Conference Abstracts

2017 The 4th International Conference on Energy and Environment Research (ICEER 2017)

July 17-20, 2017

ISEP, Porto, Portugal

ISEP (School of Engineering) P.Porto (Polytechnic of Porto)
Address: Rua Dr. António Bernardino de Almeida, 431, 4249-015 Porto
http://www.isep.ipp.pt/
# Table of Contents

Welcome Address ............................................................................................................. 2  
Committees ......................................................................................................................... 4  
Local Information .............................................................................................................. 7  
Visit to ISEP-School of Engineering of P.Porto ............................................................... 10  
Instructions for Oral & Poster Presentations ................................................................. 11  
Introduction of Keynote Speakers .................................................................................. 12  
Introduction of Invited Lecturers .................................................................................... 19  
Daily Schedule of Events ............................................................................................... 25  
Contents of Sessions ....................................................................................................... 26  
Oral & Oral Flash Presentations ...................................................................................... 34  
Posters Exhibition ............................................................................................................ 72  
Listeners ............................................................................................................................ 82
Welcome Address

We are pleased to welcome you to the ICEER2017, Porto, Portugal conference, which will take place at ISEP (School of Engineering) of the Polytechnic of Porto (P.Porto) from July 17-20, 2017.

ICEER2017 is the 4th International Conference on Energy and Environment Research and is being held with annual regularity, from 2014.

ICEER2017 is a joint organization of the School of Engineering (ISEP) of the Polytechnic of Porto (P.Porto) and of the SCIEI, and will take place this year at ISEP and Porto, with collaboration of the CIETI and LEPABE research groups.

ICEER2017 aims to be a privileged space to discuss current matters related to Energy and the Environment. This event aims to explore emerging technologies and concepts in a collaborative way, bringing together engineers, researchers and professionals from different areas. In fact, we can perceive that new and tighter targets towards sustainable development have been set by several countries. However, how to reach them is a sensitive matter concerning to each country. Since these topics are beyond the present generation, it is therefore also very important to prepare and educate young people.

ICEER is a multicultural event as can be demonstrated by the number of participant countries in the past editions. ICEER2016 registered 25 countries, from five continents, which justifies the increasing high internationalization of this conference series. The ICEER2017@ISEP will receive participants from 30 countries, from five continents.

After a thorough review process, the Scientific & Technical Committee (STC) accepted the most promising papers to be presented orally or as poster and published in conference proceedings (Energy Procedia, Elsevier). From these, a selection of papers was recommended for publication in Special Issues of Energies (MDPI), ChemEngineering (MDPI) or Waste and Biomass Valorization (Springer). We wish to express our sincere appreciation to all the STC members and Invited Reviewers who have contribute to ICEER2017 conference, reviewing all submissions, which is vital to the success of the conference, and also to the members in the local committee and the volunteers who had dedicated their time and efforts in planning, promoting, organizing and assisting the conference organizers.

Last but not least, a special thanks to Keynote and Invited speakers, as well as to all other authors for contributing their latest research and ideas to this conference.

This ICEER2017 program is highlighted by four Keynote Speakers: Prof. Hooman Farzaneh, Institute of Advanced Energy, Kyoto University, Japan; Prof. Adélio Mendes, LEPABE - University of Porto, Portugal; Prof. Gustavo Alves, CIETI/ISEP-School of Engineering, P.Porto, Portugal; Prof. Barry Benedict, University of Texas at El Paso. In addition, four Invited Speakers will contribute to the dissemination and promotion of their research and professional results: Dr. Obulisamy Parthiba Karthikeyan, Hong Kong Baptist University, Prof. Helder Santos, Polytechnic Institute of Leiria, Portugal, Engº Rui Rigueira, Latento, Portugal and Engº Carlos Carvalho, Bosch, Portugal.

One best presentation will be selected from each session, evaluated from: Originality; Applicability;
Technical Merit; PPT; English. The best one will be announced at the end of each session, and awarded the certificate over the Closing Session. Session group photo will be taken after each session. Please feel free to join us for this memorable experience.

A very warm welcome to all participants and our best wishes that you enjoy both the technical and the social activities of ICEER2017 and your stay in Porto.

Nidia Caetano
ICEER2017 Organizing Committee and Conference Chair
ISEP, Porto, Portugal
Committees

Honour Committee

Rosário Gambôa, President of P.Porto, PT
João Rocha, President of ISEP, PT
Carlos Mineiro Aires, President of the Ordem dos Engenheiros, PT
Joaquim Poças Martins, President of the Northern Region Board of Ordem dos Engenheiros, PT
Yves Y.Xie, SCIEI, CN

Organizing Committee

Conference Chair

Nidia Caetano, CIETI/Polytechnic of Porto & LEPABE/FEUP/U.Porto, PT

Program Chair

Carlos Felgueiras, CIETI/ISEP/P.Porto, PT

Local Committee

Anabela Guedes, CIETI/ISEP-School of Engineering, P.Porto, PT
André Vaz Fidalgo, CIETI/ISEP-School of Engineering, P.Porto, PT
Isabel Pereira, CIETI/ISEP-School of Engineering, P.Porto, PT
Leonilde Cristina Morais, CIETI/ISEP-School of Engineering, P.Porto, PT
Margarida Ribeiro, CIETI/ISEP-School of Engineering, P.Porto, PT
Paula Neto, CIETI/ISEP-School of Engineering, P.Porto, PT
Ricardo Costa, CIETI/ISEP-School of Engineering, P.Porto, PT
Teresa Sena Esteves, CIETI/ISEP-School of Engineering, P.Porto, PT

Scientific & Technical Committee

Nídia Caetano, CIETI/ISEP/P.Porto & LEPABE/FEUP/U.Porto, PT (Co-Chair)
Carlos Felgueiras, CIETI/ISEP/P.Porto, PT (Co-Chair)
Abdellah Kouzou, Applied Automation and Industrial Diagnostics Laboratory, Faculty of Sciences and Technology, Djelfa University, DZ
Adélio Mendes, LEPABE - University of Porto, PT
Adriano Peres, Universidade Federal de Santa Catarina, UFSC Blumenau, BR
Ahmad Abu-Jrai, Department of Environmental Engineering, College of Engineering, Al-Hussein Bin Talal University, JR
Alírio Rodrigues, Emeritus Professor, U.Porto-FEUP-LSRE, PT
Ana Meira Castro, Department of Mathematics/ISEP, P.Porto, CERENA-Polo FEUP, Center for Natural Resources and the Environment, PT
Anabela Leitão, Agostinho Neto University, Luanda – Angola, AO
Andre Vaz Fidalgo CIETI/ISEP/P.Porto, PT
Andrew Quinn, International lead Department of Engineering (Europe and India), Glasgow Caledonian University Glasgow, UK
Arminda Alves, LEPABE - University of Porto, PT
Ayşegül Aşkin, Department of Chemical Engineering, Faculty of Engineering and Architecture, Eskisehir Osmangazi University, TR
Barry A. Benedict, Department of Mechanical Engineering, University of Texas at El Paso, US
Beléza Carvalho, J.A., Department of Electrical Engineering / ISEP / P.Porto, PT
Cândida Vilarinho, University of Minho, PT
Carlos A.V. Costa, Emeritus Professor, University of Porto – LEPABE, PT
Carlos Borrego, Department of Environment and Planning, University of Aveiro, PT
Carlos Silva Santos, CIDEM/ISEP-School of Engineering, P. Porto, PT
Catalin Popescu, Business Administration Department, Oil and Gas University, Ploiesti, Romania, RO
Clovis Antonio Petry, Electronics Department, Federal Institute of Santa Catarina, BR
Coriolano Salvini, Universita degli Studi Roma Tre, Department of Engineering, Rome, Italy, IT
Costas Velis, University of Leeds, Waste-to-Energy Research and Technology Council UK, UK
Crispim Ribeiro CIETI/ISEP-School of Engineering, P.Porto, PT
Eugénio Campos Ferreira, Center of Biological Engineering, University of Minho, PT
Eduardo Bruno Vivas, Civil Engineering Department, ISEP/P.Porto, PT
Francisco José García Peñalvo, University of Salamanca, SP
František Janícek, Slovak University of Technology in Bratislava, Bratislava, Slovakia, SK
Galyna Tabunshchyk, Software Tools Department, Zaporizhzhya National Technical University, UA
Gustavo R. Alves, CIETI/ISEP-School of Engineering, P.Porto, PT
Helder Santos, ADAI-LAETA IPLeiria Delegation, Polytechnic Institute of Leiria, PT
Hikmet Karakoc, Department of Airframe and Powerplant Maintenance, Faculty of Aeronautics and Astronautics, Anadolu University, TR
Hocine Belmili, Unité de Développement des Équipements Solaires - UDES/EPST-CDER- Algeria, DZ
Isabel Maria Soares, University of Porto, Faculty of Economics, PT
Isabel Praça, GECAD, School of Engineering, P.Porto, Portugal, PT
Jean-Pierre Gerval, Head of the SIAM research team; Ecole Nationale d’Ingénieurs de Brest; ISEN - Yncréa Ouest, FR
Joaquim José Borges Gouveia, Full Professor (Retired), University of Aveiro, PT
Joaquim Sabino Domingues, Mechanical Engineering Department / ISEP, P.Porto, PT
José Carlos Lopes da Costa, Mechanical Engineering Department / ISEP, P.Porto, PT
José Tenreiro Machado, Department of Electrical Engineering / ISEP, P.Porto, PT
Lei Ren, National University of Ireland Galway, IE
Luis Marinheiro, ISWA Working Group on Landfill, Vienna, Austria, AT
Luis Schlichting, Departamento Acadêmico de Eletrônica – DAELN, Instituto Federal de Santa Catarina - Campus Florianópolis – IFSC, BR
Martin Llamas Nistal, School of Telecommunication Engineering, University of Vigo, SP
Marzieh Shafiei, Department of Chemical Engineering, Faculty of Engineering, University of Isfahan, IR
Meisam Tabatabaei, Biofuel Research Team (BRTeam), Agricultural Biotechnology Research Institute of Iran (ABRII), IR
Miroslava Smitkova, Slovak University of Technology in Bratislava, Bratislava, SK
Local Information

Conference Venue
ISEP- School of Engineering, Polytechnic of Porto (P.Porto)
Address: Rua Dr. António Bernardino de Almeida, 431, 4249-015 Porto

Conference Registration
Registration Desk, Events Room

Session Rooms
ISEP: Auditorium E; H building (Room 1, Room 2, Room 3) & Events room
ISEP Campus

ISEP is one of the top schools of technology in Portugal, and has been pioneering education and research in Engineering since 1852 and is also a trademark of Porto. Its long history is well documented in the local museum. From 2015, the ISEP Museum has become part of the Portuguese Museum Network, being the second museum of Science & Technology that integrated this network, together with the National Museum of Natural History and Science (that belongs to the University of Lisbon).

Samples of ancient equipment property of ISEP Museum: left) Zoelly steam turbine model, used for educational purposes, dated 1889; right) Transmission, dated 1888.

The ISEP goal is to contribute to the achievement of sustainable development, by creating and transmitting applied knowledge. This school has its own special long-established academic environment, which has been revealed as an important success factor. The several taught subjects are strongly supported by experimental and practical classes. At the same time, students’ potential is channeled with the spirit of entrepreneurship, teamwork, out-of-box thinking and technical expertise, key skills for a successful international career.

ISEP offers a wide range of syllabus in different fields of Engineering, and it serves approximately 6500 students distributed by 14 undergraduate and 12 master courses, which partially justifies the large attraction of international students.

Time
UTC/GMT

Banks and Foreign Exchange
The Currency is EURO here, you can exchange foreign currency 24 hours at the airport, or exchange at the bank, Money exchanger.
Tourist information & Security tips

The city of Porto
Located along the Douro river estuary in northern Portugal, Porto is one of the oldest European centres, and registered as a World Heritage Site by UNESCO in 1996. Its Latin name, Portus Cale, has been referred as the origin for the name “Portugal”, based on transliteration and oral evolution from Latin. In Portuguese, the name of the city is spelled with a definite article as “o Porto” (English: the port). Consequently, its English name evolved from a misinterpretation of the oral pronunciation and referred to as “Oporto” in modern literature and by many speakers.
Porto is one of the oldest tourist destinations in Europe and benefits from a privileged geographic location, complemented by a modern transport and communications network. The richness of its monumental and artistic heritage, Port Wine, numerous leisure facilities and its cultural and gastronomic attractions invite you to visit this contemporary and inspired city well known for its hospitality, friendliness and cosmopolitan environment.
You can search more Tourist Information and Security tips online.

Weather

The Weather Situation of Porto in July

Average daily minimum temperature  Average daily highest temperature

16°C  26°C

Emergency
Emergency phone: 112

Power

230V
Visit to ISEP-School of Engineering of P.Porto

Timetable:
15:00pm-17:00pm  A visit to the ISEP Campus - - know it all
Instructions for Oral & Poster Presentations

Oral Presentations

- **Timing**: a maximum of 15 minutes total, including speaking time, discussion and changing presenters. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.

- You can use CD or USB flash drive (memory stick); make sure you scanned viruses in your own computer. Each speaker is required to meet her / his session chair in the corresponding session rooms 15 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.

- **It is suggested that you email a copy of your presentation to your personal in box as a backup.** If for some reason the files cannot be accessed from your flash drive, you will be able to download them to the computer from your email.

- Please note that each session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft Power Point and Adobe Reader. Please make sure that your files are compatible and readable with our operating system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.

- Movies: If your Power Point files contain movies, please make sure that they are well formatted and connected to the main files.

Oral Flash Presentations

- **Timing**: a maximum of 5 minutes total, including speaking time (3 min), discussion and changing presenters. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.

Poster Presentations

- Maximum poster size is 84 cm wide by 119 cm high (A0)

- Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart.

- Please note that during poster sessions, the author should stay by the poster to explain and discuss the paper with visiting delegates.

Dress Code

- Please wear formal clothes or national characteristic clothing.
Keynote Speakers

Dr. Hooman Farzaneh
Institute of Advanced Energy, Kyoto University, Japan

Dr. Hooman Farzaneh is a Jr. Associate Professor at the Institute of Advanced Energy, Kyoto University, Japan. He has expertise on a broad spectrum of issues related to quantitative and qualitative analysis focusing on developing research patterns of low carbon scenarios and policy implementations designed to tackle air pollution problems in regional and local scales. Before joining Kyoto University, Hooman worked as a research fellow at the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS), Tokyo, Japan. He has been involved in several research projects in relation to sustainable development and mitigation such as climate co-benefits approach in Asian Cities and transfer of low carbon technology to developing countries. He also collaborated with the graduate school of energy science, Kyoto University as a research fellow and a member of the Global Center of Excellence (GCOE) scenario planning group. Dr. Farzaneh is currently conducting a comprehensive research on clean energy development for urban sustainability and serving as the Principle Investigator of a research project entitled "Assessing the multiple benefits of clean energy policies in Asian mega-cities" at Kyoto University. Born and educated in Iran, Hooman holds a bachelor's degree in chemical engineering and master’s and PhD degrees in energy system engineering. He has published over 40 journal and conference papers and numerous other reports (both public and confidential).

Clean Energy Development in Asian Cities, Challenges and Opportunities

Abstract: Cities throughout Asia have experienced an unprecedented economic development over the past decades. In many cases, this has contributed to their rapid and uncontrolled growth, and has resulted in multiple problems, which include a rapid population increase, enhanced environmental pollution, collapsing traffic systems, dysfunctional waste management, as well as a rapid increase in the consumption of energy, water, and other resources. Cities in rapidly industrialized regions of Asia face many tasks related to economic and environmental issues. So far, the energy use and emissions are not well understood. Urban authorities are largely not aware of the multiple benefits of energy management and GHG reduction. Given their growing scale and significance, Asian cities will have to be active in the global fight against climate change if it is to be effective. Municipal authorities in Asian cities therefore have a significant scope to pursue urban low emission strategies and clean energy initiatives in ways that will also foster economic development. Moreover, clean energy initiatives at the city scale could generate knowledge and innovations that can have wider economic and social benefits, in addition to inspiring climate action in other cities and at a national scale. Without more coordination between international, national, regional and local institutions, integration into different sectoral priorities and policies, and engagement between the public, private and civic sectors it seems likely that the cities in Asia will lock in more fully to high-cost, high carbon development paths. Because of the global significance of Asian cities, policies and programs, facilitating
large-scale adoption and deployment of clean and renewable energy will need to play a central role in this area. This research will demonstrate a new strategic planning mechanism for achieving multiple energy, environmental, public health and economic benefits of clean energy development strategies in Asian cities, together with a robust analytical framework that can be used to assess those benefits during the development and implementation process. By evaluating potential clean energy policies with criteria that cut across the multiple benefits, localities are able to select options that facilitate the achievement of multiple goals and avoid options that may impede key priorities. The first part of this presentation will focus on evaluating the existing clean energy policy developments, countermeasures and challenges in the selected cities in Japan, South Korea, China and India. The second part will address in detail the role of executive clean energy policy targets that are consistent with sustainability goals and the final part will summarize the key opportunities and the institutional barriers to mainstreaming clean energy development in these cities. This research project is supported by the Unit of Academic Knowledge Integration Studies of Kyoto University and the Japan Society for the Promotion of Science (JSPS).
Electricity from renewable sunlight: cheaper and cleaner

Abstract: In the 16th century Thomas More described an ideal and sustainable city in his book Utopia. Today’s ideal city should comply with the Near Zero Energy Building directive and going beyond. Photovoltaic (PV) electricity is already today the cheapest, if produced in countries with high solar irradiance. However, PV electricity is only generated during the daylight time and then just partially dispatchable. To make it fully dispatchable it is necessary to store it and batteries storage is a technology of choice. Among electricity storage technologies, redox flow batteries (RFB) emerged as promising offering low storage costs – expected of 3 €/kWh/cycle [1], independent power from storage capacity, very reliable and robust operation. The all vanadium RFBs display an energy density that can reach 50 Wh/L but the use of non-aqueous solvents for dissolving the redox pairs promise to bring soon this energy density to values that ideally can reach 1 kWh/L. The storage of electricity is made in an electrochemical fluid – electrochemical fuel, instead of being made in a solid such as in conventional batteries, which opens the doors for easy storage and transport.

More recently, it was proposed the direct conversion of sunlight into storable electrochemical fuels using photoelectrochemical panels. These panels comprehend just a glass window coated with a semiconductor and an ion-exchange membrane; the positive and negative electrolytes pass through charging and heating up in a cogeneration process. The solar redox flow batteries promise to bring the cost of stored electricity to even lower values making the dream of self-energy sustainable cities a closer reality.
Gustavo R. Alves graduated in 1991 and obtained an MSc and a PhD degree in Computers and Electrical Engineering in 1995 and 1999, respectively, from the University of Porto, Portugal. He is a professor at the Polytechnic of Porto - School of Engineering, since 1994. He has authored or co-authored +180 conference and journal papers with referee process, 7 book chapters, and co-edited a book, (with Javier García-Zubía, University of Deusto, Spain), about "Using Remote Labs in Education". He has also been involved in 19 national & international research projects. His research interests include engineering education, remote experimentation, and design for debug & test. He served as program co-chair of the 1st and 2nd International Conferences of the Portuguese Society for Engineering Education (CISPEE2013 and CISPEE2016), as general chair of the 11th Remote Engineering and Virtual Instrumentation (REV2014) conference and of the 3rd Technological Ecosystems for Enhancing Multiculturality (TEEM2015) conference, and also as a Program Committee member of several international conferences. Dr. Alves is a member of the Portuguese Society for Engineering Education (SPEE), the Global Online Laboratory Consortium (GOLC), the Portuguese Engineers Association (OE), the Institute of Electrical and Electronics Engineers (IEEE), the Association for Computing Machinery (ACM), and of the Virtual Instrumentation Systems in Reality - Special Interest Group (VISIR-SIG). He has served as guest editor at the international Journal of Online Engineering (iJOE), the international Journal of Engineering Pedagogy (iJEP), the IEEE Latin-American Learning Technologies Journal (IEEE-RITA), the European Journal of Engineering Education (EJEE), and Computers in Human Behavior (CHB). He currently serves as an Associated Editor for the IEEE Transactions on Learning Technologies.

Remote labs in Higher Education: building multicultural and sustainable learning environments

Abstract: In Higher Education, students are expected to conduct many experiments while taking a degree in science and engineering areas. With the recent contribution of Information and Communication Technologies, these experiments may be done in remote labs, in addition to traditional hands-on labs and computer simulations. While there have been discussions around the effective educational value of remote experiments in comparison with hands-on experiments and computer simulations, in this keynote we will focus our attention on two additional aspects, i.e.: how remote labs promote the creation of multicultural learning environments and how they address sustainability. In particular, we will consider the three major aspects associated with sustainability: economic practice, social integration, and environmental protection.

This presentation will sustain some of its claims with evidence obtained from on-going collaboration projects related to a particular remote lab, namely:

- The VISIR+ project, which aims to install the Virtual Instruments Systems in Reality (VISIR) remote lab in 5 Institutions of Higher Education located in Argentina and Brazil
• The PILAR project, which aims to federate 5 VISIR nodes installed in 5 European Institutions of Higher Educations.

Interested attendees are invited to visit the following web sites and prepare themselves for the forthcoming presentation. The presenter wishes to do a sort of flipped keynote where a few questions will be posed to the audience, in order to assess if the keynote goal has been achieved.

  • http://www.go-lab-project.eu
  • http://www.labshare.edu.au
  • http://vlab.co.in
Integrated Sustainable Solutions That Incorporate Resilience and Asset Management

Abstract: Sustainability requires consideration of environmental, economic, and social issues. Life cycle sustainability assessment (LCSA) includes environmental LCA (life cycle assessment), life cycle costs, and social LCA. Asset management also includes life cycle costs, as well as commitment to the public and risk management. Resilience can also be seen as the ability to respond promptly and thoroughly to hazardous (or chronic) problems. Since the response must include responding to environmental, economic, and social disruption, resilience can be considered as a design process aligned with LCSA. Further, asset management and risk assessment are linked. Since life cycle costs are contained within these analyses, the underlying factors for asset management, risk assessment, life cycle sustainability assessment, and resiliency can be considered together. This paper outlines how to build upon the LCSA framework to include elements of uncertainty (and hence risk assessment) plus how to use the same features to assess resilience and asset management. Scenario planning will be applied to the life cycles for the three sustainability elements contained within LCSA. The scenarios developed will be based on critical events based on plausible outcomes within the STEEP (Social, Technological, Economic, Environmental, and Political) arenas. This will typically include four scenarios (or plausible futures) that can each be applied to the life cycle assessment of each of the three elements of sustainability. This enables reviewing the possible risks associated with any future.
These scenarios will be further applied to design for resilience and asset management. There are some slight differences involved between these two elements and sustainability, and those will be described. All these processes are commonly under the same organizational unit, so this author believes that the combination of elements will lead to savings of time and costs, while ultimately producing more robust assessments.
Invited Lecturers

Dr. Parthiba Karthikeyan Obulisamy
Hong Kong Baptist University, Hong Kong SAR, P.R. China

Dr. Obulisamy Parthiba Karthikeyan (OPK) is an Research Assistant Professor from Sino-Forest Applied Research Centre for Pearl River Delta Environment, Department of Biology, Hong Kong Baptist University, Hong Kong. He also hold adjunct appointment with James Cook University, Australia as a Senior researcher. Dr. OPK has more than 8 years of post-doctoral research experience in waste management and material recycling, bioleaching studies and biogas to value added product researches. Dr. OPK bestowed with Australia-Thailand Early Career Research Exchange Award-2014 to Australian Embassy in Thailand, Innovative Research University Group and Office of the Higher Education Commission, Australia for his contribution in the field of Environment and Sustainability. He is also serving as an Assessor member for Australian Research Council, Australia and ad-hoc reviewer for the United States Department of Agriculture (USDA), USA and Research Foundation – Flanders (FWO), Belgium. He also serve as guest editor for Bioresource Technology, Frontiers journals. Recently he is awarded with the research fund of 0.5 million hong kong dollars by Environmental Conservation Fund, Hong Kong his innovative research project on "in-situ biogas upgradation during anaerobic digestion". Dr OPK has authored 2 books, 5 chapters and more than 45 research publications in peer reviewed journals (H-Index-10; cumulative impact factor 150). He currently co-supervises 2 PhD students from James Cook University, Australia on methane bio-refinery.

Bio-refining of Food Waste for Fuel and Energy

Abstract: Food production and wastages are serious issue for the global economy and environment. More resources are exploited for production, while one third of produce is disposed as food waste. It is projected that the food waste disposal will be ~2.2 billion tons by 2025. Therefore, developing an appropriate management plans, legislations and policies to reduce, reuse and recycle the food waste is mandate. Considering the physiochemical and biological nature, the food waste could be used as a raw material for fuel and energy productions will facilitate the bio-circular economy and reduce the environmental impacts. Bio-refining of food waste (and other organic resources) are emerged as an independent subject in last decade and matter of debate in terms of validity and viability to replace/substitute the fossil based economy. In this paper we proposed to use of integrated bio-refinery approach to produce fuel precursors and bioenergy using food waste as viable source. The literature review proved that the combined fuel and energy production is highly reliable option and easy to scale-up. However, the traditional technologies (i.e, composting and anaerobic digestion) are irreplaceable and could be part of food waste integrated bio-refinery concept to maximize the benefits are evident. A detailed life-cycle analysis will be considered to develop a bestowed bio-refinery concept to meet the local need and policy.
Rui Rigueira is a Renewable Energy Trainer at CENFIM, ISQ, CICOPN, CATIM, IEP. He has been developing professional activity as Solar Systems Project Designer (INETI), IR Thermograph, Infrared Training Center (ITC). PhD in Natural Gas and Gas Networks (FCTUC – IPN), Master in Mechanical Engineering (ISEP), Bachelor in Mechanical Engineering (ISEP).

**PCM at DHW – A Successful Case**

**Abstract:** In this presentation it will be discussed the Phase Change Materials (PCM), specifying the use of lower temperature PCM for thermal energy storage for DHW use. It will be presented the operating principle of the DHW energy storage tank with PCM and its specific design details. Finally, it will be presented a Thermodynamic Mechanical Engineering success case, using the thermal solar energy storage tank LATENTO® for DHW.
Prof. Helder Santos
ADAI-LAETA / Polytechnic Institute of Leiria (IPL), Portugal

Helder Manuel Ferreira Santos received his mechanical engineering bachelor’s degree at University of Coimbra, Portugal, in 2000 and his master and Ph.D. degrees from Lisbon Technical University, Portugal, in 2006 and 2010 respectively. He started the teaching activity in 2000 as Assistant Professor and is today Adjunct Professor with the Mechanical Engineering Department, School of Technology and Management (ESTG), Polytechnic Institute of Leiria (IPL), Leiria, Portugal.

Prof. Helder Santos is member of the R&D center ADAI-LAETA, Polytechnic Institute of Leiria (IPL) delegation. His research interests include vehicle exhaust gas after treatment systems and waste heat recovery in automotive vehicles.

He has been coordinator of various research projects, some of them with industrial partners. He has also supervised several Master thesis. He has published about 30 papers, 10 of them in international Journals, at the present his h index is 6. He has been the reviewer of numerous scientific publications in international journals and conferences. He has also participated in several conferences, having presented several communications.

Advanced vehicle exhaust gas after treatment systems technologies to meet EU and US emission regulation

Abstract: This presentation summarizes major developments in vehicular emissions regulations and exhaust gas after treatment systems technologies for both gasoline and diesel ICE (internal combustion engine). The presentation starts with the key regulatory advancements in the field and presents the main trends in gasoline and diesel vehicle emissions regulations (pollutants) and greenhouse gases (GHG). Key engine developments are summarized for the ICE propulsion system in both LD (light duty) and HD (Heavy Duty). LD gasoline concepts are achieving 45% BTE (brake thermal efficiency) and closing the gap with diesel. HD engines are demonstrating more than 50% (BTE) using methods that can reasonably be commercialized; and proposals are developed for reaching 55% BTE. Regarding the emission control, the latest developments in vehicle exhaust gas after treatment systems will be reviewed: TWC (three way catalysts), DOC (diesel oxidation catalyst), DPF (diesel particulate filter), GPFs (gasoline particulate filters), lean NOx control technologies, including LNT (lean NOx traps), SCR (selective catalytic reduction) with ammonia, and hydrocarbon-based approaches, SCR filters, and combination systems. Main emissions challenges include NOx conversion under lean burn engine operation and PM (particulate matter) reduction for both gasoline and diesel engines. In diesel engines, PM (particulate matter) reduction technologies are evolving new DPF (diesel particulate filter) materials for reduced engine exhaust back pressure and SCR integration. Gasoline direct injection (GDI) particulates carry PAHs (polycyclic aromatic hydrocarbons) through the TWC, but filters can remove most of them. GPF regeneration is now better understood, he emerging technology of GPFs (gasoline particulate filters) will be presented. At the end, the results of a research project dedicated to the study of the influence of the TWC design parameters
(substrate cell density, washcoat structure and thickness) on the mass transfer and reaction resistances will be presented, which allows an improved understanding of the catalyst-support interactions and to conclude about the most important design guidelines to further enhance TWC conversions.
Engº Manuel Carvalho graduated in Electrical and Computer Engineering at the Faculty of Engineering of University of Porto (FEUP)
Specialist in Safety and Health at Work.
Responsible by Health, Safety and Environment at Bosch Car Multimédia Portugal S.A from 2000 to 2017.
Responsible by Health, Safety and Environment of the Car Multimédia Division of Bosch since 2017.

Bosch - Futuring a sustainable mobility

Abstract: With Connected mobility, Smart Home, Smart Cities, Industry 4.0 and IoT we are preparing the future with sustainability.
Four Pilars will be addressed:
• Sustainable mobility:
  Bosch pursues the aim of sustainable mobility, which is low in harmful substances and does not rely on fossil fuels.
• Energy efficiency:
  Our products are energy efficient, help conserve resources and save costs. In short, they are good for our customers and for the environment.
• Renewable energies:
  Solutions in the areas of power generation, energy storage and smart management of renewable energies.
• Design for Environment:
  With this initiative, Bosch is ensuring that its technologies are becoming increasingly eco-friendly throughout the product life cycle
# Daily Schedule of Events

<table>
<thead>
<tr>
<th>July 17th</th>
<th>July 18th</th>
<th>July 19th</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main Auditorium</td>
<td>Main Auditorium</td>
</tr>
<tr>
<td>9:30-9:50</td>
<td>Opening Ceremony</td>
<td>9:15-10:00</td>
</tr>
<tr>
<td>10:00-10:45</td>
<td>KN1: Prof. Hooman Farzaneh</td>
<td>10:00-10:45</td>
</tr>
<tr>
<td>10:45-11:15</td>
<td>Coffee break &amp; Group Photo</td>
<td>10:45-11:15</td>
</tr>
<tr>
<td>11:15-12:00</td>
<td>KN2: Prof. Adélio Mendes</td>
<td>11:15-12:45</td>
</tr>
<tr>
<td>12:00-12:45</td>
<td>KN3: Prof. Gustavo Alves</td>
<td></td>
</tr>
<tr>
<td>12:45-14:00</td>
<td>Lunch &amp; Break</td>
<td>12:45-14:00</td>
</tr>
<tr>
<td>14:00-14:20</td>
<td>Room 1</td>
<td>IL1</td>
</tr>
<tr>
<td>14:20-14:35</td>
<td>Session 1A</td>
<td>O118</td>
</tr>
<tr>
<td>14:35-14:50</td>
<td>O119</td>
<td>O013</td>
</tr>
<tr>
<td>14:50-15:05</td>
<td>O165</td>
<td>O117</td>
</tr>
<tr>
<td>15:05-15:20</td>
<td>O108</td>
<td>O139</td>
</tr>
<tr>
<td>15:35-15:50</td>
<td>Session OF1</td>
<td>Session OF2</td>
</tr>
<tr>
<td>15:50-16:20</td>
<td>Coffee break &amp; Poster sessions</td>
<td>15:50-16:20</td>
</tr>
<tr>
<td>16:20-16:35</td>
<td>Session 1B</td>
<td>O089</td>
</tr>
<tr>
<td>16:35-16:50</td>
<td>O094</td>
<td>O025</td>
</tr>
<tr>
<td>16:50-17:05</td>
<td>O096</td>
<td>O035</td>
</tr>
<tr>
<td>17:05-17:20</td>
<td>O157</td>
<td>O045</td>
</tr>
<tr>
<td>17:20-17:35</td>
<td>O194</td>
<td>O054</td>
</tr>
<tr>
<td>17:35-17:50</td>
<td>O093</td>
<td>O085</td>
</tr>
<tr>
<td>17:50-18:10</td>
<td>O147</td>
<td>O179</td>
</tr>
<tr>
<td>19:00-23:30</td>
<td>Conference Dinner</td>
<td>18:30-20:30</td>
</tr>
</tbody>
</table>

**IL1:** Dr. Parthiba Karthikeyan Obulisamy  
**IL2:** Engº Rui Rigueira  
**IL3:** Prof. Helder Manuel Ferreira Santos  
**IL4:** Engº Manuel Carvalho

**Room 1:** H202 / **Room 2:** G201 / **Room 3:** H207
## Contents of Sessions

### 18\textsuperscript{th} July

### Session 1A: Energy Systems Modelling

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O119</td>
<td>Development of a Solar Cavity Receiver with a Short-Term Storage System</td>
<td>Ambra Giovannelli and Muhammad Anser Bashir</td>
</tr>
<tr>
<td>O165</td>
<td>Renewable energies: Modeling and optimization of energy production</td>
<td>Ismail El Kafazi, Rachid Bannari, El Bouzekri El Idrissi, Abida and Hmina Nabil</td>
</tr>
<tr>
<td>O108</td>
<td>Mathematical Modelling of Portuguese Hydroelectric Energy System</td>
<td>Florinda Martins, Carlos Felgueiras, and Miroslava Smitková</td>
</tr>
<tr>
<td>O122</td>
<td>Performance Assessment of a CAES System Integrated into a Gas-Steam Combined Plant</td>
<td>Coriolano Salvini</td>
</tr>
</tbody>
</table>

### Session OF1: Energy

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF02</td>
<td>Flow control in Banki turbines</td>
<td>Daniela Popescu, Constantin Popescu, Andrei Dragomirescu</td>
</tr>
<tr>
<td>OF026</td>
<td>Numerical and experimental test of a cylindrical wave energy system with horizontal rotation</td>
<td>Min-Su Park, Youn-Ju Jeong, Jeong-Soo Kim and Yoon-Koog Hwang</td>
</tr>
<tr>
<td>OF064</td>
<td>Energy analysis of a subsea steam Rankine cycle for the subsea power supply</td>
<td>Han Yuan, Jian Zhao, Yan Li, Ji Zhang and Ning Mei</td>
</tr>
<tr>
<td>OF097</td>
<td>Analysis of the icing and melting process in a coil heat exchanger</td>
<td>Yan Li, Chao Yang, Zhe Yan, Bin Guo, Han Yuan, Jian Zhao and Ning Mei</td>
</tr>
<tr>
<td>OF100</td>
<td>Parametric study of multicomponent mooring lines at catenary form in terms of anchoring cost</td>
<td>Paulo A. Figueiredo and Francisco M. Brójo</td>
</tr>
</tbody>
</table>

### Invited Lecture 1 by Dr. Parthiba Karthikeyan Obulisamy

Bio-refining of Food Waste for Fuel and Energy

### Session 2A: Biomass & Biofuels Production

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O012</td>
<td>Production of dry extract extracellular lipase from fungus \textit{Aspergillus niger} by solid state fermentation method to catalyze biodiesel synthesis</td>
<td>Tania Surya Utami, Ines Hariyani, Gandhi Alamsyah, Heri Hermansyah</td>
</tr>
</tbody>
</table>
Effect of chitosan’s amino group in adsorption-crosslinking immobilization of lipase enzyme on resin to catalyze biodiesel synthesis

Improving waste-to-energy process by co-digestion of exhausted coffee biowaste and WWTP sludge

Energetic efficiency of hybrids of *Corymbia citriodora* and *Corymbia torelliana*

Analyzing *Phaeodactylum tricornutum* lipid profile for biodiesel production

### Session OF2: Biological Applications

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF014</td>
<td>Production of α-Amylase and β-Glucosidase from <em>Aspergillus niger</em> by solid state fermentation method on biomass waste substrates from rice husk, bagasse and corn cob</td>
<td>Andi Aliyah, Gandhi Alamsyah, Rizky Ramadhani, Heri Hermansyah</td>
</tr>
<tr>
<td>OF110</td>
<td>Lipid and carbohydrate profile of a microalga isolated from wastewater</td>
<td>O. Oliveira, Sônia Gianesella, Vânia Silva, Teresa Mata, Nidia Caetano</td>
</tr>
<tr>
<td>OF163</td>
<td>Optimization of waste management scenarios by principal component analysis: a case study in Reunion Island</td>
<td>Christelle Hatik and Jean-Claude Gatina</td>
</tr>
</tbody>
</table>

### Invited Lecture 2 by Engº Rui Rigueira

PCM at DHW – A Successful Case

### Session 3A: Energy Harvesting & Storage

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O057</td>
<td>Investigation into a Multi-stage Rotor Rotating Magnetic Field Generator Powered by Ocean Current</td>
<td>Han Yuan, Jian Zhao, Lu Wang and Ning Mei</td>
</tr>
<tr>
<td>O101</td>
<td>Theoretical analysis of ammonium-perchlorate based composite propellants containing small size particles of boron</td>
<td>Paulo A. Figueiredo and Francisco M. Brójo</td>
</tr>
<tr>
<td>O129</td>
<td>1D modelling of membrane-assisted chemical looping reforming</td>
<td>J. F. Morgado, Schalk Cloete, John Morud, T. Gurker, Rosa M. Quinta-Ferreira, and S. Amini</td>
</tr>
</tbody>
</table>

Coffee Break
### Session 1B: Systems Simulation and Modelling

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O089</td>
<td>Effects of pressure loss coefficients of heat exchanger on thermal performance of the dry cooling tower</td>
<td>Huan Ma, Fengqi Si, Xuebo Li, Junshan Wang</td>
</tr>
<tr>
<td>O094</td>
<td>1D Kinetic Analysis and 3D Multi-channel Modeling of Plate-type Monolithic Catalysts for a Selective Catalytic Reduction Process</td>
<td>Cong Yu, Bei Zhang, Wei Fan, Shaojun Ren, Shuzhou Li, Xiaoming Jiang, Fengqi Si</td>
</tr>
<tr>
<td>O096</td>
<td>Simulation of the reconstruction of the boundary layer by moving cylinders</td>
<td>Yan Li, Chuan Li, Yajie Wu, Cong Liu, Han Yuan, and Ning Mei</td>
</tr>
<tr>
<td>O157</td>
<td>Multiscale modelling of packed bed chemical looping reforming</td>
<td>Arpit Singhal, Schalk Cloete, Rosa Quinta-Ferreira and Shahriar Amini</td>
</tr>
<tr>
<td>O194</td>
<td>Investigation of new generation refrigerants under two different ejector mixing theories</td>
<td>Ayşə Uğurcan Atmaca, Ayğunc Erek, Orhan Ekren</td>
</tr>
<tr>
<td>O093</td>
<td>Load Reduction of Wind Turbines Using Trailing Edge Flaps</td>
<td>Nils-Christian Oltmann, Dorit Sobotta, Arndt Hoffmann</td>
</tr>
<tr>
<td>O147</td>
<td>Study, Design and Manufacturing of Hybrid Vertical Axis Savonius Wind Turbine for Urban Architecture</td>
<td>Belmili Hocine; Ridha Cheikh, and Ratiba Wided Biara</td>
</tr>
</tbody>
</table>

### Session 2B: Sustainability & Health

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O015</td>
<td>Recovery of Silicon Carbide from Waste Silicon Slurry by Using Flotation</td>
<td>Hsun-Chi Li, Wei-Sheng Chen</td>
</tr>
<tr>
<td>O025</td>
<td>Environment Influences and Extinguish Technology of Spontaneous Combustion of Coal Gangue Heap of Baijigou Coal Mine in China</td>
<td>Xiaowei Zhai, Shibo Wu, Kai Wang, Jingyu Zhao, Carsten Drebenstedt</td>
</tr>
<tr>
<td>O035</td>
<td>Forecasting sustainable development of transport sectors of Russia and EU: energy consumption and efficiency</td>
<td>Leontiy Eder, Irina Filimonova, Vasiliy Nemov and Irina Provornaya</td>
</tr>
<tr>
<td>O045</td>
<td>Indoor Radon Concentration Assessment in a Set of Single Family Houses: Case Study held in Barcelos, North of Portugal</td>
<td>António Curado, João Silva, Lucia Carvalho and Sérgio Lopes</td>
</tr>
<tr>
<td>O054</td>
<td>Eco-toxicity assessment of concrete prepared with industrial wastes</td>
<td>Isabel Brás, Paulo Silva, Ricardo Almeida, Maria Silva and Cristina Lourenço</td>
</tr>
<tr>
<td>O085</td>
<td>Effect of Workplace Environment on the Health of Women Construction Workers</td>
<td>Kiran Singh and Garima Yadav</td>
</tr>
<tr>
<td>O179</td>
<td>Developments of Renewable Energies in Forest Areas of Biosphere Reserve to Avoid Illegal Fuel Wood Exploitation</td>
<td>Mona Poorzady</td>
</tr>
</tbody>
</table>

### Session 3B: Energy and Environment Management

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O075</td>
<td>Renewable energy management to identify suitable biomass facility location with GIS-based assessment for sustainable environment</td>
<td>Jin Su Jeong and Álvaro Ramírez-Gómez</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Authors</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>O130</td>
<td>The optimal electric energy procurement problem under reliability constraints</td>
<td>Patrizia Beraldi, Antonio Violi, Gianluca Carrozzino, Maria Elena Bruni</td>
</tr>
<tr>
<td>O200</td>
<td>Engineering education towards sustainability</td>
<td>Manuel Carlos Felgueiras, João S. Rocha, Nidia Caetano</td>
</tr>
<tr>
<td>O160</td>
<td>A multiobjective unit commitment problem combining economic and environmental criteria in a BRKGA approach</td>
<td>Luís A.C. Roque, D.B.M.M. Fontes, F.A.C.C. Fontes</td>
</tr>
<tr>
<td>O164</td>
<td>A multi-level approach to analyze the effects of renewable energy in wine sector</td>
<td>Nieves García-Casarejos, Pilar Gargallo, M.M. Begoña Cabanés</td>
</tr>
<tr>
<td>O199</td>
<td>Weighing-in-motion wireless system for sustainable railway transport</td>
<td>Bruno Costa, Rudolfo Martins, Magno Santos, Carlos Felgueiras, Rui Calçada</td>
</tr>
</tbody>
</table>
## 19th July

**Invited Lecture 3 by Prof. Helder Manuel Ferreira Santos**

Advanced vehicle exhaust gas after treatment systems technologies to meet EU and US emission regulation

**Session 4A: Sustainable Buildings and Cities**

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O008</td>
<td>Scenario-based design and assessment of renewable energy supply systems for green building applications</td>
<td>Youngjin Jeong, Minji Lee, Jiyong Kim</td>
</tr>
<tr>
<td>O033</td>
<td>Energetic study of water loop heat pump systems for office buildings in the Iberian Peninsula</td>
<td>Francisco Javier Fernández, Belén Folgueras, Inés Suárez</td>
</tr>
<tr>
<td>O040</td>
<td>Improving Visual Comfort And Energy Efficiency In Existing Classrooms Using Passive Daylighting Techniques</td>
<td>Shouib Mabdeh and Baraa Al-Khatatbeh</td>
</tr>
<tr>
<td>O099</td>
<td>Key performance indicators in green construction</td>
<td>Vatin N., Nemova D., Petrichenko M., Kazimirova A., Petrochenko M., Olshevsky V.</td>
</tr>
<tr>
<td>O032</td>
<td>An energy information system for retrofitting smart urban areas</td>
<td>Álvaro Sicilia, Leandro Madrazo, Marco Massetti, Fabian López Plazas</td>
</tr>
<tr>
<td>O083</td>
<td>Inter-Service Provider Charging Protocol: A Solution to Address Range Anxiety of Electric Vehicle Owners</td>
<td>Khalil Salah, Nazri Kama</td>
</tr>
</tbody>
</table>

**Invited Lecture 4 by Engº Manuel Carvalho**

*Bosch – Futuring a sustainable mobility*

**Session 5A: Water Pollution and Treatment**

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O065</td>
<td>Cheap metallic iron source for hexavalent chromium removal</td>
<td>Marius Gheju, Ionel Balcu</td>
</tr>
<tr>
<td>O111</td>
<td>Seasonal Variation of Nutrient Removal in a Full-Scale Horizontal Constructed Wetland</td>
<td>M.C. Mesquita, A. Albuquerque, L. Amaral, R. Nogueira</td>
</tr>
<tr>
<td>O138</td>
<td>Energy and environmental performance of wastewater treatment plants: A statistical approach</td>
<td>Renan Moreno, Manuela Correia and Florinda Martins</td>
</tr>
</tbody>
</table>
### Session OF3: Clima

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF146</td>
<td>The Saharan setting facing future climate</td>
<td>R. Wided Biara and Belmili Hocine</td>
</tr>
<tr>
<td>OF176</td>
<td>The legal framework for the energy sector in the Hashemite Kingdom of Jordan</td>
<td>Saleh AL-Sharari</td>
</tr>
<tr>
<td>OF178</td>
<td>Analysis and impact of the measures to mitigate climate change in Algeria</td>
<td>F. Sahnoune and K. Imessad</td>
</tr>
<tr>
<td>OF151</td>
<td>The economic value of the renewable heat obligation policy in the Republic of Korea</td>
<td>So-Yeon Park, Hyo-Yeon Choi and Seung-Hoon Yoo</td>
</tr>
<tr>
<td>OF042</td>
<td>CO₂ emission and reduction in transportation of tourism management at Suan Phueng Mountain, Thailand</td>
<td>A. Jamnongchob, O.Duangphakdee, Phongthep Hanpattanakit</td>
</tr>
</tbody>
</table>

### Session 6A: Wind and Solar Applications

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O029</td>
<td>Evaluation of Uncertainty in the Scheduling of a Wind and Storage Power Plant</td>
<td>J. L. Crespo-Vazquez, C. Carrillo, E. Diaz-Dorado</td>
</tr>
<tr>
<td>O102</td>
<td>Effect of the crucible-coating-silicon feedstock system quality on the electrical properties of the directional solidified multicrystalline silicon ingot</td>
<td>A. Lami, Y. Chettat, N. Drouiche, B. Palahouane</td>
</tr>
<tr>
<td>O140</td>
<td>Optimal Control of Kite Power Systems: Mesh-Refinement Strategies</td>
<td>L. Tiago Paiva and Fernando A.C.C. Fontes</td>
</tr>
<tr>
<td>O159</td>
<td>Distributed photovoltaic systems in Algeria and control of DC-DC converters for grid integration - An overview</td>
<td>S. O. Amrouche, S. H. Saidj, S. Boumechta, A. H. Arab, K. Abdeladim, Salim Bouchakour and Noureddine Yassaa</td>
</tr>
<tr>
<td>O041</td>
<td>The Aerodynamic Performance Investigation on the Archimedes Spiral Wind Turbine with 500W Class for Urban Usage</td>
<td>HoSeong Ji, JoonHo Baek, Rinus Mieremet, KyungChun Kim</td>
</tr>
</tbody>
</table>

### Session OF4: Miscellaneous

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF016</td>
<td>Study of the influence of current harmonics on the thermal behavior of LV cables by COMSOL Multi-physics software</td>
<td>Sid Ahmed Tadjer, Idir Habi, Al Ganaouei Mohammed and Scipioni Angel</td>
</tr>
<tr>
<td>OF195</td>
<td>Thermographic analysis of power transformers in the power plant of LAARBA, ALGERIA</td>
<td>Samira CHALAH, ismahan MAHDI, bouchra NADJI</td>
</tr>
<tr>
<td>OF107</td>
<td>Green bio-oil obtained from digested sewage sludge: new substitute bio-fuel to diesel oil in thermoelectric plants</td>
<td>Glacia E. G. Vieira, Fernanda Rêgo, Luana F. Teixeira</td>
</tr>
<tr>
<td>OF201</td>
<td>Study, design and analysis of sustainable alternatives to plastic takeaway cutlery and crockery</td>
<td>Anirudh Gautam, Nidia Caetano</td>
</tr>
<tr>
<td>OF133</td>
<td>Fish oil acidity reduction by enzymatic esterification</td>
<td>T. M. Mata, António A. Martins, D. Correia, A. Pinto, S. Andrade, I. Trovisco, E. Matos, N. S. Caetano</td>
</tr>
</tbody>
</table>
Session 4B: Combustion & Biogas Separation

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O059</td>
<td>Influence of temperature on the gasification of cork wastes</td>
<td>Sara Rodrigues, Ana Almeida, Albina Ribeiro, Paula Neto, Elisa Ramalho and Rosa Pilão</td>
</tr>
<tr>
<td>O109</td>
<td>Separation of biogas using newly prepared cellulose acetate hollow fiber membranes</td>
<td>Yong-Woo Jeon, Myung-Seop Shin</td>
</tr>
<tr>
<td>O150</td>
<td>Optimization-based approach for design and integration of carbon dioxide separation processes using membrane technology</td>
<td>Minsoo Kim, Sunghoon Kim, Jiyong Kim</td>
</tr>
<tr>
<td>O105</td>
<td>Impact of EGR and Engine speed on HCCI engine performance and tail pipe emissions</td>
<td>A O HASAN, Ahmad abu Jrai, Alaa H Almohtaseb, Farrukh Jamil</td>
</tr>
<tr>
<td>O177</td>
<td>Development of real exhaust emission from passenger cars in Algeria by using on-board measurement</td>
<td>R. Kerbach, S. Chikhi, M. Ménouèr</td>
</tr>
<tr>
<td>O002</td>
<td>Comparison of the fuel properties and the combustion behavior of PET bottle caps with lignite</td>
<td>N. Irem Unal, Siddika Mertdinc, Hanzade Haykirí-Acma, S. Yaman</td>
</tr>
</tbody>
</table>

Session 5B: Energy and Environment Management

<table>
<thead>
<tr>
<th>Paper ID</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>O112</td>
<td>Optimization of acid mine drainage remediation with central composite rotatable design model</td>
<td>D. Núñez-Gómez, F. Rubens Lapolli, Maria Elisa Nagel-Hassemer, Maria Ángeles Lobo-Recio</td>
</tr>
<tr>
<td>O115</td>
<td>Environmental Aspects and Impacts of a Waste Incineration Plant</td>
<td>Sofia Silva and A. Miguel Lopes</td>
</tr>
<tr>
<td>O128</td>
<td>The convenience benefits of induction cooktops over gas stoves for Korean households</td>
<td>Hyo-Jin Kim and Seung-Hoon Yoo</td>
</tr>
<tr>
<td>O131</td>
<td>Acidity Reduction of Mammalian Fat by Enzymatic Esterification</td>
<td>T. M. Mata, S. Andrade, Daniela Correia, Elisabete Matos, António A. Martins, Nidia S. Caetano</td>
</tr>
<tr>
<td>O142</td>
<td>Acidity Reduction in Animal Fats by Enzymatic Esterification: Economic and Environmental Analysis</td>
<td>António Martins, Fábio Pinto, Nidia Caetano and Teresa Mata</td>
</tr>
<tr>
<td>O153</td>
<td>Public willingness to pay for research and development of marine bio-hydrogen in Korea: Results of a contingent valuation survey</td>
<td>Se-Jun Jin, Seul-Ye Lim, Joseph Kim and Seung-Hoon Yoo</td>
</tr>
<tr>
<td>Paper ID</td>
<td>Title</td>
<td>Authors</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>O030</td>
<td>The green energy transition and civil society in Tunisia: Actions, motivations and barriers</td>
<td>Raja Akermi and Pr. Abdelfattah Triki</td>
</tr>
<tr>
<td>O038</td>
<td>Augmented energy-growth nexus: economic, political and social globalization impacts</td>
<td>Luis Miguel Marques, José Alberto Fuinhas, António Cardoso Marques</td>
</tr>
<tr>
<td>O081</td>
<td>Investigations Into Influences of Wind Field Resolution on Simulating Surface Currents for Galway Bay</td>
<td>Lei Ren, Diarmuid Nagle, Stephen Nash and Michael Hartnett</td>
</tr>
<tr>
<td>O086</td>
<td>Evaluation of economic, social and environmental effects of low-emission energy technologies in Poland – multi-criteria analysis</td>
<td>Magdalena Ligus</td>
</tr>
<tr>
<td>O141</td>
<td>Numerical simulation and optimization of CdS/CdTe heterojunction solar cell including ZnTe layer using SILVACO-ATLAS software</td>
<td>Zaid Ainad Tabet, Abdelhalim Benmansour</td>
</tr>
<tr>
<td>O143</td>
<td>Modelling of the Multi-Chamber Oscillating Water Column in Regular Waves at Model Scale</td>
<td>Mohammad Shalby, Paul Walker, and David Dorrell</td>
</tr>
<tr>
<td>O196</td>
<td>Feasibility study of integrating solar energy into anaerobic digester reactor for improved performances using TRNSYS simulation: Application kenitra Morocco</td>
<td>Ouhammou Badr, Aggour Mohammed</td>
</tr>
</tbody>
</table>
Presentation Abstracts (Oral)

July 18th

Session 1A: Energy Systems Modelling
Venue: Room 1
Time: 14:20-15:35

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

Mr. Miguel Miguel, Teresa Nogueira and Florinda Martins
ISEP, Portugal

Energy storage has become a crucial issue regarding renewable energy management, even more important in an island system with the inherent fluctuating operation and inaccurate energy forecast.
The growth of decentralized generation in an isolated electrical grid means load stability problems and requires energy storage as a potential solution to guarantee safety and reliability standards.
The study described in this paper highlights the need to store energy in Madeira island system and evaluate the operational power dispatch with the introduction of batteries. A simulation tool was developed to quantify the impact of batteries in wind and thermal power plants technologies.

O119  Development of a Solar Cavity Receiver with a Short-Term Storage System
Dr. Ambra Giovannelli, Muhammad Anser Bashir
Dept.of Engineering, Roma Tre University, Italy

The technological progress carried out in the development of high-temperature materials has led to the design of new Concentrated Solar Power plants, like Dish-Micro gas turbines (Dish-MGTs). This study proposes a novel cavity receiver for small-scale Dish-MGT plants with a Phase-Change Material storage system integrated inside the receiver container. Such a storage system provides a proper thermal inertia to the component to level the effects of short-term solar radiation fluctuations which can reduce plant performance and, in the worst cases, damage seriously the MGT. In the paper, results related to CFD steady-state and transient (charge and discharge storage phases) analyses are presented and discussed.
Modeling and optimization of energy production

**Mr. Ismail El Kafazi**, Rachid Bannari, El Bouzekri El Idrissi Abida and Hmina Nabil
IBN TOFAIL University Kenitra, Morocco

In this work, we aim to contribute to the modeling and the optimization of the energy production. In order to minimize the production costs, the quantity of the available green energy in the power system. The model is implemented under the GAMS 24.7.1 environment and was validated by using CPLEX. The presented model can easily combine different sources of energy, by scheduling the resources with high performance and flexibility. This optimization of production cost is applied in a real case, the cost can be reduced by 38% in winter and by 40, 89% in summer.

Mathematical Modelling of Portuguese Hydroelectric Energy System

**Prof. Florinda Martins**, Carlos Felgueiras, and Miroslava Smitková
ISEP, Portugal

Hydropower is one of the most traditional renewable energy source and a major contributor for renewable energy production in many countries. In Portugal it was the only renewable energy source for many years but nowadays wind presents similar production levels and for example in 2015 wind was the main source producing 45.5% of the total renewable energy. However hydro energy will continue to be important in the renewable energy production and in this work ranking of nine models for hydro energy production with various numbers of parameters was done using adjusted R-squared and corrected Akaike information criterion (AICc).

Performance Assessment of a CAES System Integrated into a Gas-Steam Combined Plant

**Assoc. Prof. Coriolano Salvini**
ROMA TRE University, Italy

In the present paper, the performance of an energy storage concept based on the integration of a Compressed Air Energy Storage (CAES) system into a Gas Steam Combined Cycle (GSCC) plant is investigated. CAES systems featured by different design power output have been coupled with a commercially available small size GSCC plant. Storage efficiencies around 63% have been evaluated for CAES design power output ranging from 5 to 10 MW. Such encouraging values, together with other CAES good features (long life duration and established technologies available for key plant components) confirm the potential of the proposed system to emerge as an economically viable energy storage alternative.
<table>
<thead>
<tr>
<th>Session OF1: Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venue: Room 1</td>
</tr>
<tr>
<td>Time: 15:35-16:00</td>
</tr>
</tbody>
</table>

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

<table>
<thead>
<tr>
<th>OF024</th>
<th>Flow control in Banki turbines</th>
</tr>
</thead>
</table>
| **Prof. Daniela Popescu**, Constantin Popescu, Andrei Dragomirescu  
   Technical University Gheorghe Asachi of Iasi, Romania |
| Cross flow micro turbines are environmentally friendly equipment. A low head Banki turbine is studied in this paper numerically and experimentally in order to identify the reasons why the turbine efficiency is poor at low rotational speeds. A procedure that consists in dividing the flow domain into different zones is proposed for clarifying the main issues. The turbine efficiency obtained experimentally is explained based on a CFD analysis that highlights the influence of recirculation phenomena and shock losses produced when the water jet impinges on the shaft. This analysis is also used to propose a device for internal flow control. |

<table>
<thead>
<tr>
<th>OF026</th>
<th>Numerical and experimental test of a cylindrical wave energy system with horizontal rotation</th>
</tr>
</thead>
</table>
| **Dr. Min-Su Park**, Youn-Ju Jeong, Jeong-Soo Kim and Yoon-Koog Hwang  
   Korea Institute of Civil Engineering and Build Technology, Republic of Korea |
| In the present study a cylindrical wave energy system with horizontal rotation is newly suggested. The suggested cylindrical wave energy system is composed of the horizontal cylinder and the swing plate. The horizontal cylinder is floated at the free surface, and rotated by the water particle velocity and the current flow. The swing plate is submerged at the bottom of horizontal cylinder and has the pendulum motion according to incident wave motion. To evaluate the characteristic of cylindrical wave energy system the numerical test is carried out using ANSYS Fluent V15 for various parameters. Moreover, the numerical results are compared with experimental results. |

<table>
<thead>
<tr>
<th>OF064</th>
<th>Energy analysis of a subsea steam Rankine cycle for the subsea power supply</th>
</tr>
</thead>
</table>
| **Dr. Han Yuan**, Jian Zhao, Yan Li, Ji Zhang and Ning Mei  
   Ocean University of China, China |
| In this paper, a steam Rankine cycle is proposed for the subsea power supply. The turbine, as the key component, is connected to a power shaft to produce the power output. The pressure at the inner and outside of the turbine shaft seal can be balanced. A mathematical model is established, energy and parametric analysis are applied. The results show that this power cycle can acquire a thermal efficiency of 35% at 5000 meters depth. Besides, the electrical heating temperature and the condensing pressure are the key parameters that dominant the performance of this cycle. |

<table>
<thead>
<tr>
<th>OF097</th>
<th>Analysis of the icing and melting process in a coil heat exchanger</th>
</tr>
</thead>
</table>
| **Assoc. Prof. Yan Li**, Chao Yang, Zhe Yan, Bin Guo, Han Yuan, Jian Zhao and Ning Mei  
   Ocean University of China, China |
| The analysis of the icing and melting process in a coil heat exchanger is carried out to understand the performance of the heat exchanger under different conditions. The icing and melting processes are simulated using a CFD model. The results show that the coil heat exchanger can effectively transfer heat even under icing and melting conditions. The study also highlights the importance of design parameters in improving the efficiency of heat exchangers under such conditions. |

- 36 -
The ice storage coil heat exchanger are analyzed based on unstable heat conduction theory, the analytical solution of solidified layer is obtained, and get the solution of the temperature distribution in both solid phase and liquid phase. Through numerical simulation, it is found that the agitator can rise the convective heat transfer coefficient of the structure and enhance heat exchange efficiency. The temperature distribution of surface of the evaporation coil during the deicing process is measured by experiment. It is found that melting phenomenon occurred at the lower part of the ice layer first, and the outer side of the ice layer melting faster than the inner side.

Parametric study of multicomponent mooring lines at catenary form in terms of anchoring cost

Dr. Paulo A. Figueiredo and Francisco M. Brójo
Universidade da Beira Interior, Portugal

The process of anchoring FPSOs (floating production storage offloading) is one of the most important parameters in the preparation for exploitation of new oilfields in terms of capital expenditures [1] (CAPEX). Precise position and the motion control are indispensable factors for offshore platforms. Mooring passive systems are the most reliable and common devices to obtain the required position and control. Based on these principles, a methodology of quasi-static analysis of single and multi-component mooring systems in deep-water has been developed by several authors. In this work was developed a relation of the effective cost of a mooring line with minimum catenary suspended length. Proposed method was applied to know the mooring costs of a new single mooring line and compared with the mooring line of the FPSO Glen Lyon in the Schiehallion Field. Costs will be compared as well as minimum length and vessel mooring line offset.
Effects of pressure loss coefficients of heat exchanger on thermal performance of the dry cooling tower

Dr. Huan Ma, Fengqi Si, Xuebo Li and Junshan Wang
Southeast University, China

Crosswind deteriorates thermal performance of the natural draft dry cooling tower (NDDCT) mainly due to the unfavorable pressure distribution at tower entrance. Thus, effects of air cooled heat exchanger with various pressure loss coefficients are investigated with numerical simulation. The vortex inside the tower would cut down air inflow of heat exchanger of sideward and leeward parts. A quite large exponent of pressure loss coefficient expression of heat exchanger contributes to reduce heat transfer unevenness among cooling deltas, and would generate a small enhancement for the overall thermal performance of the tower.

1D Kinetic Analysis and 3D Multi-channel Modeling of Plate-type Monolithic Catalysts for a Selective Catalytic Reduction Process

Dr. Cong Yu, Bei Zhang, Wei Fan, Shaojun Ren, Shuzhou Li, Xiaoming Jiang and Fengqi Si
Southeast University, China

A comprehensive experimental and modeling method for plate-type SCR catalyst is presented. The analysis of mass transfer limitation was first conducted to determine the condition of the kinetic experiments, then the intrinsic kinetic parameters of SCR reaction were estimated from the kinetic experimental data using genetic algorithm. Compared to honeycomb catalyst, plate-type catalyst was coated on a supporting metal mesh. In this respect, a SCR multi-channel model was built with a correction factor of intrinsic reaction rate. Also, different diffusion coefficients in gas channels and catalyst layers were introduced. This model was validated by the experiments over a micro-scale reactor.

Simulation of the reconstruction of the boundary layer by moving cylinders

Assoc. Prof. Yan Li, Chuan Li, Yajie Wu, Cong Liu, Han Yuan, and Ning Mei
Ocean University of China

In this paper, the reconstruction of the boundary layer of the fluid in the channel is studied by lattice Boltzmann method (LBM). By comparing the distribution of velocity in the channel, the conclusion that LBM has the feasibility and superiority in dealing with moving boundary is obtained. Based on this, physical model of moving square cylinders with different height are set up to simulate the effect on the thickness of boundary layer, and the results indicate that the thickness of the boundary layer decreases with the cylinders’ height increasing in the given
range. Furthermore, double cylinders model is also set up, and the results show that the optimal interval distance of the cylinders is between 90 and 140 lattice unit. It is found that the moving cylinders have significant effect on the thickness of the boundary layer, which will change the fluid flow and enhance the heat transfer.

O157

Multiscale modelling of packed bed chemical looping reforming

Mr. Arpit Singhal, Schalk Cloete, Rosa Quinta-Ferreira, and Shahriar Amini
Norwegian University of Science and Technology (NTNU), Norway / University of Coimbra, Portugal

A comparison of reactive flows on two distinct scales is presented here (i) Particle resolved direct numerical simulation (PR-DNS), and (ii) 1D packed bed model. The PR-DNS geometry is meshed with polyhedral elements both inside and outside the particle to directly resolve the phenomena of intra particle diffusion and external heat and mass transfer. In contrast, the 1D packed bed model incorporates appropriate closure models to compare against the PR-DNS solutions at a computational cost several magnitudes less. Simulations are performed for endothermic steam methane reforming reactions (SMR) over a range of inlet temperatures. The comparison of the results between the two approaches shows that the 1D model can adequately replicate the PR-DNS results with appropriate modifications to the closures. The resulting verified 1D model was then used to simulate the reforming stage of an industrial scale packed bed chemical looping reforming reactor.

Investigation of new generation refrigerants under two different ejector mixing theories

Ms. Ayşe Uğurcan Atmaca, Aytunç Erek, Orhan Ekren
Dokuz Eylül University, Turkey

The use of ejectors in the vapor compression refrigeration cycles as an expansion device is of great importance since they decrease the compression work and increase the evaporation capacity to make the overall cycle much more efficient. In this study, ejector expansion refrigeration cycle is compared with vapor compression refrigeration cycle as the starting point of the discussion. The environmentally friendly refrigerants, R1234yf and R1234ze(E) are chosen from the HFOs for the purpose of the performance improvement declarations and operation condition analyses regarding the ejector expansion refrigeration cycle, i.e., COP and entrainment ratio variations caused by the change in the area ratio. R134a as well is chosen from the HFCs in order to create a comparative basis although it is about to be prohibited by DIRECTIVE 2006/40/EC and REGULATION (EU) No 517/2014. Thermodynamic models are established using Matlab via conservation laws of mass, momentum, and energy.

O093

Load Reduction of Wind Turbines Using Trailing Edge Flaps

Nils-Christian Oltmann, Dr. Dorit Sobotta and Arndt Hoffmann
German Aerospace Center, Germany

Horizontal axis wind turbines have become an attractive renewable energy source due to their low carbon footprint. It was the aim of this study to reduce fatigue inducing variations of the blade root bending moment and thus enable the construction of lighter structures which further reduces the carbon footprint. Within the Smart Blades project the IWT-7.5-164 wind turbine has been used to investigate the feasibility of using trailing edge flaps as active control mechanism for load reduction. The analysis has been conducted using the German Aerospace Center’s in-house comprehensive rotor simulation code S4 to simulate the aerodynamics as well as the structural deformation. For a tilted rotor without flaps the blade root bending moment acting perpendicular to the rotor plane has been observed to undergo a characteristic cyclic variation due to the tilt and gravity. Adding trailing edge flaps with a constant deflection alters the mean bending moment of the cyclic variation. A following study addressed the effect of using a sinusoidal flapping motion for a range of flapping amplitudes and phases. As a result a configuration has been identified that eliminates the cyclic variation of the blade root bending moment.
This paper presents Study, Design and Manufacturing of a Small Residential Renewable Energy Conversion System mainly based on a local manufactured Savonius -rotor type Vertical Axis Wind Turbine, equipped with Photovoltaic Panel and a Storage System (Battery). This system can be used both for remote area and building integration. For remote area this system can be adapted to guarantee uninterruptible electrical power supply, for that, it is recommended to be used in the Algerian East–West Highway for lighting and/or petrol station electrical equipments supply. The advantages of this design are cleanliness, start-up under low wind speed, silent, adaptability in urban architecture.
Session 2A: Biomass & Biofuels Production

Venue: Room 2
Time: 14:20-15:35

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

O012  Production of dry extract extracellular lipase from fungus Aspergillus niger by solid state fermentation method to catalyze biodiesel synthesis

Tania Surya Utami, Ines Hariyani, Gandhi Alamsyah, Prof. Heri Hermansyah
University of Indonesia, Indonesia

Lipase can be produced from Aspergillus niger using solid state fermentation method. This research aimed to produce lipase in powder form. The highest activity unit (38.67 U/g) was obtained from rice bran substrate at 5th day with inducer concentration of 2%. The best drying method to produce dry extract with activity unit of 566.67 U/g was freeze drying with maltodextrin additive. The best drying method to produce fine powder with activity unit of 333.33 U/g was spray drying with skim powder additive. Supernatant and powder lipase worked optimally at 30°C with activity unit of 44.00 U/g and 355.56 U/g respectively.

O013  Effect of chitosan’s amino group in adsorption-crosslinking immobilization of lipase enzyme on resin to catalyze biodiesel synthesis

Gandhi Alamsyah, Vania Anisya Albels, Muhammad Sahlan, Prof. Heri Hermansyah
University of Indonesia, Indonesia

Lipase as biocatalyst is used in biodiesel production but its price is becoming serious problem. Immobilization could improve the ability of enzyme. Immobilization method which gives higher activity and stability is adsorption-crosslinking method. The addition of amino group on supports has proven to stabilize the enzyme. Thus, this research focused on the improvement of lipase immobilization performance by the addition of chitosan which contains amino group. The highest unit activity (24.69 U/g resin) is reached by immobilized lipase on anion-exchange macroporous resin with addition of chitosan on resin directly. This enzyme produces biodiesel with yield of 50.79%.

O117  Improving waste-to-energy process by co-digestion of exhausted coffee biowaste and WWTP sludge

Ana Rita Carvalho, Rita Fragoso and Prof. Elizabeth Duarte
Universidade de Lisboa, Portugal

The purpose of this study is to investigate the effects of using pre-treated exhausted coffee biowaste (ECB) as a co-substrate to optimize sewage sludge (SS) biogas production. The trials were conducted in semi-continuous mode at mesophilic conditions (36 ± 1°C) with a Hydraulic Retention Time of 17 days and an average organic loading rate (0.94 ± 0.05 g VS L reactor.day⁻¹). An anaerobic co-digestion trial (T1) was assessed using a feeding mixture with a ratio of SS (80 %)
and LECB (20%), v:v, and compared against a reference scenario (T0). Results showed that the addition of the co-substrate had a significant influence on specific methane production (3 times higher) and biogas quality (12% higher), which is a feasible strategy towards self-sufficient wastewater treatment plant. Furthermore, the stability along assays was ensured monitoring the digestate characteristics (pH, electrical conductivity, total alkalinity and ammonia content) and the specific energy loading rate.

O139
Energetic efficiency of hybrids of Corymbia citriodora and Corymbia torelliana
Breno Assis Loureiro, Paulo F. Trugilho, Sónia A.C. Carabineiro, Rodrigo Simetti, Solange Araújo and Dr. Túlio A.S. Vieira
University of Porto, Portugal
The aim of this study was to evaluate the energetic efficiency of hybrids of Corymbia citriodora and Corymbia torelliana. Seven 45 month old clones were used. The wood quality was assessed through the basic density and higher calorific values. After charring the wood, the gravimetric yield, apparent relative density and superior calorific value were determined. From those analyses it was possible to obtained the energetic efficiency. The carbonization was carried out, with a time of 4 h, starting at a temperature of 100 °C up to 450 °C. The wood quality was assessed through the basic density and higher calorific values. After charring the wood, the gravimetric yield, apparent relative density and superior calorific value were determined. Results showed the variation of the energetic efficiency was between 52.63 % and 54.08 %. It was concluded that the clones presented significant characteristics for the production of charcoal, considering the satisfactory energy efficiencies.

O162
Analyzing Phaeodactylum tricornutum lipid profile for biodiesel production
Ms. Monique Vieira, Sergio San Martin, Cristian Agurto, Marco A. Santos, Marcos A.V. Freitas, Nídia S. Caetano
FEUP, Portugal
Microalgae are eukaryotic or prokaryotic organisms, with high photosynthetic efficiency for biomass production. The constituent elements of microalgae can be extracted and used as raw material for the production of various products, such as biodiesel, which the main components are fatty acid methyl esters (FAMEs). This study aimed to analyze the lipids composition of Phaeodactylum tricornutum cultured at outdoor photobioreactor. The P. tricornutum samples showed 24.39% of C16-C18 fatty acids, 26.52% saturated fatty acids (SFAs), 21.91% monounsaturated fatty acids (MUFA) and 32.02% polyunsaturated fatty acid (PUFA). These findings suggest that P. tricornutum lipids meet to international biodiesel standards and could be an alternative raw material for biodiesel production.
Production of $\alpha$-Amylase and $\beta$-Glucosidase from Aspergillus niger by solid state fermentation method on biomass waste substrates from rice husk, bagasse and corn cob

Andi Aliyah, Gandhi Alamsyah, Rizky Ramadhani, Prof. Heri Hermansyah
University of Indonesia, Indonesia

Hydrolysis enzymes can be produced from Aspergillus niger using solid state fermentation method. This research aimed to understand the fermentation efficiency of A. niger with different variety of the biomass waste substrates, i.e. rice husk, sugarcane bagasse and corn cob, to produce $\alpha$-amylase and $\beta$-glucosidase. The optimum fermentation time for each substrate was 6 days. The highest activity unit for $\alpha$-amylase and $\beta$-glucosidase were 81.86 U/ml and 95.02 U/ml using substrate corn cob respectively. Activity units were 73.94 U/ml and 82.35 U/ml measured for dry $\alpha$-amylase and dry $\beta$-glucosidase respectively. This dried enzyme was stable for hydrolysis process at 30-50°C.

Lipid and carbohydrate profile of a microalga isolated from wastewater

Octávio Oliveira, Sônia Gianesella, Ms. Vânia F. Silva, Teresa M. Mata, Nídia S. Caetano
ISEP, Portugal

Native species of Asterarcys quadricellulare was isolated from wastewater from the International Centre for Reference and Water Reuse, at the São Paulo University campus. Microalga was cultivated at 24.2 ± 1.2 ºC, under mixotrophic conditions in Bold Basal medium supplemented with 0.1 g/L glucose, under 12 h:12 h light:dark photoperiod of artificial light, in 2 L photobioreactors. A. quadricellulare achieved 0.463-0.567 g/L (dw) concentration, with 20.0% of lipid and 36.6% of carbohydrate. 0.0198 g oil and 0.0362 g sugar /L.day yields show the potential of this microalgae as raw material for biofuel production and wastewater treatment.

Optimization of Waste Management Scenarios by Principal Component Analysis: A Case Study in Reunion Island

Dr. Christelle Hatik and Jean-Claude Gatina
University of La Réunion, Reunion

Knowledge of waste composition and production is a requirement to build an efficient waste management scenario. Analysis of this data at a detailed level of observation (regional or communal) is useful to create adapted local scenarios, thus optimizing the overall waste management. However, working at a detailed level of observation multiplies the number of scenarios to build. In this article, we use Principal Components Analysis (PCA) to identify similarities between local administrative areas. By grouping administrative areas based on their waste production, this analysis is an efficient way to reduce the number of local waste
management scenarios to define and it also favors cooperation among similar administrative areas. To illustrate our methodology, we focus on the specific case of Reunion Island, which is composed of 24 municipalities. The PCA analysis enabled to identify 5 groups of municipalities, thus reducing the number of required scenarios to build drastically.
Session 2B: Sustainability & Health
Venue: Room 2
Time: 16:20-18:10

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

O015 Recovery of Silicon Carbide from Waste Silicon Slurry by Using Flotation
Mr. Hsun-Chi Li and Wei-Sheng Chen
National Cheng Kung University, Taiwan
The amount of waste silicon slurry increases as the wafer production raises. The slurry is generally disposed using incineration or land-filling. Separating high-purity SiC from waste silicon slurry can reduce costs for enterprises and assist in waste reuse and recycling. In this study, flotation was applied to separate SiC and Si from waste silicon slurry through hydrophilicity and hydrophobicity of the particle surface. By controlling the concentration of hydrofluoric acid and the oxidation reduction potential of the two stages flotation, the SiC can be separated from Si. The optimal condition of first stage flotation is 0.8 mol/L of HF at -400 mV, while 0.6 mol/L of HF and -300 mV was applied in the second stage. Under these conditions, approximately 52.8% of SiC was recovered with the grade of 98.1%.

O025 Environment Influences and Extinguish Technology of Spontaneous Combustion of Coal Gangue Heap of Baijigou Coal Mine in China
Assoc. Prof. Xiaowei Zhai, Shibo Wu, Kai Wang, Jingyu Zhao and Carsten Drebenstedt
Xi'an University of Science and Technology, China
This paper has tested the CO source of 2521 fully mechanized face through SF₆ gas and contrapuntally made the comprehensive control technology based on loess cover, loess isolation and grouting slurry. In fire extinguishing process, loess isolation is used to prevent spontaneous combustion area from enlarging, loess cover reduces the air leakage in the spontaneous combustion area of Coal Gangue Heaps, and borehole grouting and trenching grouting reduce heat quantity of the spontaneous combustion area. According to the detection of spontaneous combustion field parameters, above technical measures have controlled the spontaneous combustion area of coal gangue in Baijigou Coal Mine.

O035 Forecasting sustainable development of transport sectors of Russia and EU: energy consumption and efficiency
Prof. Leontiy Eder, Irina Filimonova, Vasilii Nemov and Irina Provornaya
Novosibirsk Stat University, Institute of petroleum Geology and Geophysics SB RAS, Russia
The paper analyzes energy efficiency for the road transport of Russia and its regions against the backdrop of the ongoing processes in the EU countries. The emphasis is laid on mathematical modeling of energy consumption forecasts for the transport sector. The results
show that despite the fact that economy of Russia as a whole has a relatively low level of energy efficiency however in road transport the situation is different. Total consumption of energy in Russia’s transport sector is expected to decrease by 15% by 2040, despite a significant increase in the number of vehicles. However, unlike in the EU, the share of renewable sources of energy will be relatively low in the structure of energy consumption in Russia.

Indoor Radon Concentration Assessment in a Set of Single Family Houses: Case Study held in Barcelos, North of Portugal

Dr. António Curado, João Silva, Lucia Carvalho and Sérgio Lopes
Instituto Politécnico de Viana do Castelo

The aim of this paper is to analyze the radon concentration in 3 granitic single-family houses, located in the countryside region, Barcelos, North of Portugal, one of the highest indoor radon concentrations regions, due to the granitic nature of the soil. In situ measurements were taken using digital radon monitors. Simultaneously, thermo-hygrometric measurements were undertaken to allow a more detailed assessment of the relation between the measured variables. Measurements were performed during the summer and autumn season of 2016. The results attained have shown that the human occupancy, mostly through passive ventilation processes, works as a radon concentration mitigation factor.

Eco-toxicity assessment of concrete prepared with industrial wastes

Assoc. Prof. Isabel Brás, Paulo Silva, Ricardo Almeida, Maria Silva and Cristina Lourenço
ESTGV - IPV, Portugal

The technical performance and the environmental behavior of new materials are key factors in their acceptance. In this work, wastes from local industries (lime sludge and biomass fly ashes) replaced natural fine aggregates in the concrete production. The concrete mechanical strength was evaluated and eco-toxicity was assessed using duckweed as biomarkers. The results showed that wastes addition to the concrete mix led to a decrease of 3% and 35% in the compressive strength when fly ashes and lime were used, respectively. The bioassays performed did not show different behaviors between conventional concrete and concrete produced with the wastes.

Effect of Workplace Environment on the Health of Women Construction Workers

Ms. Kiran Singh and Garima Yadav
Chaudhary Charan Singh Haryana Agricultural University, India

The construction industry is a very dangerous and high-risk area for labourers. In this industry, labourers mostly affected by the dirt, dust, harsh environment, chemicals and high noise produced by the heavy machines etc. The present study was conducted on 100 women construction workers to observe the effect of workplace environment on their health. Results revealed that 47 percent of the respondents were in the age group of 30-40 years followed by those having age between 20-30 years (36%) and (85%) were married,74 percent and in the age between 15-20 years, most of them having nuclear family (64%), majority of the respondents were illiterate (93%). The majority of the respondents (71%) were employed on a temporary basis. Labourers were observed to be facing higher problems in joint pain, backache, and breathing problem, skin problem and allergy respectively due to carrying heavy load manually. After carrying the head load, highly significant increase was observed in pulse rate (27.9 b.min⁻¹), heart rate (HR) (32.7 b.min⁻¹), energy expenditure (EE) (6.4 kJ.min⁻¹). Oxygen uptake volume of respondents were found to be decreased after the work. Women have faced problems like a headache, burning of skin, eye strain, degradation in the quality of work and vomiting due to the adverse environment condition on the site.
Developments of Renewable Energies in Forest Areas of Biosphere Reserve to Avoid Illegal Fuel Wood Exploitation

Dr. Mona Poorzady
Free University of Berlin, Germany

People residing in or close to the biosphere reserves need to access clean and economic energy. It's widely agreed that UNESCO biosphere reserves aim to provide contexts in which local citizens may participate in decision-making processes. This focus not only forms a central piece of the sustainability concept, but also constitutes a core element of Biosphere Reserve governance. The question is that how institutions and governments can integrate these new technologies into public discourse in an effort to let the voices of the people be heard, regarding their socio-economic status and party affiliation, in power of the non-democratic and developing countries? Stakeholders from different sectors need to be connected to best implement a sustainable Biosphere Renewable Energy Strategy. Results showed that a decision-making process needed to actively include all stakeholders. Also one of the main drivers for the democratization of energy in Arasbaran biosphere reserve is the strong local governance.
Session 3A: Energy Harvesting & Storage

Venue: Room 3
Time: 14:20-15:50

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

O057
Investigation into a Multi-stage Rotor Rotating Magnetic Field Generator Powered by Ocean Current

Dr. Han Yuan, Jian Zhao, Lu Wang and Ning Mei
Ocean University of China, China

In this paper, a prototype of ocean current induced rotating magnetic field multi-stage rotor generator is developed. The power can be improved significantly by using multi-stage rotor structure. In order to improve the power of the prototype of the multi-stage rotor generator, theoretical and experimental investigation has been carried on in this paper. Simulation on the performance in different parameters of the rotating magnetic field electric generator was conducted, such as effects of the number of permanent magnets and the windings in axial, the turns number of windings, and the distribution of the permanent magnets, etc. The power of optimized electric generator can be raised from 1.2mW to 5.7mW. A test bed was set up to evaluate the performance of the multi-stage rotor generator under the water. The simulation results suit the experimental results well. The power of the electric generator increased obviously with the increase of the flow velocity.

O095
Evolution of Global Heat Transfer Coefficient on PCM Energy Storage Cycles

Esteves, L.P., Magalhães, A., Ferreira, V. and Assoc. Prof. Carlos Pinho
DEMEC-FEUP, Portugal

Using a simple experimental layout, some results on the evolution of global heat transfer coefficient for two phase change materials (PCM), during fusion and solidification processes, were determined. To do this, a system using commercially available thermal oil as the heat transfer carrier was used and the phase change material being tested operated in a fusion and solidification cycle. The heat transfer oil transferred heat to the phase change material during the fusion step and carried heat away from the phase change material during the solidification step. The influence of the mass flow rate of the heat transfer fluid, as well as of its temperature, in the evolution of the overall heat transfer coefficient from the thermal oil to the PCM during its fusion and in the opposite direction during the PCM solidification, for a given experimental set-up, was studied. One of the tested phase change materials was a salt while the other was a paraffin.

O101
Theoretical analysis of ammonium-perchlorate based composite propellants containing small size particles of boron

Dr. Paulo A. Figueiredo and Francisco M. Brójo
Universidade da Beira Interior, Portugal
One of the main goals for the scientific/military rocket industry is to increase the operational burning time, thus the specific impulse. New homogeneous and heterogeneous propellants were tested and metallic fuels were added in the mixture to obtain best performance.

To study heterogeneous propellant, containing large amount of fine boron and ammonium perchlorate, it is appropriate to estimate the combustion products to evaluate/obtain the values of the specific impulse, density, Mach number and mass flow of the mixture. Several composite propellant mixtures, ammonium perchlorate, nitramides (RDX – Cyclotrimethylene trinitramide), were defined with or without addiction of small particles of Boron and modeled. The energetic properties of boron and progress of boron particles on the burning surface of the ammonium perchlorate based composite propellants was modeled used a numerical algorithm. This paper reports the analysis of the influence of boron in the performance parameters for ammonium perchlorate based composite propellants.

1D modelling of membrane-assisted chemical looping reforming

Ms. Joana Francisco Morgado, Schalk Cloete, John Morud, Thomas Gurker, Rosa M. Quinta-Ferreira, and Shahriar Amini
Norwegian University of Science and Technology (NTNU) / University of Coimbra, Portugal

Membrane-assisted chemical looping reforming (MA-CLR) has been proposed as an alternative to the conventional CLR technology. In this work, a non-isothermal 1D model is used to simulate the MA-CLR fuel reactor. The effect of the resulting axial temperature gradients on the reactor performance is assessed, showing up to 10% declines in reactor performance (hydrogen extraction and fuel slip). The inclusion of the energy balance therefore appears to be important for this application, despite the high degree of mixing achievable in fluidized beds.
### Session 3B: Energy and Environment Management

**Venue:** Room 3  
**Time:** 16:20-18:10

**Note:**  
* Session photo will be taken at the end of the session.  
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.  
* For the best presentation of each session, it’s encouraged to award it to student author prior.  
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.  
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Abstract</th>
</tr>
</thead>
</table>
| O075    | Renewable energy management to identify suitable biomass facility location with GIS-based assessment for sustainable environment | Prof. Jin Su Jeong and Álvaro Ramírez-Gómez  
Universidad Politécnica de Madrid, Spain | Identifying proper location of a biomass facility is a critical issue due to biomass materials characteristic geographically spread. This paper presents a GIS-MCDA approach with WLC and sensitivity analysis to optimize suitable areas of a biomass facility. The approach can be used to solve renewable energy planning problems in sustainable environment context. The results’ analysis with 16 criteria concludes the most suitable locations close to agricultural and forestal areas, 8.64% of the Spanish case study region. Therefore, the results denote that the approach proposed could be used for decision-makings for renewable energy management policy in various governmental and industrial sectors. |
| O078    | Connection of the CDER-Algiers photovoltaic system to low-voltage distribution grid | Dr. A. Hadj Arab, S. Bouchakour, K. Abdeladim, S. Ould Amrouche, S. Semaoui and B. Taghezouit  
Centre de Développement des Energies Renouvelables (CDER), Algeria | This work deals with the first photovoltaic (PV) system connected to the low voltage electrical grid in Algeria. The system is made of a PV generator and inverters, which convert the generated direct current into alternating current, and injects it in the low voltage distribution network of Sonelgaz (Algerian electricity provider). The generated current is perfectly compatible with that supplied by the network. The power of the installed PV generator is 9.54 kWp. In order to produce this power, three sub-fields of I-106 modules are used. Each of these sub-fields is connected to an inverter. This work allowed the study of phenomena related to the PV system connection to the network, namely: power quality, reactive power, current THD and voltage, etc. Electrical parameters at the common connection point (CCP) were studied, including the impact of this PV installation on the grid. |
| O130    | The optimal electric energy procurement problem under reliability constraints | Assoc. Prof. Patrizia Beraldi, Antonio Violi, Gianluca Carrozzino, Maria Elena Bruni  
University of Calabria, Italy | We consider the problem faced by a large consumer that has to define the procurement plan to cover its energy needs. The uncertain nature of the problem, related to the spot price and energy needs, is dealt by the stochastic programming framework. The proposed approach |
provides the decision maker with a proactive strategy that covers the energy needs with a high reliability level and integrates the Conditional Value at Risk (CVaR) measure to control potential losses. We apply the approach to a real case study and emphasize the effect of the reliability value choice and the difference between risk neutral and adverse positions.

**O200**

**Engineering Education Towards Sustainability**

**Prof. Manuel Carlos Felgueiras**, João S. Rocha, Nidia Caetano

ISEP, Portugal

Planning the Nation’s and World’s future requires not only professionals from specific and state of the art areas, but also special professionals who are multidisciplinary and can understand the set of questions that can arise by changing one single thing, such as the type of lighting system or the fresh water source. Having this in mind, and knowing that Engineering is behind all the daily activities, in this paper it will be discussed how to introduce in the engineering curricula the tools to educate such professionals, and how this strategy can be used to distinguish this new generation of technicians. Several questions drive the authors along the analysis of a particular case study aiming to answer some of the questions: How and who will develop these new solutions? How can we make engineering more attractive? How can we make automated control natural in engineering?

**O160**

**A Multiobjective Unit Commitment Problem Combining Economic and Environmental Criteria in a BRKGA Approach**

**Prof. Luís A.C. Roque**, D.B.M.M. Fontes, F.A.C.C. Fontes

Polytechnic of Porto, Portugal

The environmental concerns are having a significant impact on the operation of power systems. The traditional Unit Commitment problem (UCP), which minimizes the total production costs is inadequate when environmental emissions are also considered in the operation of power plants. This paper proposes a metaheuristic approach combined with a nondominated sorting procedure to find solutions for the multiobjective UCP. The metaheuristic proposed, a Biased Random Key Genetic Algorithm, is a variant of the random-key genetic algorithm, since bias is introduced in the parent selection procedure, as well as, in the crossover strategy. Test results with the existent benchmark systems with 10 up to 100 generation units and 24 hours scheduling horizon are presented. The comparison of the obtained results with those of other Unit Commitment multiobjective optimization methods reveals the effectiveness of the proposed method. The decision maker can select any economical and environmentally friendly schedule among the Pareto solutions.

**O164**

**A multi-level approach to analyze the effects of renewable energy in wine sector**

**Assoc. Prof. Nieves García-Casarejos**, Assoc. **Prof. Pilar Gargallo**, M.M. Begoña Cabanés

University of Zaragoza, Spain

The objective of this paper is to design the map of positive effects of the implementation by a winery of a series of prototypes to carry out the substitution of non-renewable energies by clean energies. To this aim we propose the use of a multi-level approach including three analyses: a multi-stakeholder analysis to determine all the interest groups affected by this intervention; a multi-dimensional analysis to identify the effects from the triple bottom line of sustainability and a multi-term analysis to classify the effects depending of the length of the term in which they take place: immediate, intermediate and long-term.

**O199**

**Weighing-in-motion wireless system for sustainable railway transport**

**Dr. Bruno J. A. Costa**, Rodolfo Martins, Magno Santos, Carlos Felgueiras

ISEP, Portugal

At the world level, the transport sector relies almost exclusively on fossil fuels for its energy supply. Besides the obvious economic dependence problem, the increasing awareness of
greenhouse gas emissions and the negative contributions to climate change are now perceived as the major driving challenges for the transport sector. The freight transport has been continuously growing for EU member states, with the total volume rising by 35% between 1996 and 2006. In the same period, the annual average of kilometers travelled by passengers in the EU grew by 1.3%. However, it is still mainly dependent on the least energy efficient modes that are increasing the most. Rail transport is well known as one of the safest and energy-efficient transport modes, thus favoring its strengthening as part of a sustainable transport system. Yet, the truck service life and the quality of the ride on a railway are dependent upon a number of different factors, which can be assessed by a diverse set of technology based systems. In this context, this paper presents the EVO4Rail project that seeks to design, develop and implement a wireless monitoring system for weighing-in-motion and detecting faulty wheels in railway vehicles, positively impacting railway operation, maintenance and management, ultimately aiming at a sustainable rail transport.
Presentation Abstracts (Oral & Oral Flash)

July 19th

Session 4A: Sustainable Buildings and Cities

Venue: Room 1
Time: 14:20-15:50

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

O008 Scenario-based design and assessment of renewable energy supply systems for green building applications

Ms. Youngjin Jeong, Minji Lee and Jiyong Kim
Incheon National University, Republic of Korea

This study aims to develop a new approach to design and analyse the feasibility and benefit of renewable energy sources (RES)-based energy supply strategy for green building applications. In achieving the goal, we generated a technology superstructure for the energy supply systems using nine different scenarios by combining three types of building and three representing regions. We then analysed the proposed systems using an optimization technique for the minimum cost or CO2 emission. As a result, we identified the feasibility and benefits of the proposed hybrid systems by comparing to the conventional energy supply systems.

O033 Energetic study of water loop heat pump systems for office buildings in the Iberian Peninsula

Assoc. Prof. Francisco Javier Fernández, Belén Folgueras and Inés Suárez
University of Oviedo, Spain

The energy consumption is analyzed for the air conditioning of an office building in four important cities of the Iberian Peninsula. A water loop heat pump (WLHP) system is compared with a conventional water system. Energy redistribution is an important advantage, but significant savings come from heat pumps high efficiency parameters and minor air flow rates in the cooling tower. Even using natural gas as energy source, 14.2% decrease of CO2 emissions is reached, but additional important reduction can be easily obtained by using a solar thermal energy system as energy source.

O040 Improving Visual Comfort And Energy Efficiency In Existing Classrooms Using Passive Daylighting Techniques

Assist. Prof. Shouib Mabdeh and Baraa Al-Khatatbeh
Jordan University of Science and Technology, Jordan

In classrooms, light levels are directly related to energy consumption; due to the use of artificial
lighting. Hence, this study aims to improve the visual comfort and energy efficiency in existing classrooms, by investigating various retrofit methods for passive daylight techniques, in northerly oriented classrooms at Jordan University of Science and Technology (JUST). Data of this research are obtained using computer simulation and real measurements. The combination of the clerestory window and the anidolic ceiling directed toward the south provided about 62% of the lighting level required in the classroom, and it decreased the energy consumption required for lighting, heating, and cooling by 16.3%.

**Key performance indicators in green construction**

Vatin N., Nemova D., Petrichenko M., Ms. Kazimirova A., Petrochenko M. and Olshevsky V.
Peter the Great St. Petersburg Polytechnic University, Russia

Key Performance Indicators (KPI) are important for monitoring the efficiency in the green building. They can be used to identify poor efficiency and the improvement potential. To assess the effectiveness of the green building project, the concept of a project KPI is introduced, which will take into account costs, CO₂ emissions, thermal protection of the building, resistance coefficient, heat recovery coefficient, heat storage coefficient.

**An energy information system for retrofitting smart urban areas**

Dr. Álvaro Sicilia, Leandro Madrazo, Marco Massetti and Fabian López Plazas
ARC, La Salle Engineering and Architecture, Ramon Llull University, Barcelona, Spain

This paper presents the ENERSI platform, an energy information system that provides advanced energy services by means of integrating energy related data from multiple domains and formats using Semantic Web technologies. The platform services can provide qualified information at different scales – from building to district, city and region – to different kind of users – such as building owners, city planner, energy agencies, architects, contractors and consultants – to take decisions aimed at improving the building energy performance in their respective decision-making realms.

**Inter-Service Provider Charging Protocol: A Solution to Address Range Anxiety of Electric Vehicle Owners**

Khalil Salah and Prof. Mohd Nazri Kama
Universiti Teknologi Malaysia (UTM), Malaysia

Range anxiety describes the drivers’ stress regarding the available battery range while driving an electric vehicle. Considering this issue as a barrier against general acceptance of electric vehicles, several researches has been reviewed. The results show that there is no direct communication among current networks of charging stations which causes isolation in these networks. Thus, the users are not able to use cross-network facilities which leads to range anxiety. To overcome, a protocol is suggested to be used in development of RESTful web services to provide direct communication among the networks of charging stations.
Session 4B: Combustion & Biogas Separation

Venue: Room 1
Time: 16:20-18:10

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

O021

Fast pyrolysis of *Guadua angustifolia* Kunth

Assoc. Prof. María Belén Folgueras, Francisco Javier Fernández, Cristian Rolando Ardila, Manuela Alonso and Susana Lage
University of Oviedo, Spain

In this work, the condensable gases of the bio-oil produced from its fast pyrolysis at 500 ºC for 30 s has been analyzed by Py-GC/MS. Relatively high yields of acetic acid, phenolics and levoglucosan have been found. Levoglucosan can be used as a source for synthesizing bio-fuels and both, phenolics and levoglucosan in the production of chemicals. However, further research is necessary in order to find adequate ways of using the great potential of this type of lignocellulosic biomass for developing a bio-based economy less dependent on fossil fuels and more respectful with the environment.

O059

Influence of temperature on the gasification of cork wastes

Sara Rodrigues, Ms. Ana Almeida, Albina Ribeiro, Paula Neto, Elisa Ramalho and Dr. Rosa Pilão
ISEP, Portugal

This work aimed to study the gasification of cork industry residues using a semi-batch fluidized bed reactor. The experimental tests were performed using air as oxidizing agent and sand particles as bed material. The effect of bed temperature (780 – 900ºC) on gasification performance was evaluated. Samples of producer gas were analysed, by a gas chromatograph, allowing the quantification of CO, CO2, H2, CH4, O2 and N2. Temperature had an important role in gasification performance and all gasification parameters showed an increase with the temperature rise up to 850ºC.

O109

Separation of biogas using newly prepared cellulose acetate hollow fiber membranes

Dr. Yong-Woo Jeon, Myung-Seop Shin
Korea Testing Laboratory, South Korea

The highly selective cellulose acetate (CA) asymmetric hollow fiber membranes were prepared via a dry/wet spinning process with NIPS from dope solutions containing NMP as a solvent and THF and EtOH as a non-solvent and coated with PDMS. The prepared CA hollow fiber membranes showed excellent selectivity about 37.0 for CO2 and CH4 at optimized condition (23 wt% CA, 62 wt% NMP, 10 wt% THF, 5 wt% EtOH, and 15 cm air-gap) and 5 wt% PDMS coating. The newly prepared CA hollow fiber membranes were applied to CO2/CH4 separation. The newly prepared CA hollow fiber membranes showed much better performance than the existing commercial membranes.
Optimization-based approach for design and integration of carbon dioxide separation processes using membrane technology

Dr. Minsoo Kim, Sunghoon Kim, Jiyong Kim
Incheon National University, Republic of Korea

The purpose of this paper is to examine carbon dioxide (CO₂) separation process using membrane technologies. In achieving this goal, we develop an optimization model to design and integrate the CO₂ separation using multi-stage membrane technologies by maximizing the total profit calculated with the total capital and operating costs, and the expected revenue from the CH₄ selling. Using the proposed model, we are able to determine the optimal design and operation strategies of the individual membrane and compressor to meet the design specification (i.e., purity and recovery rate) in the scenarios of different CO₂ market prices.

Impact of EGR and Engine speed on HCCI engine performance and tail pipe emissions

Dr. A O HASAN, Ahmad abu jrai, Alaa H Almohtaseb and Farrukh Jamil
Al-Hussein Bin Talal University

The higher overall efficiency of HCCI combustion leads to lower CO₂ emissions which is one of the major concerns for car manufacturers at present. At the same time HCCI is capable of emitting less NOx but produces more HC and CO. The HCCI operation is achieved by internal EGR, using negative valve overlap which traps exhaust gasses in order to retain enough energy for auto-ignition. Allowing increasing air-to-fuel ratio has been considered as one of the advantages of HCCI combustion. A more diluted in-cylinder mixture leads to lower temperatures and therefore lower NOx emissions. On the other hand excessive air improves oxidation which in turn suppresses knocking and leads to lower UHC emissions. This improvement has been mostly due to a higher trapped residual rate in the cylinder when higher lambda is set. Higher lambda means more air, therefore more trapped residual is required to deliver enough energy for auto-ignition. Analysis show that, HC, CO in HCCI mode are heavily dependent on engine speed. HC emissions was influenced by engine speed more than CO and NOx, emissions, applying 10% boost pressure has reduced HC emissions almost 50% at 1500 engine speed, , engine load was increased with supplying boost pressure and decreased with engine speed.

Development of real exhaust emission from passenger cars in Algeria by using on-board measurement

Prof. R. Kerbachi, S. Chikhi, M. Ménouère
Ecole Nationale Polytechnique, Algeria

On-board measurements of unit emissions of CO, HC, NOₓ and CO₂ were conducted on a sample of 17 private cars with different fuels, dual gasoline and LPG, single gasoline and diesel. The 298 tests have shown the effect of LPG injection technology on unit emissions and allowed to compare emissions to Artemis European model. Except for NOₓ, sequential multipoint injection LPG kit, without catalyst installed is the most efficient for all other pollutants. Particular test results on a subsample of LPG vehicles have shown that LPG fuel alone cannot compete with catalyzed gasoline and diesel vehicles. The advantages of LPG are quickly lost facing the high development of either gasoline or diesel engine technology and catalytic converter. LPG performance seems to be lower under real driving conditions than expected on chassis dynamometer.

Comparison of the fuel properties and the combustion behavior of PET bottle caps with lignite

Nurdan Irem Unal, Ms. Siddika Mertdinc, Hanzade Haykiri-Acma and Serdar Yaman
Istanbul Technical University, Turkey

Used PET materials can be recycled in several ways to reuse them in many areas unless they are not heavily polluted. Thermal conversion methods such as burning, gasification or pyrolysis may be applied alternatively not only for waste disposal but also energy generation from these used plastic materials. In this context, this study focuses on evaluation of used PET bottle caps as energy resource for combustion process. For this purpose, fuel properties of PET bottle caps
were determined considering proximate analysis (moisture, volatiles, fixed carbon, and ash contents) and HHV (Higher Heating Value) results. Also, combustion properties were investigated based on DSC (Differential Scanning Calorimetry) profile and the functionalities were determined by FTIR (Fourier Transform Infrared Spectroscopy) technique. Besides, these fuel properties of PET bottle caps were compared with those of a Turkish lignite sample from Afsin-Elbistan region. It was concluded that the HHV of PET is 3.5 times as high compared to HHV of lignite and this shows that the use of PET in energetic purpose may be promising approach. In addition, some problems arising from high ash yield of lignites can also be avoided by using PET as a fuel since it is almost ash-free. On the other hand, there exist some important differences on the burning characteristics and the functional groups of lignite and PET samples.
Session 5A: Water Pollution and Treatment

Venue: Room 2
Time: 14:20-15:35

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

O065  Cheap metallic iron source for hexavalent chromium removal

Assoc. Prof. Marius Gheju and Ionel Balcu
Politehnica University Timisoara, Romania

This work presents investigations on recovery and activation of a water treatment residue, for further reuse in another water treatment process. Bentonite, an inexpensive and readily available natural material, was used for the removal of Fe(II) from synthetic acid mine drainage (AMD). Then, iron-contaminated bentonite was recovered and treated with NaBH₄ to reduce the adsorbed Fe(II) to Fe(0). Subsequently, the activated bentonite was reused for the treatment of Cr(VI) contaminated solutions. Our results clearly indicated that residues generated during treatment of AMD with bentonite can be used as cheap precursor for production a Fe(0)-based reagent with good Cr(VI) removal potential.

O111  Seasonal Variation of Nutrient Removal in a Full-Scale Horizontal Constructed Wetland

Prof. M.C. Mesquita, A. Albuquerque, L. Amaral, R. Nogueira
Polytechnic Institute of Castelo Branco, Portugal

The main objective of the present study was to evaluate the difference in removal efficiency (RE) of nitrogen and phosphorus compounds based on the seasonal changes in a full-scale gravel-based horizontal subsurface flow constructed wetland located in Interior Central Region of Portugal. The RE of nitrogen and phosphorus compounds were relatively poor, but the results allow us to conclude that season had a significant (p<0.05) effect on the RE of TN, NH₄⁺-N, NOx-N, TP and DP, with higher values in spring-summer period (10.4%, 10.4%, 3.4%, 27.5% and 26.1%, respectively) than in autumn-winter (0%, -7.7%, -9.8%, 12.9% and 0%, respectively).

O124  Environmental preservation of emerging parabens contamination: Effect of Ag and Pt loading over the catalytic efficiency of TiO₂ during photocatalytic ozonation

Mr. João Gomes, Ana Rita Lopes, Katarzyna Bednarczyk, Marta Gmurek, Marek Stelmachowski, Adriana Zaleska, M. Emília Quinta-Ferreira, Raquel Costa, Rosa Quinta-Ferreira and Rui Martins
University of Coimbra, Portugal

The aim of this study was to verify the effect of Ag and Pt with different loadings (0.1 and 0.5wt.%) as dopants on TiO₂ for the degradation of a mixture of five parabens through photocatalytic ozonation. The effect of the treatment on the mixture toxicity over different species was also analyzed. The best catalyst in terms of parabens degradation was 0.5% Ag-TiO₂. The decrease of metal loading on TiO₂ decreased the parabens degradation efficiency as well as COD and TOC removal. Also this decrease has a slight effect over the treated solution toxicity over the different species tested.
Energy and environmental performance of wastewater treatment plants: A statistical approach

Mr. Renan Moreno, Manuela Correia and Florinda Martins
ISEP, Portugal

In this study data of Portuguese wastewater treatment plants (WWTPs) were analyzed in order to compare the energy and environmental performance of the WWTPs. Several absolute and ratio indicators were considered such as electricity consumption, CO$_2$ emissions from electricity, biochemical oxygen demand removal and the corresponding ratio indicators where each of the previous amounts was divided by total volume treated. Groups for statistical analysis were established considering different factors (population equivalent, size, etc.) and Kruskal-Wallis test was applied to assess the effect of these factors on the indicators considered. It was possible to conclude that significant differences were found for population equivalent and size for the three absolute indicators. However for the ratio indicators no significant differences were found.
Session OF3: Clima

Venue: Room 2
Time: 15:35-15:50

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

OF146  The Saharan Setting facing future climate

Dr. Ratiba Wided Biara, Hocine Belmili
Université Tahri Mohamed, Algeria

Climate change is now a reality. It threatens human settlements and natural resources; threatening human life and its development stability. If this phenomenon takes more and more the magnitude, what then about Saharan regions where temperatures are excessive and the environment is difficult to live?

Saharan cities organized in well-defined spaces, located close to water resources (very rare in the region), decorated with Palm trees on the outskirts (which provided sustenance, in addition to the regulation of the climate). Current Saharan habitat is not inspired of the former production, who knew playing with the wind and the Sun. Just wandering the streets of the town of Bechar (for example) to collect all these transformations that appear in all their ugliness on the walls of buildings, filled with air conditioners to anarchic available. Today, looking to make the environment built more pleasant to live. This paper is intended to emulate the ancestral production that could (for centuries) challenges facing the climatic constraints.

OF176  The Legal Framework In Energy Sector in Hashemite Kingdom of Jordan

Prof. Saleh Al-Sharari
al-hussien ben talal university, Jordan

This study aims to shed light on the energy related legislations of the Hashemite Kingdom of Jordan, (referred to as Jordan). It also presents Jordan’s renewable energy and nuclear power plans and programs to alleviate its dependency on imported energy sources, mostly natural gas from Egypt and Israel, as well as to meet its future electricity demand which is expected to double by 2030. This research is qualitative. Theoretical approach and analytical examination of the national legislation: Temporary Law No. (64) for the Year 2003 General Electricity Law, Law No. (13) Of 2012 Renewable Energy & Energy Efficiency Law, the Nuclear Energy and Radiation Protection Act No. 29 of 2001, the Law of Nuclear Energy No. 42 of 2007 and the Law of Radiation Protection and Nuclear Safety No. 43 of 2007, and international conventions and agreements that Jordan is a signatory to and has ratified, will be followed. Furthermore, review of relevant sources and references was conducted.

OF178  Analysis and impact of the measures to mitigate climate change in Algeria

Dr. F. Sahnoun and K. Imessad
Centre de Développement des Energies Renouvelables, Algeria

Algeria has adopted various measures of mitigation and adaptation to adverse climate change impacts. Algerian strategy focus on reducing GHG emissions, CO2 sequestration, expanding forest areas and improving water resources by sea water desalination. This study presents the
GHG mitigation potential of Algeria to 2030, the fossil energy saved through promoting renewable energy and energy efficiency and analyses the main barriers that could hamper the success of this strategy of mitigation and adaptation.

The economic value of the renewable heat obligation policy in the Republic of Korea

Ms. So-Yeon Park, Hyo-Yeon Choi and Seung-Hoon Yoo
Seoul National University of Science & Technology, Republic of Korea

Renewable Heat Obligation (RHO) that some portion of heat energy used in newly constructed buildings with minimum gross area should be supplied using new and renewable energy sources. The Korean Government is considering the introduction of the RHO policy, in the newly-built building with should be supplied heat using new and renewable energy sources 20% by 2020. Extended application of RHO gives the public two benefits compared to using fossil fuels: decreasing reliance on energy from overseas; and reducing greenhouse gases and air pollutants. In spite of above advantages, it has difficulty to apply RHO in the new buildings. Because supply renewable heat in the new building raises construction cost. Nevertheless of different positions of energy- and construction- authorities, there is social consensus on the necessity of RHO. Thus the quantitative information for benefits from applying RHO is needed to support decision-makers. This study attempts to evaluate the economic value of expanding supply of renewable heat in the new buildings. We took the economic value as additional willingness to pay (WTP) of annual income tax. The WTP data were obtained from a one-and-one-half-bounded dichotomous choice contingent valuation survey of 1,000 households. We applied a spike model to treat the WTP data with zero observations. The yearly mean WTP was computed as KRW 5,753 (USD 4.7) per household for the next 10 years, which is also statistically meaningful at the 1% level. Expanding the value to the national population gives us KRW 106.2 billion (USD 93.0 million) per year.

CO2 emission of tourist transportation in Suan Phueng Mountain, Thailand

Angsumalin Jamnongchob, Orawan Duangphakdee, Dr. Phongthep Hanpattanakit
Srinakharinwirot University, Thailand

Transportation represents the key contributor to greenhouse gas emissions, which are linked to global warming and climate change. The objective of this study was to estimate the amount of CO2 emission from energy consumption by tourist transportation in Suan Phueng, Thailand. The methodology of a bottom up approach was observed by using questionnaire surveys. First, the questionnaire design can be validated by calculating the Item-Objective Congruence (IOC) index as well as 0.96 which was acceptable. Moreover, CO2 emission from energy consumption by transportation was calculated follow by IPCC2006 guideline. Then, the 400 questionnaires were distributed to the tourists. The results estimated that the average distances were 208.15±139.38 km. Total energy consumption of gasoline and diesel in transportation were 4,810.85 and 8,640.91 liters. Car was the most popular vehicle for visiting this area about 78%, respectively. Total and mean CO2 emissions in tourist transportation were 32,249.66 kg CO2 eq and 21.20 kg CO2 person	extsuperscript{-1}. 
<table>
<thead>
<tr>
<th>Session 5B: Energy and Environment Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venue: Room 2</td>
</tr>
<tr>
<td>Time: 16:20-18:10</td>
</tr>
</tbody>
</table>

**Note:**

* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

<table>
<thead>
<tr>
<th>O020</th>
<th>Biotechnological potential of biodegradable waste. Opportunities for circular economy by banana peel in Ecuador</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Prof. Hugo Romero, Cristhian Vega, Andres Castillo, Thalia Vera, Cinthia Romero and Adriana Lam</strong></td>
</tr>
<tr>
<td></td>
<td>Universidad Técnica de Machala, Ecuador</td>
</tr>
<tr>
<td></td>
<td>In the first phase of the research, the generation of CO2 (greenhouse gas) from mature banana peel (urban and agroindustrial residue important in tropical countries) was determined experimentally. Likewise, it was possible to quantify the amount of glucose syrup that can be obtained by the biotechnological process of enzymatic hydrolysis of this residue. For the first phase, an anaerobic reactor was used to determine the volume of CO2 that is no longer emitted in the city of Machala, Ecuador, by the use of the mature banana peel when subjected to the enzymatic hydrolysis process. At the same time the concentration of CO2 produced by the shell was quantified by means of gas chromatography. For the second phase, an aerobic bioreactor was prepared for the enzymatic hydrolysis of the residue with a w / v ratio of 60% mature banana husk / water. The results show that the opportunity for circular economy of the shell results in a Volume of 403.6 metric tons CO2 / year (0.73 L CO2 / kg mature banana peel day) with a concentration of 99.97% of purity that would be ceasing to emit to the environment in study zone by this residue. A value of $ 2813.2 / year was determined as an incentive in carbon credits for the local municipality for the mitigation of this gas to climate change, which could be adjudicated if these residues will be used for their bioconversion in glucose syrup and, it would increase if its bio-conversion in bioethanol is continued. On the other hand, the biotechnological potential results in the production of 5.91 g / L of glucose syrup, through the enzymatic hydrolysis of the discarded peel. The biogas production initiative has a positive bio-economic potential of between 21 and 24 million dollars subject to an investment between 2.5 and 2.6 million dollars, so that without public financing incentives the initial investment is the main restriction for its implementation in Private terms. As for the bio-economic potential of ethanol production, this is subject to production costs lower than potential revenues of between $ 698 and $ 614,000, as well as incentives from government programs for the local purchase of ethanol, to international prices the production of ethanol from mature banana peel is unattractive and has less benefits than the use of banana peel in the production of biogas for the purpose of electricity generation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O112</th>
<th>Optimization of acid mine drainage remediation with central composite rotatable design model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Dámaris Núñez-Gómez, Flávio Rubens Lapolli, Maria Elisa Nagel-Hassemere and Prof. María Ángeles Lobo-Recio</strong></td>
</tr>
<tr>
<td></td>
<td>Federal University of Santa Catarina, Brazil</td>
</tr>
<tr>
<td></td>
<td>Response surface methodology using the central composite rotatable design (CCRD) model was used to optimize parameters for acid mine drainage (AMD) remediation with shrimp and aquaculture farming waste (shrimp-shell and mussel byssus). The CCRD (2³) consisting of</td>
</tr>
</tbody>
</table>
three-factored factorial design with five levels was used in this study. The dependent variables were agitation, shrimp-shell and byssus content. The results were derived by computer simulation programming applying least squares method using STATISTICA 7 StatSoft software. Coefficient of determination and the standard errors results from the analysis of variance have shown the model to be adequate. Predicted values were found to be in good agreement with experimental values. This study has shown that the CCRD could efficiently be applied for the modeling of AMD remediation with biomaterials and it is economical way of obtaining the maximum amount of information in a short period of time and with the fewest number of experiments.

O115

Environmental Aspects and Impacts of a Waste Incineration Plant

Sofia Silva and Assoc. Prof. A. Miguel Lopes
CIICESI - ESTG - IPP, Portugal

The work was developed in real context, in a company of solid waste management, more concretely in the facility of incineration of hospital and others dangerous solid waste. The work involved bibliographic research, analysis of the best existing available technologies, comparing them with those implemented, proposal for new measures to be implemented, a survey and evaluation of the environmental aspects and impacts associated, with proposal of mitigation measures of the identified impacts, as well as the presentation of a monitoring plan. The impacts from the installation are small and of limited magnitude, with the exception of the impacts associated with gaseous emissions and energy consumption. The work was developed in cooperation with the technician responsible for the installation, which provided a better assimilation of the knowledge, understanding of the difficulty of implementing certain actions and the importance of the relationship between the type of waste (heterogeneous) and their behavior in the incineration process.

O128

The convenience benefits of induction cooktops over gas stoves for Korean households

Ms. Hyo-Jin Kim and Seung-Hoon Yoo
Seoul National University of Science & Technology, Republic of Korea

Korean households generally prefer to use an induction cooktop over a gas stove due to more convenience and safety features that induction cooktop can provide. This paper attempts to investigate Korean households’ willingness to pay (WTP) for replacing use of a gas stove, currently a common cooking ware in Korea, with use of induction cooktop from the perspective of convenience. To this end, we apply a one-and-one-half-bounded dichotomous choice contingent valuation to assessing additional WTP for induction cooktop using a survey of 1,000 randomly selected households. A spike model is applied to deal with the zero WTP responses. The results show that the mean additional WTP for using the induction cooktop over the gas stove is estimated to be KRW 207 (USD 0.19) per m³. This value can be interpreted as the consumer’s convenience benefits of the induction cooktop over the gas stove, and amounts to approximately 26.7% of the average price for residential gas, KRW 775.13 (USD 0.70) per m³ in 2015. This information is useful for evaluating market potential for induction cooktop in Korea.

O131

Acidity Reduction of Mammalian Fat by Enzymatic Esterification

Dr. Teresa M. Mata, Soraia Andrade, Daniela Correia, Elisabete Matos, António A. Martins, Nídia S. Caetano
LEPABE, Portugal

This work studies the mammalian fat acidity reduction, through enzymatic esterification with ethanol for converting FFA into esters. The fat samples collected in a Portuguese company were characterized for their acid value, iodine value, density, kinematic viscosity and moisture content. Four commercial enzymes were tested as catalyst. Lipozyme CALB L contributed to highest acidity reduction. It was selected for the parametric study of the best operating conditions: 45 °C of temperature, enzyme/fat and ethanol/FFA mass ratios of respectively
0.0060 and 3.25 wt/wt, which reduced 67% the acidity in just one reaction step, after 3 h of reaction time.

**Acidity Reduction in Animal Fats by Enzymatic Esterification: Economic and Environmental Analysis**

Dr. António Martins, Fábio Pinto, Nidia Caetano and Teresa Mata  
ISEP, Portugal

This study examines the economic potential of reducing animal fats acidity by enzymatic esterification and evaluates the carbon and water footprints. Two enzymes scenarios were considered based on experimental data. Results show that operational costs are larger than income generated. To be economic viable, the maximum enzyme cost to process fish oil and mammalian fat should be respectively 9.75 €/kg and 1 €/kg. Alternatively, for the fish oil acidity reduction to be cost-effective, its sales price should be increased about 3%. This new process carbon footprint is 602 ton CO$_2$-eq/year and the water footprint is 261073 m$^3$ water/year.

**Public willingness to pay for research and development of marine bio-hydrogen in Korea: Results of a contingent valuation survey**

Mr. Se-Jun Jin, Seul-Ye Lim, Joseph Kim and Seung-Hoon Yoo  
Seoul National University of Science & Technology, Republic of Korea

Marine bio-hydrogen is produced by combining microbial strain Thermococcus onnurineus NA1 (NA1) derived from deep sea water column with carbon monoxide-containing industrial off-gas generated from steelworks and thermal power plant. In addition, marine bio-hydrogen is produced using abandoned by-product gas, resulting in no additional greenhouse gas (GHG) emissions. Therefore, the Korean government is planning to increase a number of marine bio-hydrogen production from 2018, to reduce GHG emissions by enhancing the application of hydrogen fuel cell generation and fuel cell electric vehicles. This article aims to evaluate the Korean public’s willingness to pay (WTP) for carrying out the marine bio-hydrogen research and development project. To this end, a contingent valuation survey of 1,000 Korean households was implemented. To mitigate the response effect in eliciting the WTP and to increase the statistical efficiency of the analysis of the WTP data, we employed a one-and-one-half-bounded dichotomous choice question format. Furthermore, we used a spike model to model the WTP responses with zero observations. The yearly mean WTP for the policy implementation is computed to be KRW 2,856 (USD 2.44) per household, which is statistically significant at the 1% level. The national annual value amounts to KRW 54.1 billion (USD 46.2 million). This value can be taken as an indicator of external benefits that reduce GHG emissions through expansion.
Evaluation of Uncertainty in the Scheduling of a Wind and Storage Power Plant

Mr. Jose L. Crespo-Vazquez, C. Carrillo and E. Diaz-Dorado
University of Vigo, Spain

Increase the participation of wind energy in the power market is of paramount importance to increase the penetration of wind energy in the power systems. To address this issue, we propose a system consisting on a wind farm and a generic energy storage system and develop a deterministic model of such a plant participating in day-ahead and reserve markets used to decide the operation strategy of the system and to evaluate the cost of the uncertainty linked to several parameters of the model. The resulting model is a deterministic Mixed Integer Convex Program and is used to analyze a real-world case of a wind farm located in northwestern Spain.

Effect of the crucible-coating-silicon feedstock system quality on the electrical properties of the directional solidified multicrystalline silicon ingot

Abdenour Lami, Yassine Chettat, Nadjib Drouiche and Baya Palahouane
CRTSE, Algeria

The purity effect of two combinations of crucible-coating-silicon feedstock on the electrical properties of the mc-Si is studied by the measure of the carrier lifetime parameter. The first: is a low purity standard silica crucible coated with a standard silicon nitride $\text{Si}_3\text{N}_4$. The second: is a high purity silica crucible coated with a high purity silicon nitride. The used silicon feedstock is standard solar grade silicon. The crucible-coating effect at the centre of the ingot is hidden by the low purity degree of the silicon feedstock, since the use of a high purity combination didn’t allow enhancing the electrical parameters.

Optimal Control of Kite Power Systems: Mesh-Refinement Strategies

Assoc. Prof. Luís Tiago Paiva and Fernando A.C.C. Fontes
Polytechnic of Porto, Portugal

In this work we address the problem of generating electricity through Kite Power Systems. We solve an optimal control problem which devises the trajectories and controls for the kite that maximize the total energy produced in a given interval. This is a highly nonlinear problem for which the optimization is challenging. We use a continuous–time model of the kite and implement time mesh–refinement strategies to solve the problem. We report results that show that with an adaptive mesh refinement strategy the problem can be solved with a high level of accuracy and (in simplified versions) much faster.
Distributed photovoltaic systems in Algeria and control of DC-DC converters for grid integration - An overview

**Dr. Said Ould Amrouche**, Sabah Hana Saidj, Samer Boumechta, Amar Hadj Arab, Kamal Abdeladim, Salim Bouchakour and Noureddine Yassaa
Centre de Développement des Energies Renouvelables (CDER), Algeria

This paper describes the current situation of the renewable energies (RE) in Algeria and the structure of the national grid. In view of studying the issues of grid integration of injection of renewable energy produced by distributed systems. The main issues to be considered actually in Algeria are the lines upgrade and the protections design, to prepare the near future of large share of renewable electricity in the national energy mix. For grid integration, due to continuously decreasing cost of battery storage, the modeling and the structure of control of a photovoltaic grid connected system is given.

The Aerodynamic Performance Investigation on the Archimedes Spiral Wind Turbine with 500W Class for Urban Usage

**Assoc. Prof. HoSeong Ji**, JoonHo Baek, Rinus Mieremet and KyungChun Kim
Pusan National University, South Korea

For urban usage of an Archimedes spiral horizontal axis wind turbine, the aerodynamic characteristics including output power, power coefficient, and effect of the angle of attack was investigated using proto-type wind turbine model with Archimedes spiral shape. To provide the aerodynamic performance, the experimental model was consisted with Archimedes spiral wind turbine model, torque meter, powder brake with PWM (Pulse Width Modulation) control basic and RPM sensor. The Archimedes spiral wind turbine model employed in this study shows the similarity with Modern multiblade turbine type. And the maximum power coefficient as a function of the TSR shows the similar that of Ideal Efficiency of Propeller-type turbine. The electric generation feasibility study on the 0.5 kW class small scale Archimedes Spiral Wind Turbine was carried out through site operation during 10 months. The 0.5 kW class small scale Archimedes Wind Turbine Systems for household employed in this study were consisted with generator, slip ring, anemometer, RPM sensor, electronic brake and control system. The wind blade was made of FRP resin with fiberglass fabric through hand layup fabrication process. The wind turbine models with auto yawing system were located the top of tower with 10 m. To minimize the power output change of wind turbines from inter-turbine spacing, the Archimedes Wind Turbine systems were inter-spaced with 10 m. The generated electric power was charged in energy storage system and the charging capacity was recorded through the control system during 10 months. Through the real electric generation for house hold feasibility test, the performance verification on the electric brake system for extreme wind condition was investigated, and the optimized facing of wind blade to the approaching wind was investigated through yawing system.
Session OF4: Miscellaneous

Venue: Room 3
Time: 15:35-15:50

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

**OF016**
Study of the influence of current harmonics on the thermal behavior of LV cables by COMSOL Multi-physics software

Dr. Sid Ahmed Tadjer, Idir Habi, Al Ganaoui Mohammed and Scipioni Angel
University M'Hamed Bougara, Algeria

The object of this study is the estimation of the cable heating due to increased Joule losses caused by current harmonics. To this end, we will establish a model for low-voltage cables and we will make secondly a simulation using the finite element method, using the Comsol simulation software. Finally we set the heating of the cable phases and particularly the heating of the neutral.

**OF195**
Thermographic analysis of power transformers in the power plant of LAARBA, ALGERIA

Samira CHALAH, Dr. Ismahan MAHDI, bouchra NADJI
University Mhamed Bougara Boumerdes Algeria

For decades, transformers have been crucial elements in the transmission system and the distribution of electrical energy. These are the critical links of adaptation between two networks of different voltages. A faulty transformer leads to situations sometimes very heavy consequences; technical, financial, trade and environment aspect, hence the need to detect and identify the defect since his birth. As long as the price of the transformer is too high to bear, the temperature and the resulting thermal behavior of electric power generation and distribution equipment and industrial electrical systems and processes are the most critical factors in the reliability of any operation or facility. Temperature is by far the most measured quantity in any industrial environment. For these reasons, monitoring the thermal operating condition of electrical and electromechanical equipment is considered to be key to increasing operational reliability and decreasing electrical losses. The aim of our work is to study the conditional preventive maintenance of these transformers by the thermographic analysis of power transformers in the power plant of LARBA&A in ALGERIA to know the thermal state of the transformers.

**OF107**
Green bio-oil obtained from digested sewage sludge: new substitute bio-fuel to diesel oil in thermoelectric plants

Assoc. Prof. Glauzia E. G. Vieira, Fernanda Régo, Luana F. Teixeira
Universidade Federal do Tocantins LEDBIO, Brazil

This study aims to take advantage of the residual sludge generated in sewage treatment plants (STP) for production of bio-oil fuel in order to apply it in thermoelectric plants by reducing the impacts on power generation. The sewage sludge was subjected to the process of pyrolysis in a fixed-bed reactor for the production of bio-oil. The average of yield of bio-oil was 10.52%-18.38% (m/m). The analysis of bio-oil showed pH 8.35, density 0.97 g.cm$^{-3}$ and higher calorific value 32.36 MJ.kg$^{-1}$, the mixture 1:1 bio-oil/diesel presented calorific value 41.41 MJ.kg$^{-1}$ and density 0.94 g.cm$^{-3}$. 
OF201 Study, design and analysis of sustainable alternatives to plastic takeaway cutlery and crockery

Mr. Anirudh Muralidharan Gautam, Nidia Caetano
ISEP, Portugal

This paper would take a look at alternatives to plastic takeaway cutlery, crockery, mainly from areca palm and coconut tree products. Most of the take away materials used today in the hotel industry and the household industry are made of plastic. This presents a huge challenge in terms of waste management and pollution. It is widely known that plastic takes several hundred to thousand years to decompose, releasing toxic substances in the process. This paper would focus on reviving the methods and knowledge that existed in the southern and central parts of the Indian subcontinent for making sustainable products used in everyday life. It would also concentrate on giving it an uplift in terms of design and modern approach for the existing market. A market analysis, design, life cycle analysis and deeper research on the fabrication would be explained in the latter parts of the paper.

OF133 Fish Oil Acidity Reduction by Enzymatic Esterification

Dr. Teresa M. Mata, António A. Martins, Daniela Correia, Ana Pinto, Soraia Andrade, Isabel Trovisco, Elisabete Matos, Nidia S. Caetano
LEPABE, Portugal

This work studies the enzymatic esterification for fish oil acidity reduction. Lipozyme TL 100L showed greater acidity reduction (75%) for esterification at 40 °C, with ethanol 96%, with enzyme/oil and alcohol/FFA mass ratios of respectively 0.01 and 3.24 w/w, reaching 3.13 mg KOH/g oil of final acid value or 1.57 % FFA content. Lipozyme CALB L showed greater acidity reduction (76%) for esterification at 45 °C, with ethanol 99.8%, with enzyme/oil and alcohol/FFA mass ratios of respectively 0.0045 and 4.92 w/w, reaching 3.33 mg KOH/g oil of final acid value or 1.67 % FFA content.
Session 6B: Simulation, Modelling and Multicriteria Analysis

Venue: Room 3
Time: 16:20-18:10

Note:
* Session photo will be taken at the end of the session.
* Copy PPT/PDF on conference laptop 10 minutes earlier before each session starts.
* For the best presentation of each session, it’s encouraged to award it to student author prior.
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

O030 The green energy transition and civil society in Tunisia: Actions, motivations and barriers

Ms. Imen AKERMI, RAJA AKERMI and Pr. Abdelfattah TRIKI
University of Tunis, Tunisia

The green energy transition must be understood as a complex process requiring the involvement of many actors. Civil society stakeholders’ opinion on energy sources began to influence energy policy formation and implementation. It plays a significant and complementary role to central government’s actions in raising awareness about the green energy transition and positions themselves in the move towards a sustainable energy future. Greater understanding of civil society motivations towards the promotion of renewables will present both opportunities, and highlight challenges, for the delivery of an energy policy and action-taking aimed at progress towards energy sustainability. Previous researches have tended to analyze civil society participation from a more broadly perspective which interrogated the dynamic of group formation apart from the work we present in this paper which explores the civil society’s motivations and barriers to promote renewable energies in Tunisia through a qualitative research.

O038 Augmented energy-growth nexus: economic, political and social globalization impacts

Mr. Luís Miguel Marques, José Alberto Fuihnas and António Cardoso Marques
NECE-UBI and University of Beira Interior, Portugal

The augmented energy-growth nexus with globalization is analyzed for a panel of 43 countries between 1971 to 2013, by using an autoregressive distributed lag (ARDL) approach. The impacts of economic, political and social globalization on energy-growth nexus are explored. The results are consistent with the presence of cointegration. Evidences of the traditional feedback hypothesis on the energy-growth nexus was found. Economic, political and social globalization have heterogenous impacts on the nexus. In general, globalization is a long-run driver of both energy consumption and economic growth. Accordingly, globalization should be promoted. In addition, restrictive energy policies should be avoided or carefully designed to no hamper economic growth.

O081 Investigations Into Influences of Wind Field Resolution on Simulating Surface Currents for Galway Bay

Lei Ren, Diarmuid Nagle, Stephen Nash and Prof. Michael Hartnett
National University of Ireland Galway, Ireland
Inaccurate wind data can lead to inaccuracies in the surface currents computed by three-dimensional hydrodynamic models. In the present research, a wind forecast model is coupled with a 3D hydrodynamic model to investigate the effect of surface wind data resolution on model accuracy. High resolution and low resolution wind fields are specified to the model and the computed surface currents are compared with measurements obtained from the High-Frequency (HF) radar observation system and Acoustic Doppler Current Profile. Modelled surface currents show good correlation with observations and the resolution of the surface wind data is shown to be important for model accuracy.

**O086**
Evaluation of economic, social and environmental effects of low-emission energy technologies in Poland – multi-criteria analysis

**Assoc. Prof. Magdalena Ligus**
Wroclaw University of Economics, Poland

The study aims to assess the extent to which five low-emission energy technologies contribute to social welfare in the scope of the concept of sustainable development. Heuristic methods: multi-criteria analysis (MCA) and the Delphi method are used to resolve the multi-goal problem of this research. The study reveals that priorities of environmental and economic dimensions are most important, followed by social ones. Renewable energy technologies should be utilized instead of nuclear energy to meet sustainable development policy goals. First place belongs to photovoltaics, followed by biomass and biogas. Wind on-shore and wind off-shore are on third and fourth place respectively.

**O141**
Numerical simulation and optimization of CdS/CdTe heterojunction solar cell including ZnTe layer using SILVACO-ATLAS software

**Dr. Zaid Ainad Tabet, Abdelhalim Benmansour**
URMER, University of Tlemcen, Algeria

In this work, a heterojunction-based solar cell CdS/CdTe, including a ZnTe interlayer between the CdTe layer and the back contact, was modeled then optimized using SILVACO-ATLAS device simulator. At first, n-CdS/p-CdTe reference cell was simulated. Technological parameters such as doping and thickness were varied in order to define the optimal characteristics. The conversion efficiency has increased from 15.54% for the reference cell to 17.54% after optimization. In the second step, ZnTe layer was added in order to fix problems related to the CdTe ohmic contact. Results obtained showed that the ZnTe layer added acts as a back surface field (BSF). The higher electrical efficiency of 19.49% was obtained using the optimized structure SnO$_2$/CdS/CdTe/ZnTe. Finally, results obtained were compared with previous experimental data.

**O143**
Modelling of the Multi-Chamber Oscillating Water Column in Regular Waves at Model Scale

**Mr. Mohammad Shalby, Paul Walker, and David Dorrell**
University of Technology Sydney, Australia

This paper studies the reliability of numerical models used for estimating multi-chamber oscillating water column (MC-OWC) response in the time-domain. The model for the internal water surface level and instantaneous pressure inside the chamber at regular waves conditions using a hybrid system of hydrodynamic and thermodynamic rigid piston models without power take-off. Reliability is assessed using experimental data obtained from a wave tank used in the model concept validation. The results show the method could be extended to describe the hydrodynamics of the MC-OWC in regular and irregular wave conditions.
Feasibility study of integrating solar energy into anaerobic digester reactor for improved performances using TRNSYS simulation: Application Kenitra Morocco

Dr. OUHAMMOU Badr, AGGOUR Mohammed
Ibn Tofail University, Morocco

This paper studies the feasibility of the integration of the solar thermal energy in the anaerobic digestion (AD). In this purpose, a simulation model of the digester reactor (V=70 l) coupled with a new design of the solar water thermal system has been developed using TRNSYS. The heating is carried out by an exchanger inside of the digester. The thermal performance and dynamic behaviors of the system under a climatic condition of Kenitra are investigated. It is found that the solar system covers 90% of the energy consumed by the AD during the year. Also, the results show a daily temperature fluctuation of 0.8°C in the summer and 2.3 °C in the winter.
Note:
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

**P113**

Electrochemical sensor for selective lead ion detection from water sources

**Dr. Lidia Magerusan**, Crina Socaci, Florina Pogacean, Maria Coros, Marcela-Corina Rosu, Stela Pruneanu
National Institute for Research and Development of Isotopic and Molecular Technologies INCDTIM Cluj-Napoca, Romania

The altering of living environment has received extensive attention worldwide since it severely threatens ecological balance and human health. Owning its high toxicity, abundance and persistence, the heavy metal ion contamination is one of the most serious problems, which undermines global sustainability. Once introduced in the body, the metals form complex compounds within the cells, accumulate in the organs, causing chronic poisoning, imbalances and diseases. For this reason, it has become a critical and necessary issue to accurately detect and quantify them by developing simple, fast and sensitive methods. The electrochemical detection based on the usage of modified electrodes, seems to hold great potential and offers several advantages over other sensing schemes in terms of reliability, response time, sample volume, energy consumption, reproducibility, sensitivity and selectivity.

In this context the aim of the present work was to increase both selectivity and sensitivity in the electrochemical detection of Pb$^{2+}$ from aqueous solutions, using as working electrode a gold substrate modified with a new nanocomposite material based on N-doped graphene and chitosan. Under optimized conditions, the detection limit was found to be $6.64\times10^{-8}$ M. The validity and effectiveness of the method was confirmed by trace determination in real samples.

**P049**

Removal of cationic dyes from aqueous solutions by adsorption onto Ziziphus Lotus stones

Noreddine Boudechiche and **Prof. Zahra Sadaoui**
University of Science and Technology HB, Algeria

Water pollution by dyes is a worldwide problem particularly in textile industry where large quantities of dye effluents are discharged from the dyeing process. Considering both composition and amount, effluent from the textile industry was declared as one of the major sources of wastewater in the world. In the present study, raw biomaterial stones (Ziziphus Lotus) have been successfully used as a novel biomaterial for the removal of a cationic dye: Methylene Blue (MB), from aqueous solutions. The characterization of the biosorbent was carried out by the Fourier-Transform Infrared Spectroscopy (FTIR). The effects of various parameters such as contact time, biosorbent dose (1-4 g L$^{-1}$), pH of the solution (2-10), initial dye concentration (20-200 mg L$^{-1}$), were investigated. The Langmuir, Freundlich, Temkin models were applied to investigate the biosorption isotherms. From the results obtained, the experimental data were well fitted with the Langmuir model ($R^2 > 0.99$), with a maximum biosorption capacity of 83 mg g$^{-1}$ at pH 10. In other hand, three simplified kinetic models were tested to investigate the adsorption mechanism: the pseudo-first order, pseudo-second order and intraparticle diffusion. The pseudo-second-order model was found to describe adequately the experimental kinetic data and the intraparticle diffusion model was involved in the MB biosorption process but it was not the sole rate-controlling step.
Enhancement of CH$_4$ Recovery from Aquatic Weeds by Steam Explosion Pre-treatment

Ms. Honami Suzuki, Shinichi Akizuki, Hiromi Joo, Mitsuhiko Koyama, Fernando Fernandez-Polanco, Raúl Muñoz Torre, Syuhei Ban and Tatsuki Toda
Soka University, Japan

This study evaluated the effect of steam explosion pre-treatment on anaerobic digestion of two aquatic weed species which are dominant in Lake Biwa. During steam explosion pre-treatment, the hydrolysis efficiency of both species increased with the increase of severity factor (SF). The highest hydrolysis efficiency was observed at 210 °C 15 min (SF 4.4) for both species. On the other hand, the effect of steam explosion pre-treatment on CH$_4$ yield was different with species. For *Potamogeton maackianus* which is rich in lignin, the CH$_4$ yield increased by two times at 210 °C 15 min (SF 4.4) compared with the un-treated condition. For *Elodea nuttallii* which is low in lignin, the CH$_4$ yield increased marginally at 190 °C 10 min (SF 3.6) compared with the un-treated condition. These results indicated steam explosion was effective as pre-treatment of anaerobic digestion to enhance CH$_4$ yield especially from lignin-rich biomass such as *P. maackianus*.

Selective Transport of Hexavalent Chromium through Polymer Inclusion Membrane Based on PVDF and Room Temperature Ionic Liquid

Mr. F. Sellami, O. Senhadji-kebbiche, S. Marais, K. Fatyeyeva
University of Rouen, France

Rapid growth of industrial activities generates large amounts of heavy metals wastes causing an environmental pollution. Due to its easy diffusivity in the cell wall; Chromium causes irreversible damages to human health. Polymer inclusion membranes, (PIMs) are generally made using a cellulose triacetate and poly (vinyl chloride) as base polymers; however, both polymers have some drawbacks in acidic and alkaline media which limit their stability and reusability. Poly (vinylidene fluoride) (PVDF) is a polymer with good chemical resistance to a wide range of chemicals which makes it potentially attractive as a base polymer for PIMs.

In present work we report the elaboration of new PIMs using PVDF as base polymer, tri-capryl-methyl-ammonium chloride as ion carrier and 2-nitrophenyl octyl ether as plasticizer. In order to have deeper insight into the transport mechanism, the obtained PIMs were characterized using different techniques. The elaborated membranes were then tested for the transport of Cr (VI) in acid medium using a double compartment permeation cell. The PVDF-Aliquat 336 based PIM without plasticizer ensures almost complete transport of chromium ions. The mechanism of Cr(VI) removal was proposed.

Photocatalytic membranes for degradation of water organic micropollutants

Mr. Seghir Dekkouche, S. Morales-Torres, A.R. Ribeiro, J. L. Faria, O. Kebiche-Senhadji, C. Fontàs, A. M. T. Silva
University of Porto, Portugal

The occurrence of contaminants of emerging concern (CECs) in both surface and ground waters is a well-recognized issue of environmental concern. CECs are normally found at low concentrations (ng L$^{-1}$ - µg L$^{-1}$) and many of them are found in the treated effluents of conventional urban wastewater treatment plants. Advanced oxidation processes, particularly heterogeneous photocatalysis, have been successfully applied for the removal of micropollutants, such as the pharmaceuticals diclofenac (DCF) and 17-α-ethinylestradiol (EE2). However, most studies employed suspended particle catalysts, requiring the separation of the material from the treated water, at some stage. The immobilization of photocatalysts in membranes circumvents this limitation and allows to easily operate in continuous mode. In the present study, photocatalytic membrane reactors (PMRs) based on microfiltration membranes of polysulfone (PS) or polyvinylidene fluoride (PVDF), both containing immobilized titanium dioxide (TiO$_2$) particles, were developed. The physical, chemical and optical properties of these PMRs were evaluated by thermogravimetric analysis, physical adsorption of N$_2$, scanning electron microscopy, UV-Visible diffuse reflectance spectroscopy and contact angle
measurements. Both PS and PVDF membranes presented a well-assembled layer of TiO$_2$ particles on their surface, being the TiO$_2$ content superior in PS membranes. Higher surface areas and surface hydrophilicity were obtained for all TiO$_2$-immobilized membranes in comparison with neat membranes, i.e. without TiO$_2$. Dark adsorption and UV-LED photocatalytic experiments were performed under recirculation mode, in order to study the efficiency of the developed membranes to remove both DCF and EE2 on different matrices (e.g., distilled, river and tap waters). The assembly of TiO$_2$ particles on the membrane surface and its subsequent crystallization allowed to enhance the DCF and EE2 removals, in comparison to neat membranes. In fact, TiO$_2$-immobilized PS membranes were more efficient than TiO$_2$-immobilized PVDF membranes, leading to almost complete degradation of both contaminants under UV-LED irradiation.

**P125**

Analysis Equivalent Circuit models of Piezoelectric Energy Harvester for Impedance Matching

**Mr. Se Yeong Jeong**, Hamid Jabbar, Jae Yong Cho, Jung Hwan Ahn, Won Seop Hwang and Tae Hyun Sung
Hanyang University, South Korea

Energy harvesting technology that harvest wasted energy in daily life is becoming more issued because electrical energy can be made from mechanical energy which is made from human body, road. We analyzed a lead zirconate titanate (PZT) which is one of the piezoelectric materials. Because PZT have high inner impedance value and can be represented an electrical equivalent circuit which is consist of resistance, capacitor and inductor, impedance matching is very important to have maximum power at load, so we analyzed equivalent circuit of PZT on non-resonance and resonance mode according to the piezoelectric harvester that can be a model for road, shoes, and others. We found out the impedance matching point according to piezoelectric harvester and considered additional parts such as rectifiers.

**P149**

Design of piezoelectric energy harvesting system based on cantilever structure for harvesting energy from road

**Mr. Won Seop Hwang**, Jung Hwan Ahn, Jae Yong Cho, Se Yeong Jeong, Sung Do Hong, Jong Hyuk Eom, Sung Min Ko and Tae Hyun Sung
Hanyang University, South Korea

Existing researches on energy harvesting are used as a micro-power source for powering sensors or wireless communications through energy harvesting. Piezoelectric energy harvesting is also typically a micro-power source level, but can also be used as a macro power source, depending on the design. This study is the study of piezoelectric road energy harvesting, which is one of the most famous application of macro power source studies. In this study, a new piezoelectric energy harvester was designed based on the cantilever structure. Also it was also designed with conditions to be considered when the harvester was buried on the road. The designed harvester showed better performance than conventional cantilever generators. In addition, we constructed a storage circuit to store power and apply it to wireless communication. This study shows the possibility of constructing an infrastructure using renewable energy in the autonomous driving car era.

**P047**

Sonocatalytic degradation of food dyes in aqueous solution catalyzed by ZnO in the presence of H$_2$O$_2$

**Insaf OULDBRAHIM** and **Prof. Mohamed BELMEDANI**
University of Science and Technology Algiers, Algeria

The degradation of food dyes in aqueous solution was studied using sonocatalysis system coupled with hydrogen peroxide in the presence of ZnO [ZnO/US/H$_2$O$_2$]. We determine priority the influence of pH on food dyes (Dye 1 and Dye 2) which is investigated by spectral method. Study has shown Dye 1 is influenced by the acidic pH of less than 5; and Dye 2 is stable in all pH value; and demonstrated that pH affects the ADMI colour number of food dyes from aqueous solutions. The effect of catalyst loading (ZnO) revealed the fact that the maximum decolorization rate is obtained under an optimized catalyst loading condition. The
decolorization efficiency was also investigated over the pH range of 2 - 11 indicating that increasing pH enhances decolorization efficiency. The influence of H₂O₂ on decolorization efficiency was found noticeable since it is a hydroxyl radical provider. The kinetic study of this degradation indicates that under the experimental condition, the decolorization mechanism follows Behnajady's kinetics mathematical model. The structure and morphology of the catalyst ZnO nanoparticles were investigated using scanning electron microscopy (SEM). The results proved that the novel US / [ZnO] / [H₂O₂] process is capable of decolorizing food dyes.

**P155**

Design of Piezoelectric Energy Harvesting System using Hybrid Generation Methods

**Mr. Sung Min Ko**, Won Seop Hwang, Jung Hwan Ahn, Se Yeong Jeong, Jeong Hun Kim, Jae Yong Cho, Yewon Song, and Tae Hyun Sung

Hanyang University, South Korea

Piezoelectricity is the electric charge that accumulates in certain solid materials in response to applied mechanical stress. It is called a piezoelectric module which generates electricity by applying piezoelectricity. These days, piezoelectric harvesting system have been developed in various shapes and sizes. Generation methods of these harvesting systems are also becoming diversely. There are many piezoelectric harvesters that generates electricity by bending a piezoelectric module or vibrating it. Those actions generate electricity by d₃₁ movement. Bending type generates high voltage temporarily but less electrical energy, while vibrating type generates for longer time than bending but less voltage by one external pressure. In this study, we designed a piezoelectric harvesting system which generates electricity using both generation types when one external pressure occurs such as walking. By lever and spring system, the piezoelectric module is bended and vibrates in sequence after the harvesting system is pressed. By using this harvesting system, it generates more power and energy than the previous types about one external pressure. In conclusion, we can approach possibility of generating more electricity by only one external pressure.

**P022**

Thermal simulation of buildings with walls incorporating PCM

**Dr. Lotfi Derradji**, Mohamed Amara, Farid Boudali Errebai

CNERIB, Algeria

The phase change materials (PCMs) have the ability to absorb or release a large amount of latent heat during phase change, to improve thermal comfort and reduce energy consumption in buildings. This work aims to make a thermal simulation to test the influence of the integration of PCM with different building materials on the thermal comfort of buildings in Algeria.

For this purpose, a thermal dynamic simulation system was conducted, using the TRNSYS thermal simulation software, to study the thermal behavior of office to walls incorporating change materials phase (PCM) using type 204. The simulation was performed for different climatic zones in Algeria, on a top-floor office, 3.5 m length, 3 m wide and 3 m high.

In this work, the effect of different building materials integrating a layer of a phase change material on the thermal behavior of a room for office use was studied. The following materials were taken into account: hollow brick, concrete, concrete block and stabilized earth brick (SEB). The simulation results during the summer period show that the temperature of the office varies most of the time between 25 and 28 °C. The introduction of PCM with SEB has the lowest temperature range compared to other materials. The results show that the presence of a layer of PCM with the different building materials reduces the maximum temperatures and contributes to improve the thermal comfort of summer.

**P023**

Numerical simulation of the influence of melting temperature of PCMs on the winter and summer comfort in a building

**Dr. Farid Boudali Errebai**, Salah Chikh, Lotfi Derradji, Mohamed Amara

CNERIB, Algeria
The energy storage is a privileged means for optimal management of thermal energy. It allows adapting production to the needs and creating the most suitable conditions for such management, providing a constant relationship between the demand and the supply of energy. Storing heat during the day is very important for efficient energy management in buildings seeking to optimize the use of solar energy. Systems enabling significant energy capture with inadequate thermal mass can lead to overheating which result in additional requirements for ventilation or air conditioning.

The passive use of Phase Change Materials (PCMs) in the building can help reduce energy consumption while improving thermal comfort by controlling the thermal inertia of the walls. In fact, the PCM can absorb, store and release large amounts of energy as latent heat in a range of relatively low temperature due to a phase change phenomenon.

In this paper, numerical simulations were performed to study the influence of the choice of the melting temperature of the PCMs on the thermal comfort for the heating and cooling periods. The simulations were done on two kinds of walls, i) the first one integrated the PCM Micronal DS 5001 with a melting temperature of 26 °C and a latent heat capacity of 110 kJ/kg and ii) the second one integrated Micronal DS 5008 with a melting temperature of 23 °C and a latent heat capacity of 100 kJ/kg.

The results showed that the melting temperature of PCM plays an important role for summer and winter comfort. Indeed, the wall containing a Micronal DS 5001 with a $T_f = 26 \, ^\circ C$ absorbs better the heat compared to the wall containing a Micronal DS 5008 with a $T_f = 23 \, ^\circ C$ and vice versa in winter.

For an outdoor temperature amplitude of 14 °C during summer period, the room with a PCM containing wall of $T_f = 26 \, ^\circ C$ has a wall temperature amplitude of more than 4 °C less compared to the room which contains a wall with MCP having a $T_f = 23 \, ^\circ C$.

Whereas, in winter, for an outdoor temperature amplitude of 12 °C, the room a PCM containing wall of $T_f = 23 \, ^\circ C$ has an amplitude of the wall temperature of more than 2 °C compared to the room which contains a wall with MCP of $T_f = 26 \, ^\circ C$.

Change of Net Primary Productivity of Forest due to SSP2 Scenario Emission in South Korea

Mr. Jin Han Park, Dong Kun Lee, Chan Park, Sunyong Sung, Songyi Kim
Seoul National University, South Korea

The Korea government and the rest of the world discussed “Post-2020(Paris Agreement)” at the UNFCCC COP21 in Paris, France in December 2015. And most of the countries submitted the INDC (Intended National Determined Contribution) to the UN.

The main cause of the impacts of climate change is anthropogenic greenhouse gas emissions in the IPCC 5th report. And the reports said that the risks of climate change will be change throughout the 21st century according to the selection of mitigation actions in the near future. Also, short-lived climate pollutants (SLCP) have been mentioned [1]. The researchers have paid attention to these pollutants because they remain in the atmosphere for a short period, affect global warming, and affect communities such as human health. It is also anticipated that emissions of sulfur oxides will increase by specific policies and technologies [2]. According to the recent studies, not only carbon dioxide (CO$_2$) but atmospheric chemistries such as ozone (O$_3$), aerosol and black carbon can be an important factor causing climate change [3,4].

Forests, on the other hand, absorb or store the CO$_2$ through photosynthesis. These forests not only mitigate climate change, but they also affect local weather, such as temperature, precipitation, and humidity [5,6]. Also internationally, forests are known as carbon sinks [7]. In the past, acid rain affected on forest, but in these days, O$_3$, nitrogen oxide (NO$_x$) and sulfur oxide (SO$_x$) are the most threatening factors on forest ecosystem [8]. In particular, O$_3$ accounts for most of the photochemical products and causes a direct significant impact or damage on the plant because of high toxicity [9].

The research questions of this study are 1) How much of the air pollutants are emitted by energy usage in the SSP scenarios? 2) How does O$_3$ effects on forest productivity in the present and future? In this study, we estimated the emissions by using AIM/Enduse model which was developed by National Institute of Environmental Studies in Japan. And we developed a statistical model using the parameters which effect on the net primary productivity of forest. We estimated the net primary productivity of forest using on the derived model in the present and future on the SSP scenarios.

The 8 kinds air pollutants such as SO$_x$, NO$_x$, PM$_{10}$, CO, TSP, VOC, NH$_3$ and BC were generated as a results of emission by energy use. SLCP emissions accounted for about 3.81 Mt in 2010s, accounting for 63% of the household and commercial sector, 6% of the transportation sector...
and 31% of the industrial sector. The contribution of emissions in the 2050s and 2100s is similar. On the other hand, the main source of SLCP is found in the households and commercial sector.

The average forest productivity, net primary productivity, in Korea is about 622 tC/km²/yr in the results. And the result shows that NPP decreases about 2.3% by O₃ negative effect. The NPP in the future also decreases about 1-2% and the negative effect of O₃ is similar. Finally, damage by O₃ in the future is bigger than damage by climate change.

**P136**

Study on bio-oil production by pyrolysis processing of wood biomass

Ms. Iustina Stanciulescu, Cosmin Marculescu, Dorin Boldor
University POLITEHNICA of Bucharest, Romania

The present article presents the results of an experimental study for bio-oil production from poplar wood (Populus Alba) using pyrolysis conversion conducted on batch pyrolysis reactor to establish baseline operational parameters for future larger scale pyrolysis studies. The poplar biomass sample consisted of small branches, twigs, buds and trunk of white poplar being representative for the feedstock. Reaction products distribution and process kinetics were investigated for a large range of treatment temperatures 300°C-800°C. The optimum operation parameters for enhanced bio-oil production were established.

**P180**

Variability in energy demand and greenhouse gas emission in algal biofuel production resulted from nutrient recycling

Vivek Agarwal, Dr. Raja Chowdhury, Kapil Mamtani, and Deepak Suyal
Indian Institute of Technology, India

This study was undertaken to understand the potential benefit of using dairy nutrients for algal biomass production instead of applying the raw manure to the agricultural field. To understand the benefit it was assumed that algal biomass was further processed through following processes (i) algal-biodiesel-production, (ii) anaerobic-digestion (AD), (iii) pyrolysis and (iv) enzymatic-hydrolysis. Four different scenarios were developed using above mentioned processes. In both the scenarios one and two, if one ton nitrogen (nitrogen limited) was added in the first cycle of operation would produce 7.63 tons of nitrogen where AD was incorporated for nutrient recovery. Nitrogen added in the later cycle of operation would produce less amount of nitrogen as compared to the first cycle. In 3rd and 4th scenario, in order to recover additional nutrients, enzymatic hydrolysis was utilized in addition of AD. Therefore, more nutrients were produced in scenario three and four as compared to scenario one and two. For example, if one ton nitrogen were to be added during the first cycle of operation for scenario three and four, 9.64 tons of nitrogen would be produced. To understand the benefit of nutrient recycling, net energy demand, and GHG emission associated with nutrient recycling was compared with energy demand, and GHG emission from inorganic nutrient production. Unlike algal biomass production, production of sequestered carbon was different for each scenario. The highest amount of sequestered carbon was produced in the 2nd scenario followed by the 4th scenario. Increased amount of sequestered carbon was produced in the 2nd scenario followed by the 4th scenario. To understand the effect of dairy nutrient, residual algal biomass application on the agricultural land, DNDC model was used to simulate nitrogen and carbon dynamics. Recently a fate transport model of nutrients was developed to understand the effect of nutrient recycling on GHG emission. It was observed that application of sludge on the pasture land produces same amount of biomass as compared to the algae production in a pond. No such benefit with respect to biomass and carbon sequestration was observed for algal biofuel production using dairy manure instead of applying the same on the pasture land. However, algal biofuel production could provide better management of nutrients and pollutants than the land application of dairy manure. Using the raw wastewater, for algal biofuel production, provides benefit with respect to enhanced biomass production and carbon sequestration as compared to the discharge of wastewater to the surface water.

**P043**

Using Self Assembled Monolayer to Improve Device Performance of Organic Light Emitting Diodes
There has been a great development in organic light-emitting diodes (OLEDs) during the past decade because of their advantages such as self emission, low driving voltage, high efficiency, wide viewing angle and flexibility [1, 2]. In OLED devices, metal electrode (ITO) is direct contact with organic layer (TPD), but the work function of ITO and the energy level of organic materials have a large injection barrier. This barrier leads to poor charge injection and low efficiency [3]. In order to solve this problem, ITO substrates were modified with several techniques to increase energy level of ITO. Self assembled monolayers (SAMs) are one of the most promising technique to modify ITO surface due to its ease of processing and low cost. In this study, ITO was modified with two different SAM molecules to change the work function of ITO for a better charge injection. The OLED devices which have modified ITO with SAM molecules were compared to devices that has unmodified ITO and modified ITO with PEDOT:PSS via theirs electrical, optical properties and surface characterization.

In this study, we have synthesized two novel Ir(III) complexes by using 4,5-Diaza-2',7'-Dibromo-9,9'-Spirobifluorene ligands. Their photoluminescence (PL) values were obtained as 577 nm and 515 nm for Ir complexes 1OMe-ppy and 1OMe-Fppy respectively. These complexes were used as active layer between two electrodes in the OLED devices. Consequently orange and yellow colored OLED devices were obtained with high luminescence efficiency.

Study of Multi-Level Inverters with NPC Structure in Photovoltaic Systems

Assoc. Prof. F. KHELIFI, B. Nadji
University of Boumerdes, Algeria

Globally, the photovoltaic systems market has been experiencing a very high growth rate for more than 10 years now. This exceptional growth, mainly due to the photovoltaic systems connected to the electricity distribution network, is obviously reflected in technological innovations and a reduction in the costs of photovoltaic modules but also in major research and development efforts in the field of photovoltaic energy, Power electronics. Indeed, the technical performances and reliability of the inverters used for the connection of the photovoltaic systems modules to the electricity distribution network are parameters which can very strongly vary the annual electrical energy production and therefore the financial profitability of an inverter, a system. In our work we simulated the operation of a PV source (the STP 17OS-24 / Ab-1 module which consists of 96 cells of monocrystalline silicon connected in
series), then we simulate the integrated multi-level inverter in a photovoltaic system. The efficiency of the MLI technique is analyzed and the maximum power tracking is also inspected using the MATLAB / Simulink 7.11 software. As well as the spectral analysis for the control used to be able to compare between the inverter structures studied.

Reliability study of a system dedicated to renewable energies by using Stochastic Petri Nets: application to photovoltaic (PV) system

Dr. Ismahan MAHDI, Samira CHALAH, Bouchra NADJI
University Mhamed Bougara Boumerdes Algeria

Access to energy is essential to reduce poverty. Globally, around 1.2 billion people, about 16% of the global population, still do not have access to electricity. To respond the present needs in energy without compromising those of the future generations, to increase the energy autonomy of the developing countries: such are the challenges of the 21st century. Knowing that photovoltaic (PV) energy already lengthily showed its evidence in terms of operation and reliability, its development observed an improvement of technologies in terms of solar energy transformation output by the semiconductor, and the research in this field does not cease to progress. However, reliability and availability study of PV systems have not been received great attention from researchers, for that we decided to give it a consideration in our research works. So, we seek to study the reliability of such system by using functional and dysfunctional analysis methods. In this paper, we will be interested in the two parts of PV system: “PV module” composed by Silicon cells which is not expensive and its lifetime is estimated between 25 at 30 years but with a very high criticality rate (for the two failure modes: corrosion and discoloration of the module encapsulating). The second part is: “the converter” which is the expensive component and the most complex in a PV system and its lifetime does not exceed sometimes 15 years.

A Study on the Occurrence Probability determined by environmental factors of Macrobenathos on Korean tidal flat

Mr. Minkyu Kim, Bon Joo Koo
Korea Institute of Ocean Science and Technology, South Korea

Large gaps exist between modeling results and in-situ data of macrobenthos in tidal flat. Data predicting where macrobenthos are likely to occur along environmental gradients are important for the conservation and management. To calculate occurrence probability, we used presence/absence data from field surveys of four study sites in five periods and a statistical analysis to estimate the occurrence probability of dominant five species of macrobenthos; Ilyoplax pingi, Macrophthalmus japonicas, Macrophthalmus dilatatus, Macractra veneriformis, and Ruditapes philippinarum. Applied environmental factors which are significantly affected to inhabitation of macrobenthos were sand composition of sediment and exposure ranges, and were subdivided into five characteristics of habitat, respectively. Estimates of occurrence probabilities differed substantially between species and were influenced by the sand composition and by the continuous exposure. The effects of these two factors were not equivalent across species. Overall average accuracy of high occurrence probability of five species (range = 0.6 – 1.0) were 61.2 ± 13.0%. Our results demonstrate that the statistical analysis was successfully estimated occurrence with two significant environmental factors and will be useful for management activities in Korean tidal flat.

Sediment reworking by a sand bubbler crab, Scopimera globosa, on a Korean tidal flat

Mr. Jaehwan Seo, Bon Joo Koo
Korea University of Science and Technology, South Korea

Bioturbation, especially sediment reworking by the macroinvertebrates results from activities such as feeding and burrowing, is one of the major process that affects the physical, chemical, and biological characteristics of marine sediments. Given the importance of sediment reworking, this study was designed to evaluate the sediment reworking rate of a sand bubbler crab, Scopimera globosa, which is one of the dominant species in the upper tidal flats on the
west coast of Korea, based on quantification of pellet production and burrow sediment production during summer and fall surveys. The density of individuals, the morphometric dimensions of the crab and its pellets were significantly higher, longer and heavier in fall than in summer. Daily pellet production and burrow sediment production were much higher in fall than in summer, mostly due to an increase in daytime production on pellet production and nighttime production on burrow sediment production. The sediment reworking rate of Scopimera was notably higher in fall than in summer and depended on its density as well as the sediment reworking rate per individual. The overall sediment reworking rate of Scopimera was 214 cm yr⁻¹ based on its density in this study area.

P114 Good Environmental Practices for the Wine Industry

Ângela Dias and Assoc. Prof. Miguel Lopes
CIICESI - ESTG - IPP, Portugal

Respect for environmental issues is increasingly essential for the competitiveness of the food industry. As viticulture is a heritage, cultural, aesthetic and ecological heritage, it must adapt its practices in order to limit negative environmental impacts. Changes in the processes of production, recovery of by-products and reuse of effluents are some of the possible measures that wine producers, without exception, must implement, in view of an eco-efficiency policy and reduction of their ecological and water footprint. This problem is particularly important in the oenological industry, since it produces and rejects effluents mainly for the water environmental, which, due to its composition, associated organic loads and volume, represent a serious environmental problem in Portugal.

The guidelines presented in this article apply to all stages of wine production. They aim to systematize a set of procedures and good environmental management practices to be applied throughout the wine sector.

P090 Growth and piezoelectricity studied by deflecting ZnO Nanorods

Prof. Shang-Chao Hung, Dongdong Li, Nai-Jen Cheng, Yin-Ming Li
SCIH-CHIEN UNIVERSITY, Taiwan

ZnO nanorods (NRs) have been successfully synthesized by aqueous solution method, and characterized piezoelectricity using Conductive Atomic Force Microscopy (CAFM). The measurement was achieved by deflecting ZnO NRs with a conductive Cr/Pt tip in contact. It creates a strain field and drives the charge flow across the NRs. It was found the output current peaks were about ~2 ~ 6 nA and lifetime of output current were about 46 ~ 78 ms. Conversion of mechanical energy into electric energy has been successfully demonstrated on ZnO NRs.

P077 Demonstration of High Efficient SiC Betavoltaics for Ni-63 Radioisotope Battery

Dr. Byoung Gun Choi, Kyung Hwan Park, Seongmo Park, Taewook Kang, Young-Mok Yun, Kyeong Su Jeon, Kwang Jae Son, and Jin Joo Kim
Electronics and Telecommunications Research Institute, Republic of Korea

Radioisotope batteries have several advantages compared to the other chemical batteries in energy storage and life time. Among the various radioisotopes, pure beta-emitting isotopes such as Ni-63, Pm-147, and H-3 can be easily shielded for safety and have long half-life from several to a hundred years. The use of long half-life beta-emitting radioisotopes as a source of batteries seems to solve all inconveniences in recharging portable personal electronic devices, such as mobile phone, and enormous kinds of wireless computer peripherals. Unfortunately, the long life and high output power cannot be satisfied at the same time with betavoltaic batteries because the energy density of a radioisotope is inversely proportional to the half-life of the isotope. Thus a lot of effort has gone into increasing the conversion efficiency of betavoltaic batteries by using wide bandgap semiconductors. In this paper, we use wide bandgap SiC semiconductor for Ni-63 betavoltaic. The PIN SiC betavoltaic structure consists of low resistive (0.015~0.025 ohm-cm) n-type SiC substrate, low doped (3.5×10¹⁵/cm³) n-type SiC absorption layer, and highly doped (1×10¹⁹/cm³) p-type SiC layer. The thickness of the each layers are 500μm, 20μm, and 0.25μm, respectively. The demonstrations of the SiC betavoltaic
batteries are performed by using 17keV electron beam, which energy is equal to the average energy of beta particles irradiated from Ni-63. Under the electron beam power of 11.9μW (700pA@17keV), the betavoltaic shows a short circuit current of 1.02μA, an open circuit voltage of 2.34V and the maximum output power of 2.1μW. Fill-factor of the device is 0.87 and the power conversion efficiency is as high as 17.5%. Also the demonstration of the Ni-63 mounted betavoltaic shows a short circuit current of 3.73nA and an open circuit voltage of 1.97V resulting a conversion efficiency of 7.9% and output power of 45.7nW/cm² under incident radioactivity of 0.9mCi Ni-63 beta-ray.

An optimization model for design and analysis of a renewable energy supply system to the sustainable rural community

Dr. Minsoo Kim, Dohyun Lee, Jiyong Kim
Incheon National University, Republic of Korea

The goal of this paper is to present a new optimization framework for design and analysis of a stand-alone energy supply system to rural communities using 100% renewable energy sources (RES). In achieving this goal, we first propose a technology superstructure for energy supply. The superstructure starts from different types of RES which are easily available in rural communities, including solar, wind, organic waste, and lignocellulose biomass. The RESs are processed in multiple technologies to meet energy demands of a rural community (chemical, thermal and electric powers). Using the model we identify the optimal system configuration and practical operational strategies.
Listeners

Note:
* The certification of Oral/Poster presentation, listeners, will be awarded at the end of each session.
* To show respect to other authors, especially to encourage the student authors, we strongly suggest you attend the whole session, and the scheduled time for presentations might be changed due to unexpected situations, please come as early as you could.

| Lis 01 | Mr. Andrew Quinn  
| Glasgow Caledonian University, UK |
| Lis 02 | Prof. Anabela Leitão  
| Agostinho Neto University |
| Lis 03 | Dr. Shinichi Akizuki  
| Soka University, Japan |
| Lis 04 | Prof. Fengqi Si  
| Southeast University, China |
| Lis 05 | Prof. John McFarlane  
| JRM, Australia |
| Lis 06 | Assoc. Prof. Nemova Darya  
| Peter the Great St. Petersburg Polytechnic University, Russia |
| Lis 07 | Assoc. Prof. Petrochenko Marina  
| Peter the Great St. Petersburg Polytechnic University, Russia |
| Lis 08 | Prof. Seung-Hoon Yoo  
| Seoul National University of Science & Technology, Republic of Korea |
Lis 09
Ms. Sofia Silva
CIICESI - ESTG - IPP, Portugal

Lis 10
Prof. Bon Joo Koo
Korea University of Science and Technology, South Korea

Lis 11
Ms. Bukurije Gashi
Ecological Association “Eko Viciana”

Lis 12
Prof. Kim Byeong-Kyu
Korea Port Engineering Corp. South Korea

Lis 13
Mr. Lee Hyung-Don
Seoul University, South Korea

Lis 14
Mr. Alexander Kaiser
Austrian Power Grid AG