous sky digitalization using images from an all-sky camera**
Carlos M. Travieso-González(1,2), Yeremi del C. Santana-Suárez(2), Alejandro Piñán-Roescher(2), Fabián Déniz(3), Jesús B. Alonso-Hernandez(1,2), José M. Canino-Rodríguez(1), Fidel Cabrera-Quintero(1), Jose F. Medina-Padrón(3), Antonio Ravelo-García(1,2)
1. Signals and communications Department, University of Las Palmas de Gran Canaria (ULPGC). Spain
2. Institute for Technological Development and Innovation in Communications (IDETIC), University of Las Palmas de Gran Canaria (ULPGC). Spain
3. University Institute of Intelligent Systems and Numerical Applications in Engineering (SIANI), University of Las Palmas de Gran Canaria (ULPGC). Spain
- 245 Multilevel inverter with active clamping diodes for energy efficiency improvement**
R. Mecke. Department of Automation and Computer Sciences, Harz University of Applied Sciences. Germany
- 248 Runner optimal position in a gravitational water vortex hydraulic turbine with spiral inlet channel and a conical basin**
Velásquez García L., Rubio-Clemente A., Chica E.
Grupo de Investigación Energía Alternativa, Facultad de Ingeniería, Universidad de Antioquia, Medellín. Colombia
- 254 Performance analysis of power flow strategies adjusted to a distribution network with non-linear loads and a PV system**
Alejandra Martínez-Peñaloza, German Osma-Pinto, Gabriel Ordoñez-Plata
Escuela de Ingenierías Eléctrica, Electrónica y de Telecomunicaciones
Universidad Industrial de Santander, Bucaramanga. Colombia
- 435 Ocean Wave Energy Converters: Analysis, Modeling, and Simulation. Some case studies**
H. El-Shalakany, J. S. Artal-Sevil, V. Ballestín-Bernad, J. A. Domínguez-Navarro.
Department of Electrical Engineering EINA, University of Zaragoza. Spain



Wednesday July 27th, 2022

Wednesday July 27th, 2022
11:45-13:00 Oral Session A1 **ROOM A "University of Vigo"**

Chairman: **Wolf-Gerrit Früh**

- 227 System for repetitive battery charge and discharge tests for battery life analysis**
F. Ciancetta, E. Fiorucci, A. Fioravanti, S. Mari, A. Prudenzi, A. Silvestri
Department of Industrial and Information Engineering and Economics. University of L'Aquila. Italy
- 250 Firm capacity of PV+STG systems**
J. A. Tejero, A. A. Bayod-Rújula, M. Haro Larrodé
Department of Electrical Engineering, E.I.N.A. University of Zaragoza. Spain
- 287 Resilient Smart Grid Under Cyber Switching Attacks Using Distributed Energy Storage Systems**
M. Badawi El Najjar, M. El Hassan, C. Gebran
Department of Electrical Engineering, University of Balamand. Lebanon
- 292 A model for optimum prioritisation of energy storage use. I: Optimum local use of local generation**
W.-G. Früh(1), C. Trigg(2), R. Jacob(3)
1. Institute of Mechanical, Process and Energy Engineering, Heriot-Watt University, Riccarton, Edinburgh (Scotland, UK)
2. Ongen Ltd., Edinburgh, (Scotland, UK)
3. D55 Ltd., Manchester, (England, UK)

Wednesday July 27th, 2022
11:45-13:00 Oral Session B1 **ROOM B "OPAL-RT"**

Chairwoman: **Laura Castro Santos**

- 255 A Practical Way to Balance Single Phase Loads in a Three Phase System at Distribution and Unit Level**
Moustapha El Hassan, Maged Najjar, Ramez Tohme
Department of Electrical Engineering
University of Balamand, Tripoli. Lebanon



- 277 Influence of LiBr concentration in the generation of superheated vapor for a Hygroscopic Cycle**
R. Martínez-Pérez(1), F. J. Rubio-Serrano(2), A. Meana-Fernández(1), A. J. Gutiérrez-Trashorras(1)
1. Energy Department, Polytechnic School of Engineering, Universidad of Oviedo, Gijón, Asturias. Spain
2. IMATECH, IMASA Technologies, S.L.U. Madrid. Spain
- 352 EMI Worsening in a SMPS with Non-linear Inductor**
Daniele Scirè(1), Giuseppe Lullo(1), Gianpaolo Vitale(2)
1. Department of Engineering, University of Palermo. Italy
2. ICAR, Institute for high performance computing and networking, National Research Council (CNR). Italy
- 431 Evaluation of energy consumption and power quality in oil mills using advanced smart meters**
A. Alcayde, R. Baños, F. G. Montoya, F. M. Arrabal-Campos
Department of Engineering, E.S.I., University of Almería. Spain

Wednesday July 27th, 2022

15:00-15:45 Plenary Session PL2 ROOM A "University of Vigo"

Chairman: **Gorazd Štumberger**

PL2. *Promoting the Accelerated Replacement of old electric motors in the European Union*

by **Fernando Nuño**, Clean Energy Transition of the International Copper Association

Wednesday July 27th, 2022

15:45-16:30 Poster Session P2 ROOM C "AEDIE"

Chairmen: **Boštjan Polajžer, Miguel García Gracia, Daniel Rosas Cervantes**

- 210 Optimal location of Power Quality Monitors in distribution grids based on MRA methodology**
V. Ferreira(1), A. Cerveira(2,3), J. Baptista(1,3)
1. Department of Engineering
2. Department of Mathematics
3. INESC TEC UTAD Pole
University of Trás-os-Montes and Alto Douro. Portugal
- 257 Experimental analysis of the performances of ventilated photovoltaic facades**
R. Arena, S. Aneli, G.M. Tina, A. Gagliano
Department of Electrical Electronic and Computer Engineering
University of Catania. Italy

- 258 Comparison of Bang Bang and PMW switching techniques for DC/AC photovoltaic converter**
A. Martínez(1), Y. Krim(2), D. Abbes(2), B. Eker(1)
1. Laboratoire Energie Renouvelable Propre & Alternative EIGSI
La Rochelle Cedex. France
2. Univ. Lille, Arts et Metiers Institute of Technology, Centrale Lille. France
- 260 A photovoltaic light electric vehicle for project-based education in engineering**
D. Rosas-Cervantes(1) , J. Fernández-Ramos(1), A. Gago-Calderón(2)
1. Departamento de Electrónica. Escuela de Ingenierías Industriales, Universidad de Málaga. Spain
2. Departamento de Expresión Gráfica, Diseño y Proyectos. Escuela de Ingenierías Industriales, Universidad de Málaga. Spain
- 262 Design of a bi-directional DC/DC converter for EV chargers oriented to V2G applications**
M. González-Pérez(1), F. J. Asensio(1), J. I. San Martín(1), O. Oñederra(2), I. Zamora(2), G. Saldaña(2)
1. Department of Electrical Engineering. Engineering School of Gipuzkoa (Eibar), University of the Basque Country. Spain
2. Department of Electrical Engineering. Engineering School of Bilbao, University of the Basque Country. Spain
- 263 Longitudinal supports shape influence on deflection and stresses in solar receiver tubes**
A. Montoya(1), J. López-Puente(1), D. Santana(2)
1. Department of Continuum Mechanics and Structural Analysis
2. Department of Thermal and Fluids Engineering
Universidad Carlos III de Madrid. Spain
- 264 CPS, Sustainability and Efficiency in an Aquaponic Greenhouse**
J. Galvão(1,2), P. Santos(1), L. Aires(3,4), F. Neves(5)
1. Department of Electrical Engineering/ESTG, Polytechnic of Leiria. Portugal
3. LSRE-LCM - Laboratory of Separation and Reaction Engineering – Laboratory of Catalysis and Materials, Escola Superior de Tecnologia e Gestão, Instituto Politécnico de Leiria. Portugal
4. ALiCE - Associate Laboratory in Chemical Engineering, Faculty of Engineering, University of Porto. Portugal
2. R & D Unit, Institute for Systems Engineering and Computers /INESC Coimbra. Portugal
5. Department of Computer Science, Polytechnic of Leiria. Portugal



- 267** **Portable Automatic Sensing System for Sustainable Precision Farm**
J. Galvão(1,2), J. Fernandes(1), D. Pereira(1), M. Galvão(3), F. Neves(4)
1. Department of Electrical Engineering, Polytechnic of Leiria. Portugal
2. R&D Unit, Institute for Systems Engineering and Computers /INESCCoimbra. Portugal
3. ISTécnico/Lisbon Technical University, Lisboa. Portugal
4. Department of Computer Science, Polytechnic of Leiria. Portugal
- 273** **Selection and Evaluation of Indicators for a Building Energy Labeling System for Colombia**
J. Cárdenas(1), J. Jaramillo(2), G. Osma(1)
1. Department of Electrical, Electronic and Telecommunications Engineering
Industrial University of Santander, Bucaramanga. Colombia
2. Department of Mechanical Engineering, Industrial University of Santander
Bucaramanga. Colombia
- 275** **A novel simple GMPPT method based on probability distribution of global maximum power point under partial shading conditions**
K. B. K. Cao, V. Boitier
Department of Energy and Embedded Systems. LAAS-CNRS, Université de Toulouse. France
- 276** **Harvesting air energy from extractors with a small horizontal axis turbine**
E. Romantchik, A. Santos, D. Terrazas, M. Berrocal
Department of Mechanic Engineering. Chapingo Autonomous University. México
- 278** **Adaptive Dead Time Compensation for Continuous Cross-Period Single Phase Shift Control of Dual Active Bridge Converters**
Szabolcs Veréb, András Futó, Zoltán Sütő, Attila Balogh, István Varjasi
Department of Automation and Applied Informatics
Faculty of Electrical Engineering and Informatics
Budapest University of Technology and Economics. Hungary
- 281** **Core losses analysis of the LCL filter inductor for SiC-based inverter**
S. Martín-Arroyo(1), D. Cañete(1), J. Herrero Ciudad(2), A. Llamazares(1), M. García-Gracia(1)
1. Department of Electrical Engineering. EINA, Zaragoza University. Spain
2. For Optimal Renewable Energy Systems, S.L. Zaragoza. Spain

- 282** **Selecting automation techniques of lighting and air conditioning for inner enclosures considering warm tropical climate: a case study**
J. Florez-Reyes, G. Osma-Pinto, G. Ordoñez-Plata
Department of Electrical, Electronic and Telecommunications Engineering
U.I.S, Universidad Industrial de Santander, Bucaramanga. Colombia
- 284** **Pin-hole free MAPb_{0.75} Sn_{0.25} (I_{0.5} Br_{0.5})₃ films spin casted without anti-solvent by adding MAAC additive to perovskite ink**
C. Q. Howlader(1), N. Khakurel(1), D.W. Amyx (3), W. Geerts(1,3), G. Gibson(4), M. Chen(1,2)
1. Department of Materials Science, Engineering, and Commercialization
2. Ingram School of Engineering
3. Department of Physics. Texas State University. USA
4. FAS Holding Group. Dallas. USA
- 288** **PWM Inverter with 4-Phase Carrier for Grid Connection Via Combined LCL Filter**
Hyeon-Dong Kim, Seong-Jeub Jeon
Department of Electronic Engineering, Pukyong National University. Korea
- 290** **Landfill Gas Generation and Utilisation (Case study: Chasinato Landfill. Ambato, Ecuador)**
S. Cabrera, A. Guevara
Ingeniería Mecánica, Facultad de Ingeniería Civil y Mecánica, Universidad Técnica de Ambato. Ecuador
- 294** **Local reactive power management using solar pumping in isolated electrical systems**
B. González-Díaz(1), D. Rodríguez-Urrego(1), J. F. Gómez-González(1), O. García-Afonso(1), R. Guerrero- Lemus(2), J. A. Méndez-Pérez(3)
1. Departamento de Ingeniería Industrial, Escuela Superior de Ingeniería y Tecnología, Universidad de La Laguna, Tenerife. Spain
2. Departamento de Física, Facultad de Ciencias, Universidad de La Laguna, Tenerife. Spain
3. Departamento de Ingeniería Informática y de Sistemas, Universidad de La Laguna, Tenerife. Spain
- 400** **Hybrid supercapacitors contributions to intra-urban transport ecosystem based on RES for seasonal tourism**
R. Rengel, J. Caparrós, E. López, L. Vargas
Instituto Nacional de Técnica Aeroespacial (National Institute of Aerospace Technology)
Matalascañas, Huelva. Spain



Wednesday July 27th, 2022

Wednesday July 27th, 2022
16:30-18:00 Oral Session A2 **ROOM A "University of Vigo"**

Chairman: **István Vokony**

- 229** **Analysis of electricity consumption in university buildings and possible improvements due to Spanish financial helps announcement. Study of the state of the art**
Juan Torres Navarro(1), Paula Bastida Molina(1,2), Andrés Honrubia Escribano(1), Emilio Gómez Lázaro(1)
1. Renewable Energy Research Institute, Universidad de Castilla – La Mancha. Albacete.
2. Universitat Politècnica de València. Spain
- 266** **Electricity consumption analysis for university buildings. Empirical approach for University of Castilla-La Mancha, campus Albacete (Spain)**
Paula Bastida-Molina(1-2), Juan Torres-Navarro(2), Andrés Honrubia-Escribano(2), Emilio Gómez-Lázaro(2)
1. Universitat Politècnica de València. Spain
2. Renewable Energy Research Institute, Universidad de Castilla-La Mancha Albacete.
- 304** **Requirements for New Grid Codes: A Review in Spain & Portugal**
R. Villena-Ruiz(1,2), B. Silva(3), A. Honrubia-Escribano(1), E. Gómez-Lázaro(1)
1. Renewable Energy Research Institute and DIEEAC-ETSII-AB, Universidad de Castilla-La Mancha (UCLM). Spain
2. Department of Automation, Electrical Engineering and Electronic Technology, Universidad Politécnica de Cartagena (UPCT). Spain
3. Faculdade de Engenharia da Universidade do Porto and Instituto de Engenharia de Sistemas e de Computadores - Instituto de Engenharia de Sistemas e de Computadores - Tecnologia e Ciência, Porto. Portugal
- 308** **A nested decision tree for event detection in smart grids**
J. Turanzas, M. Alonso, H. Amaris, J. Gutierrez, S. Pastrana
Electrical Engineering Department
Computer Science and Engineering Department, Universidad Carlos III de Madrid. Spain
- 335** **Sizing of a Hybrid Energy System for Al Mazyouna Area**
Abdulmajeed Al Wahaibi(1), Abdullah Al Badi(2)
1. Department of Petroleum and Natural Gas Engineering, Sultan Qaboos University
Department of Electrical & Computer Engineering, Collage of Engineering,
Sultan Qaboos University, Muscat. Sultanate of Oman
2. Department of Electrical & Computer Engineering, Sultan Qaboos University
Department of Electrical & Computer Engineering, Collage of Engineering,
Sultan Qaboos University, Muscat. Sultanate of Oman



Wednesday July 27th, 2022

Wednesday July 27th, 2022
16:30-18:00 Oral Session B2 **ROOM B "OPAL-RT"**

Chairman: **Julio Tafur Sotelo**

- 207 Energy Management of Microgrid Considering Demand Response Using Honey Badger Optimizer**
Nehmedo Alamir(1,2), Salah Kamel(2), Tamer F. Megahed(1,3), Maiya Hori(4), Sobhy M. Abdelkader(1,3)
1. Electrical Power Engineering, Egypt-Japan University of Science and Technology. Egypt
2. Department of Electrical Engineering, Faculty of Engineering, Aswan University. Egypt
3. Department of Electrical Engineering, Faculty of Engineering, Mansura University. Egypt
4. Platform of Inter/Transdisciplinary Energy Research, Kyushu University. Japan
- 214 Sizing of a Scattered Housing Microgrid in a Remote Rural Area**
R. Rodriguez(1,2), G. Osma(1), G. Ordoñez(1)
1. Department of Electrical, Electronic and Telecommunications Engineering
Universidad Industrial de Santander, Bucaramanga. Colombia
2. FEMTO-ST, FCLAB, Univ. Bourgogne Franche-Comté, Belfort. France
- 252 Efficient Smart Grid Fault-Identification Approach with Photovoltaic-Distributed Generators Based on Monitoring of Current/Voltage Signals**
Mohamed I. Zaki (1,2), Tamer F. Megahed(1,3), Sobhy M. Abdelkader(1,3)
1. Egypt-Japan University of Science and Technology, Alexandria. Egypt.
2. Electrical Engineering Department, Faculty of Engineering, Benha University. Egypt
3. Electrical Engineering Department, Faculty of Engineering, Mansoura University. Egypt
- 340 Effect of Demand Forecast Error on Imbalance Cost in Residential Micro Grid**
Kohei Nozaki(1), Teruhisa Kumano(2)
1. Department of Electrical Engineering, Meiji University. Japan
2. Department of Electronics and Bioinformatics Meiji University. Japan
- 379 Operation and Control of a Quasi Z-source Converter in a Renewable Hybrid Microgrid**
Paul N. Timo(1), Tamer F. Megahed(1,2), Masahito Shoyama(3), Sobhy M. Abdelkader(1,2)
1. Electrical Power Engineering Department, Egypt-Japan University of Science and Technology (E-JUST). Egypt
2. Electrical Engineering Department, Mansoura University. Egypt
3. Electrical Engineering Department, Kyushu University. Japan



Thursday July 28th, 2022

9:00-9:45 Plenary Session PL3 ROOM A "University of Vigo"

Chairman: **Alfredo Alcayde García**

PL3. *Islanded Operation of Distribution Grid with High Penetration of Renewable Energy Sources*

By **Prof. Luis Rouco**, Universidad Pontificia Comillas, Madrid, Spain

Thursday July 28th, 2022
9:45-11:00 Oral Session A3 ROOM A "University of Vigo"

Chairman: **Milan Bélik**

- 336 Fast Pyrolysis oil from plastics waste as a Fuel for Gas Turbine Power Plants**
A. Palomar-Torres(1), L. Lesnik(2), E. Torres-Jiménez(1), G. Bombek(2)
1. Department of Mechanical and Mining Engineering, E.P.S. de Jaén, Universidad de Jaén. Spain
2. Faculty of Mechanical Engineering, University of Maribor. Slovenia
- 241 State and Parameter Estimation of Photovoltaic Modules using Unscented Kalman Filters**
M. Á. González-Cagigal, J. A. Rosendo-Macías, A. Gómez-Expósito
Department of Electrical Engineering University of Seville. Spain
- 298 Design and economic analysis of a solar poultry incubator for rural sectors located in Pucallpa-Peru**
Jorge Retamozo, Freddy J. Rojas
Department of Mechanical Engineering, Pontifical University Catholic of Peru
- 443 Impact of Air Mass on PV modules Power Generation in Eastern Indian Climatic Zone**
Debashish Majumdar(1), Sudipta Basu Pal(2), Rajiv Ganguly(1)
1. Department of Electronics Engineering, University of Engineering & Management, Kolkata. India
2. Department of Computer Science & Technology, University of Engineering & Management, Kolkata. India



Thursday July 28th, 2022

Thursday July 28th, 2022
9:45-11:00 Oral Session B3 **ROOM B "OPAL-RT"**

Chairman: **Rudolf Mecke**

- 364 A systematic approach for analysing and improving operating conditions in distribution grids**
M. Pintarič(1), M. Rošer(1,2), M. Beković (1), E. Tratnik(1), M. Vodenik(1), J. Voh (1), G. Štumberger(1)
1. Faculty of Electrical Engineering and Computer Science. University of Maribor. Slovenia
2. Elektro Celje d.d. Celje. Slovenia
- 386 Analysis of the Impact of a Modular SSSC on the Operation of Transmission Line Protection Relays using a Hardware-In-the-Loop Configuration**
B. Polajžer(1), A. Trupej(1), P. Xenos(2)
1. Faculty of Electrical Engineering and Computer Science, University of Maribor. Slovenia
2. Smart Wires Inc. Dublin. Ireland
- 391 Impact Assessment of Different Battery Energy Storage Technologies in Distribution Grids with High Penetration of Renewable Energies**
S. P. Surve(1, 2), R. Rocca(2), E. J. Hengeveld (1), D. Martínez(2), M. P. Comech(3), D. M. Rivas(2)
1. Hanze University of Applied Sciences, Groningen. Netherlands
2. Electrical Systems Department, CIRCE Foundation (Research Centre for Energy Resources and Consumption), Zaragoza. Spain
3. CIRCE Research Institute, University of Zaragoza. Spain
- 423 Optimal economic dispatch of hybrid microgrids integrating Energy Storage Systems with Grid-Forming Converters**
Marcial González de Armas, Santiago Arnaltes Gómez, Francisco Arredondo, José Luis Rodríguez Amenedo
Departamento de Ingeniería Eléctrica, E.P.S., Universidad Carlos III de Madrid. Spain

Thursday July 28th, 2022
11:00-11:45 Poster Session P3 "Coffee Break" **ROOM C "AEDIE"**

Chairmen: **Herminio Martínez García, Eduardo García Martínez, Fernando Aznar Dols**

- 300 Energy resilience in buildings for hot tropical climate conditions: A review**
J. Flórez-Reyes, G. Osma-Pinto
Department of Electrical, Electronic and Telecommunications Engineering
U.I.S, Universidad Industrial de Santander, Bucaramanga. Colombia



- 305 Energy Management of Grid Connected Hybrid Solar/Wind/Battery System using Golden Eagle Optimization with Incremental Conductance**
Prasad Kumar Bandahalli Mallappa, Guillermo Velasco Quesada, Herminio Martínez García
Electronic Engineering Department, Eastern Barcelona School of Engineering (EEBE)
Technical University of Catalonia -BarcelonaTech (UPC). Spain
- 307 An anti-islanding protection based on RoCoF compliant with ENTSO-E and IEC 62116**
D. Cañete, S. Martín-Arroyo, M. García-Gracia, A. Llamazares, I. Sáez
Department of Electrical Engineering, EINA, Zaragoza University. Spain
- 310 Comparative Analysis of a DC-microgrid Incorporating Hybrid Battery/Supercapacitor Storage System Addressing Pulse Load**
Hossam S. Salama(1,2), Kotb M. Kotb(1,3), Istvan Vokony(1), Dan Andras(1)
1. Department of Electric Power Engineering, Budapest University of Technology and Economics. Hungary
2. Department of Electrical Engineering, Aswan University, Aswan. Egypt
3. Department of Electrical Power and Machines Engineering, Tanta University. Egypt
- 315 Optimization for vibration analysis in rotating machines**
J. Alan Calderón(1,2), Julio C. Tafur Sotelo(2), Benjamín Barriga Gamarra(2), Jorge Alencastre(2), John Lozano(2,3), Rodrigo Urbizagástegui(2), Gonzalo Solano(2), Daniel Menacho(2)
1. Applied Nanophysics, Institute for Physics, Technical University of Ilmenau. Germany.
2. Control Engineering and Automation Master Program, Mechatronic Engineering Master Program, Engineering, Department, Pontificia Universidad Católica del Perú
3. Northern (Arctic) Federal University named after MV Lomonosov, Arkhangelsk. Russian Federation
- 316 Massive Parallel Current Power Amplifier Concept for Power Hardware in the Loop Applications**
E. García Martínez(1), J. F. Sanz Osorio(2), J. Muñoz Cruzado Alba(1), J. M. Perié(1)
1. Fundación CIRCE. Zaragoza. Spain
2. Instituto Universitario de Investigación CIRCE. Universidad de Zaragoza. Spain
- 318 Predictive maintenance in LED street lighting controlled with telemanagement system to improve current fault detection procedures using software tools**
D. Segovia-Muñoz, X. Serrano-Guerrero, A. Barragán-Escandon
Universidad Politécnica Salesiana, Sede Guayaquil. Ecuador
Grupo de Investigación en Energías, Universidad Politécnica Salesiana, Cuenca. Ecuador
- 319 Impact of the incorporation of photovoltaics distributed generation in electric distribution grids in Ecuador**
X. Serrano-Guerrero, B. Marín-Toro, C. Ochoa-Malhaber, A. Barragán-Escandón
Universidad Politécnica Salesiana, Grupo de Investigación en Energías (GIE)
Cuenca. Ecuador



- 320 Procedure of the design of photovoltaic systems applied to ornamental lighting**
X. Serrano-Guerrero, C. Ochoa-Malhaber, I. Ortega-Romero
Universidad Politécnica Salesiana, Grupo de Investigación en Energías (GIE) Cuenca. Ecuador
- 324 Performance Investigation of Wind Turbine Induction Generators connected with a Single-Area Power System**
Mustafa S. Ibrahim, Ali Jafer Mahdi, Kassim A. Al-Anbarri
Electrical Engineering Department, Mustansiriyah University, Baghdad. Iraq
Department of Electrical and Electronics Engineering, University of Kerbala. Iraq
- 325 Design of a water channel to model the wave conditions in the Colombian Pacific Ocean**
Rubio Clemente A., Velásquez L., Chica E.
Grupo de Investigación Energía Alternativa, Facultad de Ingeniería, Universidad de Antioquia, Medellín. Colombia
- 330 Evaluation of the impact of experimental fusion-aimed installations on their area of influence: the price of sustainable energy**
Zaida Troya(1), Rafael Esteban López(1), Fernando Aznar(2), Antonio Peña-García(2)
1. "DONES Preparatory Phase" (CE Ref. 870186) Project Vicerrectorate of Research - University of Granada. Spain
2. Department of Civil Engineering, University of Granada. Spain
- 336 Fast Pyrolysis oil from plastics waste as a Fuel for Gas Turbine Power Plants**
A. Palomar-Torres(1), L. Lesnik(2), E. Torres-Jiménez(1), G. Bombek(2)
1. Department of Mechanical and Mining Engineering, E.P.S. de Jaén, Universidad de Jaén. Spain
2. Faculty of Mechanical Engineering, University of Maribor. Slovenia
- 339 Motor Bearings Fault Classification using CatBoost Classifier**
Muhammad Irfan(1), Alwadie. A(1), Muhammad Awais(2), Saifur Rahman(1), Abdulkarem Hussein Mohammed Al Mawgani(1), Nordin Saad(3), Muhammad Aman Sheikh(4)
1. Electrical Engineering Department, College of Engineering, Najran University, Saudi Arabia
2. Department of Computer Science, Edge Hill University, St Helens Rd. UK
3. Faculty of Computing and Engineering, Quest International University, Malaysia.
4. School of Engineering and Technology, Sunway University Malaysia
- 343 A wavelet packet-dual fuzzy control method for hybrid energy storage to suppress wind power fluctuations**
Lv. Huixiang, Chen Caixue, Xiong Zhigang
Department of Energy Powertrain, Xiangtan University. China



- 345 Novel Approach to Monitoring and Mitigating Power Quality Disturbances in Hybrid Renewable Energy System**
Syed Khawar Hussain Shah, Ali Hellany, Mahmood Nagrial, Jamal Rizk
School of Engineering, Design and Built Environment Western Sydney University.
Australia
- 346 Artificial Neural Networks – Based Method for Enhancing State Estimation of Grids with High Penetration of Renewables**
S. Cosic, I. Vokony
Department of Electric Power Engineering, Faculty of Electrical Engineering and Informatics, Budapest University of Technology and Economics. Hungary
- 348 Assessment of the energy potential of agricultural and forestry biomass sources from the Canary Islands**
L. Díaz, K.E. Rodríguez, A. Torres, L.A. González
Department of Chemical Engineering, University of La Laguna, Tenerife, Canary Island.
Spain
- 349 Biodiesel Production from Jatropha Curcas Oil Using Li/Pumice as Catalyst in a Fixed-Bed Reactor**
L. Díaz, Y. Kuzmina, C. Díaz, A. Torres
Department of Chemical Engineering, University of La Laguna, Tenerife, Canary Island.
Spain

Thursday July 28th, 2022 11:45-13:15 Oral Session A4 ROOM A "University of Vigo"

Chairman: **Luis Sainz Sapera**

- 270 Real-Time Implementation of qZSC for MVDC to Microgrids Link**
G. de J. Martínez-Figueroa(1), S. Bogarra(1), F. Córcole(1), L. Sainz(2), L. Fernández(3) R. Sarrias(3)
1. Department of Electrical Engineering, ESEIAAT-UPC.Terrassa, Barcelona. Spain
2. Department of Electrical Engineering, ETSEIB-UPC, Barcelona. Spain
3. Department of Electrical Engineering, University of Cádiz, Algeciras. Spain
- 285 Stability study of AC grid-connected quasi-Z-source inverter-based photovoltaic power systems**
L. Sainz(1), L. I. Monjo(2), F. Jurado(3)
1. Department of Electrical Engineering. E.T.S.E.I.B., UPC Barcelona. Spain
2. Department of Electrical Engineering. E.P.S.E.V.G., UPC. Vilanova i la Geltrú. Spain
3. Department of Electrical Engineering University of Jaén. Spain



- 302 Decentralized Operation of an Isolated Microgrid with Storage Systems Using Multipliers with Alternating Directions**
J. Barco-Jiménez(1,2,5), G. Obando(3), A. Pantoja(4), E. Caicedo(1), J. Aguado(5)
1. Programa de Posgrados de Ingeniería Eléctrica y Electrónica, Universidad del Valle. Colombia
2. Programa de Ingeniería Electrónica, Universidad CESMAG. Colombia
3. Escuela de Ingeniería, Ciencia y Tecnología, Universidad del Rosario. Colombia
4. Departamento de Electrónica, Universidad de Nariño. Colombia
5. Departamento de Ingeniería Eléctrica, Universidad de Málaga. Spain
- 350 Improvements in Frequency Control of an AC Microgrid by Means of Micro-Hydropower Combined Flow-Reduced Dump Load Control Method**
Leonardo Peña Pupo(1), Herminio Martínez García(2), Encarna García-Vílchez(2), Hugo Domínguez Abreu(1), Ernesto Y. Fariñas Wong(3)
1. Centre for Energy Studies and Refrigeration. University of Oriente. Cuba
2. Department of Electronics Engineering. Escola d'Enginyeria de Barcelona Est (EEBE), Technical University of Catalonia (UPC). BarcelonaTech. Spain
3. Centre for Energy and Environmental Technology Assessments. Universidad Central "Marta Abreu" de Las Villas. Santa Clara. Cuba
- 425 Transition between Stand-Alone and Grid Connected Solar PV Microgrids**
F. H. Sarker(1), A. Merabet(1), T. Salameh(2), C. Ghenai(2)
1. Division of Engineering, Saint Mary's University. Canada
2. Department of Sustainable and Renewable Energy Engineering. University of Sharjah. United Arab Emirates

Thursday July 28th, 2022
11:45-13:15 Oral Session B4 ROOM B "OPAL-RT"

Chairman: **Valery Vodovozov**

- 202 Cryptocurrency and its Effect on the Electric Grid**
P. Resch, C. Schroeder, A. Pourmovahed, K. Brinker Brouwer
Mechanical Engineering Department, Kettering University, Flint, Michigan. U.S.A.
- 217 Comparative Analysis of Intelligent Braking Controllers for Electric Vehicles**
V. Vodovozov(1), Z. Raud(1), E. Petlenkov(2)
1. Department of Electrical Power Engineering and Mechatronics
2. Department of Computer Systems
Tallinn University of Technology. Estonia
- 296 Impacts of Electric Vehicles on Distribution System Planning and Operation**
T. Al-Abri(1), M. Albadi(1,2)
1. Sultan Qaboos University. Oman
2. Arab Open University. Oman



- 312 Effect of temperature and the Carbon-Nitrogen (C/N) ratio on methane production through anaerobic co-digestion of cattle manure and Jatropha seed cake**
X. Álvarez-Montero(1), I. Mercado-Reyes(2), D. Valdez-Solórzano(2), E. Santos Ordóñez(3), E. Delgado Plaza(4), J. Peralta-Jaramillo(4)
1. Vicerrectorado de Investigación y Vinculación, Universidad Estatal de Bolívar. Ecuador
2. Laboratorio de Biotecnología Microbiana (Lab-Biotem S.A.), Guayaquil. Ecuador
3. Facultad de Ciencias de la Vida, Centro de Investigaciones Biotecnológicas del Ecuador. Escuela Politécnica del Litoral ESPO. Ecuador
4. Centro de Desarrollo Tecnológico Sustentable, Escuela Superior Politécnica del Litoral. Ecuador
- 430 Early Detection of Main Bearing Damage in Wind Turbines**
Luis Moyón(1), Angel Encalada-Dávila(2), C. Tutivén(2), Y. Vidal (3,4)
1. Universidad ECOTEC. Ecuador
2. ESPO Polytechnic University, Escuela Superior Politécnica del Litoral, Faculty of Mechanical Engineering and Production Science (FIMCP), Mechatronics Engineering, Guayaquil. Ecuador
3. Control, Modeling, Identification and Applications, CoDALab, Department of Mathematics, Escola d'Enginyeria de Barcelona Est, EEBE, Universitat Politècnica de Catalunya, UPC. Spain
4. Institut de Matemàtiques de la UPC - BarcelonaTech, IMTech. Spain

Thursday July 28th, 2022

15:00-15:45 Plenary Session PL4 ROOM A "University of Vigo"

Chairman: Péter Kádár

PL4. *A few direction in the development of Electromagnetic Compatibility*

by Prof. Mircea Ion Buzdugan, Technical University of Cluj-Napoca. Romania



Thursday July 28th, 2022

Thursday July 28th, 2022
15:45-16:30 Poster Session P4 ROOM C "AEDIE"

Chairmen: **Ovidio Rabaza Castillo, João Sanchez Galvao, Andrés Meana Fernández**

- 357 The relevance of IT Security awareness in Renewable Energy facilities**
Justino Lourenço(1), Eric Zanghi(2), José Morais(1), Nelson Neves(2), César Vasques(3), Fernando Figueiredo(3)
1. Department of Computer Science Engineering
2. Department of Electronics and Automation Engineering
3. Department of Mechanical Engineering
ISPGAYA – Instituto Superior Politécnico Gaya. Portugal
- 360 Preliminary Study of Up-Flow Anaerobic Sludge Blanket (UASB) Technology for Energy Recovery from Domestic Wastewater**
E. Ferrera, I. Ruigómez, L. Vera
Departamento de Ingeniería Química y Tecnología Farmacéutica. Universidad de La Laguna, Tenerife. Spain
- 361 Preliminary Assessment of the thermal performances of a hydroponic green roof system in a Mediterranean climate**
R. Rapisarda, F. Nocera, V. Costanzo, G. Sciuto, R. Caponetto
Department of Civil Engineering and Architecture (DICAR) University of Catania. Italy
- 368 On the Energy or Power Efficiency of a Linear System**
L. H. Keel(1), S. P. Bhattacharyya(2)
1. Department of Electrical & Computer Engineering, Tennessee State University. USA
2. Department of Electrical & Computer Engineering, Texas A&M University. USA
- 370 Catalytic Activity of Polymetallic and Hydrotalcite-like Catalysts in the Synthesis of Methanol by Carbon Dioxide Hydrogenation**
J. J. Pérez, D. J. Escalante, L. A. González, J. A. Pérez
Chemical Engineering Department, University of La Laguna, Tenerife, Canary Island. Spain
- 371 Study of the energy recovery of slaughterhouse waste. The case of Tenerife**
J. A. Pérez, K. E. Rodríguez, C. Díaz, D. J. Escalante
Chemical Engineering Department, University of La Laguna, Tenerife, Canary Island. Spain

- 373 Transformer-Based Z-Source Inverter with MVDC Link**
Enrique González-Rivera(1), Carlos Andrés García-Vázquez(1), Pablo García Triviño(1), Raúl Sarrias-Mena(2), Francisco Jurado(3), Luis Sainz(4), Santiago Bogarra(5), Felipe Córcoles(5), Luis M. Fernández-Ramírez(1)
1. Department of Electrical Engineering, Higher Technical School of Engineering of Algeciras (ETSI Algeciras), University of Cadiz. Spain
2. Department of Engineering in Automation, Electronics and Computer Architecture & Networks Higher Technical School of Engineering of Algeciras, University of Cadiz. Spain
3. Department of Electrical Engineering, EPS Linares, University of Jaén. Spain
4. Department of Electrical Engineering, ETSEIB, UPC, Barcelona. Spain
5. Department of Electrical Engineering, ESEIAAT, UPC, Terrassa, Barcelona. Spain
- 375 Agile digitalization evolution in the energy sector taking into account innovative and disruptive technologies**
I. Vokony(1), I. Taczi(1), M. Szalmane Csete(2)
1. Department of Electrical Engineering, Budapest University of Technology and Economics. Hungary
2. Department of Environmental Economics and Sustainability, Budapest University of Technology and Economics. Hungary
- 376 P2P local market concept with dynamic network usage tariff via asset enablement – Horizon2020 project demo experiences**
I. Vokony, H. Salama, L. Barancsik, B. Sinkovits, P. Sores, B. Hartmann, I. Taczi
Department of Electrical Engineering, Budapest University of Technology and Economics. Hungary
- 377 Spatial Aggregation of Local Flexibility – Horizon2020 project experiences**
I. Vokony, H. Salama, L. Barancsik, P. Sores
Department of Electrical Engineering, Budapest University of Technology and Economics (BME). Hungary
- 380 Power Flow Numerical Assessment of a STATCOM iUPQC Utility Interface for Microgrids**
M. Montagner(1), C. Rech(2), M. Mezaroba(1)
1. Department of Electrical Engineering – DEE, Santa Catarina State University – UDESC. Brazil
2. Power Electronics and Control Research Group-Federal University of Santa Maria. Brazil
- 382 Maximum Power Point Tracker Optimization for Photovoltaic Systems based on III-V Elements**
M. Trape, A. Hellany
School of Engineering, Design and Built Environment, Western Sydney University Australia



- 383 Unmanned Aerial Vehicle for Infrared Inspection of Photovoltaic Modules**
S. Vergura
Department of Electrical and information Engineering, Polytechnic University of Bari.
RELab-Renewable Energy Laboratory. Italy
- 384 Supervision of the energy performance of multi-arrays PV plants by means of bi-monthly violin plots**
S. Vergura
Department of Electrical and information Engineering, Polytechnic University of Bari.
RELab-Renewable Energy Laboratory. Italy
- 387 Contribution to Collaborative Electricity Microgrid Management Strategies of Domestic Prosumers**
Agnès Lomascolo-Pujadó, Herminio Martínez-García
Escola de Enginyeria de Barcelona Este (EEBE) Technical University of Catalonia (UPC).
BarcelonaTech. Spain
- 388 Estimating Electricity Energy Generation from Human Muscle Efforts**
R. Halfeld(1), R. Castro(1), M. Cohen(2), E. Castro(1)
1. Postgraduate program of Metrology, Quality, Innovation and Sustainability
Pós-MQI, PUC-RIO. Brazil
2. Production Engineering Department, Federal Fluminense University. Brazil
- 392 Hydrogen Technologies to Provide Flexibility to the Electric System: A Review**
Á. Menéndez, R. Rocca, G. Fernandez, L. Luengo, D. Zaldivar
CIRCE, Centro de Investigación de Recursos y Consumos Energéticos,
Zaragoza. Spain
- 402 Review of Stability Analysis in Power Systems with High Penetration of Non-synchronous Generation**
I.Táczí, I. Vokony
Department of Electric Power Engineering, Budapest University of Technology and Economics. Hungary
- 436 Optimal Operation of a Distributed Generation Microgrid based on the Multi-Objective Genetic Algorithms**
S. Oviedo-Carranza, J. S. Artal-Sevil, J. A. Domínguez-Navarro
Department of Electrical Engineering EINA, University of Zaragoza. Spain
- 449 Fast and Efficient MPC Approaches for Multilevel Drives Considering Cost Function Terms Dependency**
A. Salem(1) , Mohamed A. Abido(2)
1. Electrical Engineering Department, Oregon Institute of Technology. USA
2. Electrical Engineering Department King Fahd University for Petroleum and Minerals
Dhahran. Saudi Arabia

Thursday July 28th, 2022
16:30-18:00 Oral Session A5 **ROOM A "University of Vigo"**

Chairman: **Abdullah Al-Badi**

- 223 A Fault Ride-Through Technique for PMSG wind turbines using Superconducting Magnetic Energy Storage (SMES) under Grid voltage sag conditions**
Ernest F. Morgan(1), Tamer F. Megahed(1,2), Junya Suehiro(3), Sobhy M. Abdelkader(1,2)
1. Electrical Power Engineering, Egypt-Japan University of Science and Technology (E-JUST), New Borg El-Arab City, Alexandria. Egypt
2. Electrical Engineering Department, Faculty of Engineering, Mansoura University. Egypt
3. Faculty of Information Science and Electrical Engineering, Kyushu University, Fukuoka. Japan
- 397 Wind Power Forecasting with Machine Learning: Single and combined methods**
J. Rosa(1), R. Pestana(1,2), C. Leandro(1), C. Geraldes(1,4), J. Esteves(3), D. Carvalho(1)
1. Department of Mathematics, Electrical Engineering, Instituto Superior de Engenharia de Lisboa. Portugal
2. System Operator Division, REN - Rede Eléctrica Nacional, S.A. – Lisbon. Portugal
3. R&D NESTER, Centro de Investigação em Energia REN - State Grid, S.A. – Lisbon.
4. CEAUL, Centro de Estatística e Aplicações, Universidade de Lisboa. Portugal
- 406 Multi-objective optimisation of technical wind turbines parameters based on multi-physical models**
T. Amoretti, F. Huet, P. Garambois, L. Roucoules
Arts et Metiers Institute of Technology, LISPEN, HESAM Université. France
- 410 Insights on the use of wind speed vertical extrapolation methods**
A. Pintor(1,4,5), C. Pinto(1), J. Mendonça(2), R. Pilão(3), P. Pinto(1)
1. MEGAJOULE S.A. Portugal
2. ISEP, Instituto Superior de Engenharia do Porto. Portugal
3. CIETI, Instituto Superior de Engenharia do Porto. Portugal
4. LSRE-LCM - Laboratory of Separation and Reaction Engineering – Laboratory of Catalysis and Materials, Faculty of Engineering, University of Porto. Portugal
5. ALiCE – Associate Laboratory in Chemical Engineering, Faculty of Engineering, University of Porto. Portugal
- 419 Contribution of a photovoltaic solar system to the energetic sustainability of a Portuguese WWTP**
Bruno Eira(1,2), Paulo Pinto(2), Joaquim Carneiro(1)
1. Centre of Physics of Minho and Porto Universities (CF-UM-UP) Braga. Portugal
2. MEGAJOULE S.A. Portugal

Thursday July 28th, 2022

Thursday July 28th, 2022
16:30-18:00 Oral Session B5 **ROOM B "OPAL-RT"**

Chairman: **Benjamín González Díaz**

- 332 Estimating rooftop photovoltaics placement on administrative building using Building Information Modelling**
Stojan Spasevski(1), Vlatko Stoikov(2)
1. Elektodistribuzija Skopje, EVN Group. North Macedonia
2. Faculty of Electrical Engineering and Information Technologies, University of Ss. Cyril and Methodius, Skopje. North Macedonia
- 338 Solar energy potential calculation methods**
Péter Kádár
Óbuda University, Dept. of Power Systems, Alternative Energy Sources Knowledge Centre, Budapest. Hungary
- 344 Reactive Power Compensation for Preventing Voltage Instabilities in Distribution Lines Enriched with PV Power Plants**
A. M. Averbukh(1), B. S. Rajput(1,2), C. I. Amiel(1), D. Z. Danin(1)
1. Department of Electrical/Electronic Engineering, Ariel University, Kiriat HaMada. Israel
2. Department of Physics, University Centre for Research & Development, Chandigarh University. India
- 367 ANN-Based Large-Scale Cooperative Solar Generation Forecasting**
Lejla Pašić(1,3), Azra Pašić(2), Alija Pašić(2), István Vokony(1)
1. Department of Electric Power Engineering, Faculty of Electrical Engineering and Informatics, Budapest University of Technology and Economics. Hungary
2. Department of Telecommunications and Media Informatics, Faculty of Electrical Engineering and Informatics, Budapest University of Technology and Economics. Hungary
3. ELKH-BME Information Systems Research Group. Budapest. Hungary
- 420 Optimisation of passive solar systems seasonal operation in conditions of central Europe**
Milan Belik, O. Rubnenko
1. Department of Electrical Power Engineering, Faculty of Electrical Engineering, University of West Bohemia, Pilsen. Czech Republic
2. Department of Electric Stations and Systems, Vinnytsia National Technical University. Ukraine



Friday July 29th, 2022

9:00-9:45 Plenary Session PL5 ROOM A "University of Vigo"

Chairman: **Santiago Arnaltes Gómez**

PL5. *Developing a 100% renewable energy system: the challenge of efficient decarbonization*

by **Dr. Juan J. Alba** Vicepresident, Regulatory Affairs, Endesa

9:45-10:30 Plenary Session PL6 ROOM A "University of Vigo"

Chairman: **Gianpaolo Vitale**

PL6. *A new approach to estimate technical losses in distributing utilities in the presence of distributing generation in its concession area*

by **Prof. Reinaldo Castro Souza**, PhD, PUC-Rio; Brazil and **Prof. Fernando Cyrino**, PhD, PUB-Rio; Brazil

Thursday July 28th, 2022
10:30-11:15 Poster Session P5 "Coffee Break" ROOM C "AEDIE"

Chairmen: **Helmut Votzi, Adelino Pereira, Miguel Á. González Cagijal**

- 333 Turbogenerator Electromagnetic Analysis with Changing Reactive Load**
M. Roytgarts, A. Smirnov
JSC "Power Machines". Saint Petersburg. Russia
- 353 Importance of the fluctuations of the steel price in the economic feasibility of a hybrid offshore platform in the West of the Iberian Peninsula**
A. Filgueira-Vizoso(1), X. Costoya(2), D. Cordal-Iglesias(3), L. Castro-Santos(4)
1. Universidade da Coruña, Departamento de Química, Escola Politécnica de Enxeñaría de Ferrol. Spain
2. Environmental Physics Laboratory (EphysLab), Centro de Investigacións Mariñas (CIM)-UVIGO, Universidade de Vigo. Spain
3. Universidade da Coruña, Escola Politécnica de Enxeñaría de Ferrol. Spain
4. Universidade da Coruña, Departamento de Enxeñaría Naval e Industrial, Escola Politécnica de Enxeñaría de Ferrol. Spain

- 354 Analysis of the economic feasibility of different floating offshore renewable energies in Canary Islands**
A. Filgueira-Vizoso(1), X. Costoya(2), D. Cordal-Iglesias(3), L. Piegari(4), P. Tricoli(5), L. Castro-Santos(6)
1. Universidade da Coruña, Departamento de Química, Escola Politécnica de Enxeñaría de Ferrol. Spain
2. Environmental Physics Laboratory (EphysLab), Centro de Investigacións Mariñas (CIM)-UVIGO, Universidade de Vigo. Spain
3. Universidade da Coruña, Escola Politécnica de Enxeñaría de Ferrol. Spain
4. Politecnico di Milano, Department of Electronics, Information and Bioengineering. Italy
5. University of Birmingham, Department of Electronic, Electrical and Systems Engineering, Edgbaston. UK
6. Universidade da Coruña, Departamento de Enxeñaría Naval e Industrial, Escola Politécnica de Enxeñaría de Ferrol. Spain
- 395 Modelling the dependency relationship between wind speed and wind power generation: An application of copula theory**
Tuany Esthefany Barcellos de Carvalho Silva(1), Reinaldo Castro Souza(1), Fernando Luiz Cyrino Oliveira(1), Marco Aurélio Sanfins (2)
1. Industrial Engineering Department PUC-RJ, Pontifical Catholic University of Rio de Janeiro. Brazil
2. Department of Statistics, UFF, Federal Fluminense University. Brazil
- 405 Benefit analysis in power generation dispatch using dynamic line ratings on transmission lines**
P. Castillo(1), I. Albizu(1), M. Bedialauneta(1), I. Aranzabal (2)
1. Department of Electrical Engineering, University of the Basque Country. Eibar. Spain
2. Department of Electrical Engineering, University of the Basque Country. Bilbao. Spain
- 408 Design of a Hybrid Dryer for Hemp Flowers for the Inter-Andean region of Ecuador**
J. Peralta-Jaramillo(1), E. Delgado-Plaza(1), A. Rivera(1), D. Rivera(1), C. Polanco(1), J. Reinoso (1), Ian Sosa-Tinoco(2), X. Alvarez Montero(3)
1. ESPOL Polytechnic University, Escuela Superior Politécnica del Litoral, Centro de Desarrollo Tecnológico Sustentable, Facultad de Ingeniería en Mecánica y Ciencias de la Producción, Guayaquil. Ecuador
2. Electrical Engineering Department, Instituto Tecnológico de Sonora, Mexico
3. Vicerrectorado de Investigación y Vinculación, Universidad Estatal de Bolívar. Ecuador
- 409 Voltage Sag Estimation for Distribution Systems Using Linear Machine Learning Models**
Daniel Galeano-Suárez, César Duarte, Jairo Blanco Solano
Department of Electrical Engineering, Universidad Industrial de Santander, Bucaramanga. Colombia
- 412 Methodology to optimise electricity demand in the residential sector through efficient load management**
C. Andrada-Monrós(1), E. Peñalvo-López(2), V. León-Martínez(2), I. Valencia-Salazar(2)
1. Institute of Materials Technology. Polytechnic University of Valencia, Spain
2. Institute of Energy Engineering. Polytechnic University of Valencia. Spain



- 414 Optimisation of an aggregator's customer portfolio based on inter-user compatibility**
J. Cano-Martínez, E. Peñalvo-López, V. León-Martínez, I. Valencia-Salazar
Institute of Energy Engineering. Polytechnic University of Valencia. Spain
- 415 Methodology for designing an Energy Community and its application to the municipality of Vinalsa**
L. Molina Cañamero , E. Peñalvo-López, V. León-Martínez, J. Montañana-Romeu
Institute of Energy Engineering. Polytechnic University of Valencia. Spain
- 418 Device Modeling for GHE Experimental Test**
Alejandro J. Extremera-Jiménez(1), Cándido Gutiérrez-Montes(1), Pedro J. Casanova-Peláez(2), Fernando Cruz-Peragón(1)
1. Department of Mechanical and Mining Engineering, Higher Polytechnic School, University of Jaen. Spain
2. Department of Electronic Engineering and Automatics, Higher Polytechnic School, University of Jaen. Spain
- 419 Contribution of a photovoltaic solar system to the energetic sustainability of a Portuguese WWTP**
Bruno Eira(1,2), Paulo Pinto(2), Joaquim Carneiro(1)
1. Centre of Physics of Minho and Porto Universities (CF-UM-UP) Braga. Portugal
2. MEGAJOULE S.A. Portugal
- 422 Techno-economic Assessment of Hydrogen Production Using Solar Energy**
Mariana Ferreira(1), R. M. Monteiro Pereira(1,2), Adelino J. C. Pereira(1,2)
1. Instituto Politécnico de Coimbra, Instituto Superior de Engenharia de Coimbra. Portugal
2. INESC Coimbra - Instituto de Engenharia de Sistemas e Computadores de Coimbra. Portugal
- 426 A Dynamic Reconfiguration Method based on a Deterministic Optimization Approach in Active Distribution Systems**
C. E. Duque-Escalante, J. S. Florez-Prada, J. Blanco-Solano
School of Electrical Engineering, Universidad Industrial de Santander. Colombia
- 440 Thermodynamic modelling of the power cycle: Solar Thermal Generation in the canton of Arenillas-Ecuador**
V. Jaramillo(1), O. Cabeza(2)
1. Universidad Laica Eloy Alfaro de Mamabí. Ecuador
2. Universidade de La Coruña. Spain
- 445 Simulation studies of concatenation as the simplest way of multi-phase inverter control**
Jan Iwaszkiewicz, Adam Muc, Agata Bielecka
Department of Ship Automation, Gdynia Maritime University, Gdynia. Poland



- 446 The active filtering of the inverter output voltage by use of orthogonal vectors' control strategy**
Jan Iwaszkiewicz, Adam Muc
Department of Ship Automation, Gdynia Maritime University. Poland
- 448 A Parametric Approach for the Study of Three-phase Inverters Subject to Grid Faults**
A. Rolán(1), L. Sainz(2)
1. Department of Automatic Control, EEBE, Technical University of Catalonia (UPC) Barcelona East School of Engineering. Spain
2. Department of Electrical Engineering, ETSEIB, Technical University of Catalonia (UPC) Barcelona School of Industrial Engineering. Spain
- 450 Low-cost variable-speed wind turbines design by recycling small electrical machines. Arrangement of permanent magnets in the rotor**
V. Ballestín-Bernad, J. S. Artal-Sevil, J. A. Domínguez-Navarro, J. L. Bernal-Agustín
Department of Electrical Engineering, EINA, University of Zaragoza, Spain

Friday July 29th, 2022	
11:15-12:30 Oral Session A6	ROOM A "University of Vigo"

Chairman: **Pablo Eguía López**

- 328 Impacts of Distributed Generation on Power System Protection**
M. Almamari(1), M. Albadi(1,2)
1. Electrical & Computer Engineering Department, Sultan Qaboos University, Muscat. Oman
2. Arab Open University-Oman, Muscat. Oman
- 342 Modeling and Simulation of Renewable Energy Sources by Markov Chains**
M. A. S. G. Araujo, G. A. Melo, S. C. A. Ferreira, R. C. Souza, F. L. Cyrino Oliveira, P. M. M. Louro
Department of Industrial Engineering, Pontifical Catholic University of Rio de Janeiro. Brazil
- 358 Voltage-Controlled and Current-Controlled Low Voltage STATCOM: A Comparison**
L. Ribeiro, D. Simonetti
Department of Electrical Engineering, Power Electronics and Drives Laboratory, Federal University of Espírito Santo. Brazil

- 390 Development and Initial testing of a Virtual Laboratory for the Build-up and Testing of Microgrid Management Algorithms**
G. Fernández(1), A. Menéndez(1), P. Meneses(2), A. Zubiria(2), A. García(3), F. Díez(3), J. Jimeno(4), J. E. Rodríguez-Seco(4), F. Cortés(4)
1. Electrical Systems Area, CIRCE Foundation. Zaragoza. Spain
2. CIDETEC, Basque Research and Technology Alliance (BRTA) Donostia-San Sebastián.
3. Centre for the Development of Information and Communication Technologies in Asturias: CTIC Centro Tecnológico, Gijón. Spain
4. TECNALIA, Basque Research and Technology Alliance (BRTA) Parque Científico y Tecnológico de Bizkaia. Spain

Friday July 29th, 2022	
11:15-12:30 Oral Session B6	ROOM B "OPAL-RT"

Chairman: **Abdullah Alwadie**

- 249 A novel Design Approach of a Micro Thermoelectric Generator for High Power Density for Ambient Heat Energy Scavenging Applications**
Donart Nayebare(1), Ahmed M. R. Fath El-Bab(2), Tamer F. Megahed(1,4), Asano Tanemasa(3), Sobhy M. Abdelkader(1,4)
1. Electrical Power Engineering Department, Egypt-Japan University of Science And Technology (E-JUST). Egypt
2. Mechatronics and Robotics Engineering Department, Egypt-Japan University of Science and Technology (E-JUST). Egypt
3. Graduate School of Information Science and Electrical Engineering, Kyushu University, Fukuoka. Japan
4. Electrical Engineering Department, Mansoura University. Egypt
- 329 Main Bearing Fault Prognosis in Wind Turbines based on Gated Recurrent Unit Neural Networks**
A. Encalada-Dávila(1), C. Tutivén(1), Luis Moyón(2), B. Puruncajas(1), Y. Vidal (3,4)
1. Mechatronics Engineering, Faculty of Mechanical Engineering and Production Science, FIMCP, Escuela Superior Politécnica del Litoral, ESPOL, Guayaquil. Ecuador
2. Universidad ECOTEC, Samborondón. Ecuador
3. Control, Modeling, Identification and Applications, CoDALab Department of Mathematics, Escola d'Enginyeria de Barcelona Est, EEBE Universitat Politècnica de Catalunya, UPC. Spain
4. Institut de Matemàtiques de la UPC - BarcelonaTech, IMTech. Spain
- 394 Design of a segmented switched reluctance drive for a light electric vehicle**
P. Andrada
Department of Electrical Engineering, EPSEVG, UPC BARCELONATECH. Spain
- 442 Case Study: RTU on the Way to Participate in Race to Zero Challenge**
Janis Zakis, Alexander Suzdalenko, Leonids Ribickis, Edvins Mineikis, Alexander Repins, Yekaterina Zverkovicha.
Institute of industrial Electronics and Electrical Engineering. Riga Technical University Riga, Latvia



12:30– 13:00	ROOM A “University of Vigo”. CLOSING SESSION
	Conclusions and time for the next conference (ICREPQ'23)
	Awards for the three best posters
13:00 – 15:00	Farewell Lunch
15:00 – 21:00	Cultural Visit to Santiago de Compostela

