COVER PAGE

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2019 The 2nd International Conference on Renewable Energy and Environment Engineering

REEE 2019

August 19-22, 2019 | Munich, Germany

Published by

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an Open Access Journal by MDPI

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AGENDA OVERVIEW

August 22, 2019 (Thursday)	
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8:30	Departure Point: Gray Line SIGHTseeing, Münchener Stadtrundfahrten (Address: Bahnhofpl. 9, 80335 München)
8:30--18:30 (Attractions)	Schloss Linderhof -- Oberammergau -- New Swan Stone Castle
18:30	The end – return to the original departure point

VENUE

AZIMUT Hotel Munich

Address: Kronstadter Strasse 6-8 D ── **81677 München, Germany**

ⓘ How to get to the **AZIMUT Hotel Munich** from **Munich International Airport**?

➢ **Taxi**

🚕 Taxi------ Around 36 minutes (via B301, 36.6km/22.7miles)

Around 43 minutes (via A9, 40.0km/24.9miles)

Around 47 minutes (via A99, 47.6km/29.6miles)

➢ The affordable way: **Metro Line S8→Bus No. 149**

🚌 Metro + Bus + 🚶Walking------ one hour (Approx.)

Get on the **Metro Line S8** at the **S-Bahnhof Flughafen München**

↓ (9 stops)
Get off at **München Ost** (Platform 2)
One minute's walk
↓
Get on the **München, Ostbahnhof** to take **bus No.149**

↓ (9 stops)
Get off at **Süskindstraße**
Five minutes' walk
↓
AZIMUT Hotel Munich

VENUE

TIPS:

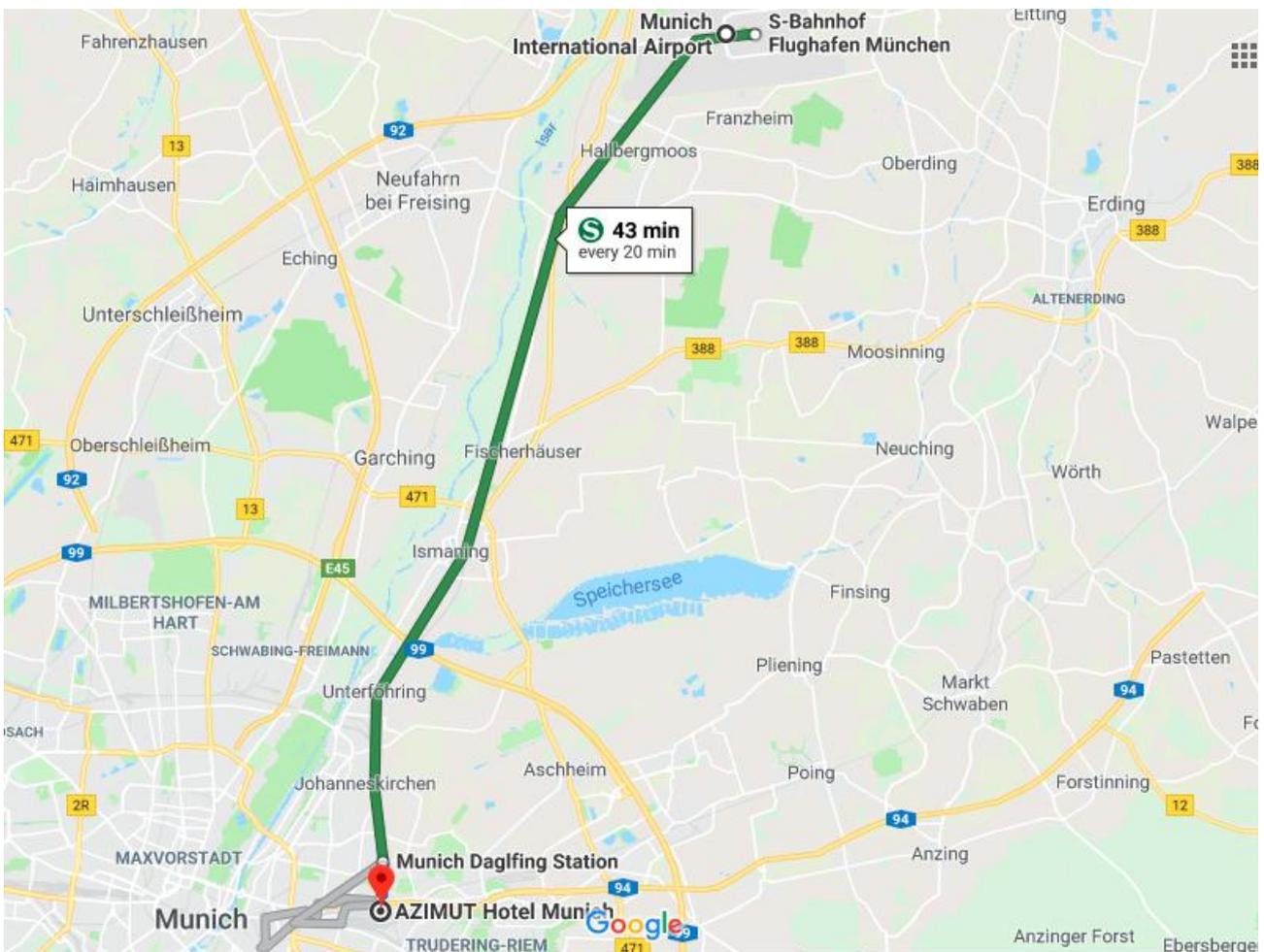**Time Zone:** GMT+2

Currency: Euro

Important Phone Numbers

Fire Brigade : 112
Emergency Medical Services : 112
Police : 110
Poison Emergency Telephone Service:
089-19240 (Munich only)

DETAILED AGENDA

[August 19, 2019 (Monday)]

10:00-17:00

Registration & Materials Collection

Venue: AZIMUT Hotel Munich | Lobby

Give your **Paper ID** to the staff.

↓

Sign your name in the attendance list and check the paper information.

↓

Check your **conference kit**, which includes conference bag, name tag, lunch & dinner coupon, conference program, the receipt of the payment, the USB of paper collection.

Tips for Participants

✧ Your punctual arrival and active involvement in each session will be highly appreciated.

✧ The listeners are welcome to register at any working time during the conference.

✧ Get your presentation PPT or PDF files prepared.

✧ Regular oral presentation: 15 minutes (including Q&A).

✧ Laptop (with MS-Office & Adobe Reader), projector & screen, laser pointer will be provided by the conference organizer.

DETAILED AGENDA

[August 20, 2019 (Tuesday)]

Morning | 09:00-12:10

📋 **Opening & Keynote Speech & Invited Speeches**

	📍 **Vienna+Moscow (The Ground Floor)**	
09:00-09:10	**Opening Remarks**	**Prof. Elmar Bollin** Offenburg University of Applied Sciences, Germany
09:10-09:40	**Invited Speech Ⅰ**	**Prof. Dr. Jorge Loredo** University of Oviedo, Spain **Speech Title**: Valorisation of Mine Water for Low Enthalpy Geothermal Energy in the Framework of a Circular Economy
09:40-10:10	**Invited Speech Ⅱ**	**Prof. Dr. Aurel Lunguleasa** Transilvania University of Brasov, Romania **Speech Title**: Energetic Aspects of Lignocelluloses Biomass and its Relationship with Natural Environment
10:10-10:20	**Group Photo**	
10:20-11:00	☕ **Coffee Break & Poster Presentations** MG018-A, MG057, MG058, MG059, MG065-A, MG078, MG080	
11:00-11:40	**Keynote Speech Ⅰ**	**Prof. Elmar Bollin** Offenburg University of Applied Sciences, Germany **Speech Title**: When Batteries Get Older - Antiaging of Batteries
11:40-12:10	**Invited Speech Ⅲ**	**Prof. Dr. Jin Su Jeong** Universidad de Extremadura, Spain **Speech Title**: Sustainable Development with MCDA-FDEMATEL Method: Prioritizing Criteria for Renewable Energy and its Application to Flipped Science Education

Lunch @ Restaurant (the Ground Floor)
<12:10-13:30>

DETAILED AGENDA

[August 20, 2019 (Tuesday)]

Afternoon | 13:30-18:45

Parallel Presentations

	📍 **Vienna + Moscow (The Ground Floor)**
13:30-15:30	**Session Ⅰ -- Environment Engineering** Chaired by Prof. Somchai Wongwises King Mongkut's University of Technology Thonburi, Thailand
	8 Presentations - MG040-A, MG072-A, MG081, MG086 MG3002, MG077, MG067, MG074
16:00-16:15	☕ **Coffee Break | Outside Meeting Room**
16:15-18:45	**Session Ⅲ -- Power System** Chaired by Assoc. Prof. Susanta K. D Kettering University, USA
	10 Presentations - MG002-A, MG021, MG055, MG076, MG022, MG090, MG1001-A, MG053, MG082, MG089

	📍 **Berlin (The Ground Floor)**
13:30-16:00	**Session Ⅱ -- Energy Science** Chaired by Dr. Daniel Villanueva University of Vigo, Spain
	10 Presentations - MG001-A, MG016, MG034-A, MG038, MG036-A MG045-A, MG049, MG054, MG027, MG033-A
16:00-16:15	☕ **Coffee Break | Outside Meeting Room**
16:15-18:15	**Session Ⅳ -- Wind Energy System** Chaired by Lecturer Florin Onea "Dunarea de Jos" University of Galati, Romania
	8 Presentations - MG035, MG020, MG029, MG042, MG051 MG009, MG030, MG048-A

Dinner @ Restaurant (the Ground Floor)
<19:00-21:00>

DETAILED AGENDA

[August 21, 2019 (Wednesday)]

Morning | 09:00-11:45

Parallel Invited Speeches & Presentations

	📍 **Berlin (The Ground Floor)**
09:45-11:45 📊	**Session Ⅴ -- Air Quality Assessment** Chaired by Assoc. Prof. Spiru Paraschiv "Dunarea de Jos" University of Galati, Romania
	8 Presentations - MG008-A, MG017, MG014-A, MG023 MG010-A, MG024, MG060-A, MG062

	📍 **St. Petersburg (The Ground Floor)**
09:45-11:45 📊	**Session Ⅵ -- Material Science** Chaired by Lecuter Cosmin Spirchez Transilvania University of Brasov, Romania
	8 Presentations - MG1003, MG039-A, MG041-A, MG050, MG056, MG073-A, MG052, MG2001-A

Lunch @ Restaurant (the Ground Floor)
<11:45-13:30>

DETAILED AGENDA

[August 22, 2019 (Thursday)]

08:30-18:30

Social Program

❋ **Assembly Time**: 08:30
Assembly Point: Gray Line SIGHTseeing, Münchener Stadtrundfahrten
Address: Bahnhofpl. 9, 80335 München

08:30		Departure point: Gray Line SIGHTseeing, Münchener Stadtrundfahrten Address: Bahnhofpl. 9, 80335 München
09:45		Schloss Linderhof - It is a Schloss in Germany, in southwest Bavaria near Ettal Abbey. It is the smallest of the three palaces built by King Ludwig II of Bavaria and the only one which he lived to see completed.
10:15		Oberammergau - It is a municipality in the district of Garmisch-Partenkirchen, in Bavaria, Germany. The small town on the Ammer River is known for its woodcarvers and woodcarvings, for its NATO School, and across the world for its 380-year tradition of mounting Passion Plays.
13:00		New Swan Stone Castle - It is a 19th-century Romanesque Revival palace on a rugged hill above the village of Hohenschwangau near Füssen in southwest Bavaria, Germany. The palace was commissioned by Ludwig II of Bavaria as a retreat and in honour of Richard Wagner. Ludwig paid for the palace out of his personal fortune and by means of extensive borrowing, rather than Bavarian public funds.
18:30		Return to the original departure point: Gray Line SIGHTseeing, Münchener Stadtrundfahrten Address: Bahnhofpl. 9, 80335 München

DETAILED AGENDA

❇ Included

Air-conditioned vehicle

Professional guide

❇ Not Included

Tickets to Neuschwanstein Castle and Linderhof

Hotel pickup and drop off

Food and drinks

Gratuities

Personal consumption

❇ Note

- This social program is optional and chargeable.
- Please keep your belongings with you.
- The bus will leave on time. Please arrive the assembly point 5 minutes earlier.
- The conference committee doesn't offer hotel pick up and drop off service. Please go to the assembly point by yourself.
- If you are interested, please give your feedback **before July 31**. If you miss this date, we can't accept your request anymore.

WELCOME

Dear distinguished delegates,

It is our great honor and pleasure to welcome you to the 2nd International Conference on Renewable Energy and Environment Engineering (REEE 2019) which is held in Munich, Germany on August 19-22, 2019.

The purpose of the conference is to enable all delegates from all over the world communicate with each other and provide a platform that professional thoughts can be shared and new innovative brilliant ideas may also be sparked.

The evaluation of all the papers was performed based on the reports from anonymous reviewers, who are qualified in the field of renewable energy and environment engineering. The conference committee is also honored enough to invite 1 keynote speaker and 3 invited speakers to share their researches with us. They are Prof. Elmar Bollin from Offenburg University of Applied Sciences, Germany; Prof. Jin Su Jeong from Universidad de Extremadura, Spain, with the topic of Sustainable Development with MCDA-FDEMATEL Method: Prioritizing Criteria for Renewable Energy and its Application to Flipped Science Education; Prof. Jorge Loredo from University of Oviedo, Spain, with the topic of Valorisation of Mine Water for Low Enthalpy Geothermal Energy in the Framework of a Circular Economy, and Prof. Aurel Lunguleasa from Transilvania University of Brasov, Romania, with the topic of Energetic aspects of lignocelluloses biomass and its relationship with natural environment. We believe these talks will be of a great impression and a spark for all the conferences professionals in the field of renewable energy and environment engineering, and related fields.

Apart from this, we are pleased to have accepted 58 presentations from all over the world. The presentations are divided into 6 parallel sections themed on Environment Engineering, Energy Science, Power System, Wind Energy System, Air Quality Assessment and Material Science and 1 poster section. Here we'd like to express our heartfelt appreciation to our chairs, sponsors, technical program committee members, organizing committee members, authors and delegates, who all have contributed a lot to this conference. Thank to your support and help, the conference can be held successfully and be raised for increasing concern year by year.

We believe that by this excellent conference, you can get more opportunity for further communication with researchers and practitioners with the common interest in this field. Obviously, your suggestions are warmly welcomed for the further development of the conferences. Wish you will enjoy this conference, contribute effectively toward it and take back with your knowledge, experiences, contacts and happy memories of these days. Thank you for your attention!

We look forward to meeting you again next time.

Yours sincerely,
Conference Organizing Committee

KEYNOTE SPEAKER

Prof. Elmar Bollin

Offenburg University of Applied Sciences, Germany

Scientific Employee at Fraunhofer Institute for Solar Energy Systems ISE at Freiburg/Germany; Head of the research group Solar Thermal Systems;

Since1993: Professor for Control Techniques, Building Services, Building Automation, Solar Engineering and Energy Conversion Techniques at the Offenburg University of Applied Sciences;

Head of the Research Group net (sustainable energy systems) at Offenburg University of Applied Sciences;

see: www.fgnet.hs-offenburg.de

Founder of the Institute for Energy Systems INES at University of Applied Sciences Offenburg;

see http://ines.hs-offenburg.de/institut/

Director of the Institute of Applied Sciences at Offenburg University of Applied Sciences;

see http://www.iaf.hs-offenburg.de/

Author and editor of different books on Sustainable Energy Systems,

Involving in to Various Research Activities in Sustainable Energy Techniques and Solar Thermal Application

Speech Title---When batteries get older - antiaging of batteries

Speech Abstract---At University of Applied Sciences Offenburg two research projects were initiated and executed concerning detailed analyses of Li-Ion-batteries. Today batteries are central components of mobil and stationary energy systems. Short battery lifespan drive of system costs and can lead to uneconomical system operation. To evaluate aging mechanisms of Li-Ion batteries new processes are developed. The project resulted in recommendations to prevent against calendaric and cyclic aging. Based on a Battery Management System BMS with Modell Predictive Control MPC new control algorithms were tested with Li-Ion batteries integrated in the Microgrid of the INES Institute at the University's Campus to prevent against aging of batteries. A Battery Lab called ENERLAB was newly installed for in-operando and post-mortem diagnostic. ENERLAB helps to analyze electro chemical and material properties of Li-Ion Battery cells and provides gloveboxes to open battery cells under controlled conditions.

INVITED SPEAKER

Prof. Dr. Jorge Loredo

University of Oviedo, Spain

Jorge Loredo is a professor in University of Oviedo, Spain since 2008. He received his Ph. D degree in mining engineering from University of Oviedo, Spain in the year of 1981, and master degree in Environmental Engineering from Minister of Industry / University of Oviedo, Spain in 1978. He was a Visiting Professor at University of California at Berkeley, USA (1987/88).

Speech Title---Valorisation of mine water for low enthalpy geothermal energy in the framework of a circular economy

Speech Abstract--- The contribution of renewable energies to the world's total energy demand has increased particularly during the last decade, and they will continue gaining market share. Renewables energies were the third largest contributor to global electricity production in 2015; they accounted for 22.8% of world electricity generation, after coal (39.3%) and gas (22.9%) and ahead of nuclear (10.6%) and oil (4.1%). The European energy and climate policies have as one of their targets 20% of final energy from renewable origin by 2020. In this context, abandoned or closured flooded underground mines constitute large underground reservoirs that can be economically managed to supply geothermal energy (heating and cooling) by means of heat pumps.

Then, a mine water valorisation based on its use in the field of low enthalpy geothermal energy can be found after the consideration of the mine water as a potential resource generating new economic activities in declined historical mining regions. Due to the temperature of the stored water in the mining voids resulting from the extractive operations, this water can be successfully used as a source for low enthalpy geothermal energy generation. In addition to the production of electrical energy, one of the main uses of the low enthalpy geothermal energy is in the generation of thermal energy.

Closed and inundated mines constitute mining reservoirs which can be regulated and used as water and energy resource, and all this in the framework of a circular economy. According to the pumping rates and the COP values that can be reached for mine water in a specific mine shaft, their energy use by means of water-water heat pumps for heating and cooling can be an interesting option for renewal energy generation.

Compared to conventional systems using fossil fuels, producing energy by means of heat pumps using mine water, economic savings above 70% and a reduction in CO_2 emissions between 20$-$80% cab be achieved. Then, mine water, either coming from the pumps or from the stage rebound after flooding during the closure period, could be used with economic and social benefits for energy generation, contributing to improve the economic and social conditions of the historical mine districts with abandoned or closured underground mining works.

INVITED SPEAKER

Prof. Dr. Aurel Lunguleasa

Transilvania University of Brasov, Romania

Professor at Transilvania University of Brasov, Faculty of Wood Industry, Department of Wood Processing and Design of Wood Product;

-Teach courses about Wood Composites, Wood Wastes, Energy and Energetic of Wood and Wood Wastes, Briquettes and pellets, Quality Control of industrial process, Relationship between Wood and Environment;

-Former director of Forestry College;

-Abilities in researches of wood energies and relation of wood calorific value with natural and industrial environment

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Speech Title---Energetic aspects of lignocelluloses biomass and its relationship with natural environment

Speech Abstract--- This paper aims to present the energetic problems of lignocellulosic biomass and its relation to the natural environment. All kinds of energy from biomass are firstly presented, insisting on the wooden and vegetal biomass. It is emphasized that lignocellulosic biomass is friendly to the natural environment and will not increase greenhouse gas emissions (it is neutral from this point of view). The main energetic characteristics of lignocellulosic biomass, such as calorific value, ash content, and calorific density are presented as a comparison between oak and larch biomass. The final conclusion of the paper is that although the role of vegetal biomass has diminished significantly in the last few years, it has not yet said its last word. The role of lignocellulosic biomass, as a sustainable fuel, will increase as fossil fuels will be diminish, and when the world's population will realize that fossil fuels are exhaustible and that others type of fuels have to be replaced instead.

INVITED SPEAKER

Prof. Jin Su Jeong

Universidad de Extremadura, Spain

Jin Su Jeong is a professor at the Universidad de Extremadura (Spain) and was a research fellow at the Universidad Politécnica de Madrid (Spain) with the Juan de la Cierva program. He was received his MS in Architecture from the Texas A&M University at College Station (United States) in 2006, his PhD with International Mention and Suma Cum Laude in Graphic Engineering, Geomatics and Projects (2014) and Science and Mathematics Education (2018) from the Universidad de Extremadura (Spain) along with a part of study in the University of Washington at Seattle (United States) and his BE in Architecture from the Chonnam National University in 2002 (South Korea). For his doctoral dissertations, he had done different doctoral research stays and collaborations in various countries. He has published more than 100 publications in journals, books and conference proceedings, including 32 papers in journals indexed in the Web of Science. He has participated more than 50 scientific committees of international conferences and associations, has served as more than 100 reviewers in a wide range of international journals, has invited more than 10 times as an international conference invited speaker and has served as an editorial board member in various international journal. Also, he has been involved in a number of international, European and national grants as well as industrial collaborations.

Speech Title---Sustainable development with MCDA-FDEMATEL method: Prioritizing criteria for renewable energy and its application to flipped science education

Speech Abstract--- This work presents an approach of sustainable development with an operational method of Multi-Criteria Decision Analysis-Fuzzy Decision-Making Trial and Evaluation Laboratory (MCDA-FDEMATEL). This approach can classify and analyze the criteria and sub-criteria of renewable energy facility and its application to flipped science education. For this study, it presents three different steps to be specified: firstly, it is to identify the most suitable location of a biomass plant with MCDA-FDEMATEL assessment in response to various disciplines; secondly, it is to introduce a web-based tool of biomass facility location suitability assessment, a web Multi-Criteria-Spatial Decision Support System (MC-SDSS); thirdly and finally, it is to apply its operational concept of sustainable development to flipped science education as to identify and analyze the most suitable criteria in a long-term learning program. The results verify the justification and positivity, differentiating suitable locations, with the approach proposed in terms of the criteria and sub-criteria selected. With the embodiment of web-based tool, it particularly articulates the advantages of a web MC-SDSS for seamless and asynchronous decision-makings for renewable energy facility location. Its adaptation results to flipped science education are showing to validate most important criteria for sustainable development, which fills a niche of decision-makers' subjectivity. Therefore, this proposed approach could be utilized to validate the most important criteria with parallel professional and educational circumstances and available data required. Also, it could be engaged to answer decision problems due to the proposed application's flexible and pertinent characters.

SESSION Ⅰ

August 20, 2019
Session Ⅰ

[Environment Engineering]

🕐 13:30-15:30

⊙ Vienna + Moscow @ ground floor

Chaired by Prof. Somchai Wongwises

King Mongkut's University of Technology Thonburi, Thailand

8 Presentations—

MG040-A, MG072-A, MG081, MG086, MG3002, MG077, MG067, MG074

*Note:

⚠ Please arrive 30 minutes ahead of the sessions to prepare and test your PowerPoint.

⚠ Certificate of Presentation will be awarded to each presenter by the session chair when the session is over.

⚠ One Best Presentation will be selected from each parallel session and the author of best presentation will be announced and awarded when the session is over.

SESSION I

MG040-A **13:30-13:45**	Anaerobic co-digestion of Fat, oil, and grease (FOG): Challenges and Opportunities **Hoo Kim**, Ji-Kwang Cheon, Mayur Kurade, El-Sayed Salama and Byong-Hun Jeon Hanyang University, South Korea Abstract-Biomethane production through the anaerobic digestion (AD) of sludge can play a major role by offsetting the energy consumption of WWTPs. However, only 40–50% of the organic portion of sludge is converted to biomethane, resulting in low digestion efficiency and biomethane yield. Recently, anaerobic co-digestion (ACD) of lipidic-waste such as fat, oil, and grease (FOG) has received much attention for the enhancement of biomethanation in WWTPs. However, there are several major challenges associated with ACD of FOG which includes inhibition by long chain fatty acids, sludge floatation and washout, and scum formation. Here we summarized the scientific and engineering aspects of the FOG supplementation as a cosubstrate in AD as well provides appropriate solutions for challenges encountered during the anaerobic operation. The discussion on the existing pretreatment approaches (including mechanical, thermo-chemical, and biological) for rapid degradation of FOG was also highlighted. Metagenomic analysis elucidates the microbial community and the interspecies interactions which are responsible for the degradation of FOG and its biomethanation during ACD. Addition of FOG to AD was found be economically feasible in municipal WWTPs.
MG072-A **13:45-14:00**	Leak Detection in Pipelines Using Fractal Analysis **Ariadna Sanjuan Perrusquia**, Jazael Moguel-Castañeda, Norberto Flores-Guzman, Eliseo Hernández-Martínez and Hector Puebla Universidad Autonoma Metropolitana Azcapotzalco, Mexico Abstract-Billions of dollars' worth of products are moved annually in pipelines. Thus, pipelines are an integral part of the world's economic structure. Thus, a suitable integrating monitoring system is of utmost relevance in the pipeline operation aimed at energy savings, high efficiency, and environmental protection. Indeed, non-detected pipeline leaks could lead to economic losses, potential risks to the safety of communities when the conveyed fluid is toxic or flammable; or for the environment when the leak pollutes aquifers or the atmosphere. Leak detection systems range from simple to computer-aided process engineering systems. Data-driven methods are based on the processing and analysis of historical data, as well as fluctuations associated with or generated by a leak. The apparent random behavior of these fluctuations motivates the use of non-conventional time series analysis methods. In this work, we have applied the fractal analysis of time series from a random perturbed model of a pipeline with a leak. Our results show that fractal analysis is able to identify the presence and magnitude of a leak.
MG081 **14:00-14:15**	Effect of Nano-TiO2 Additives Blended in Palm Biodiesel on Compression Ignition Engine Performance **Karoon Fangsuwannarak**, Thipwan Fangsuwannarak and Yongsathon Khotbut Suranaree University of Technology, Thailand Abstract-The property improvement of palm oil biodiesel (POB) was investigated by mixing a nano-TiO2 additive in order to achieve in the decrease of exhaust emissions of a diesel engine. The different POB fuel fractions were used including B10, B20, B30, B40, B50, and B100 which are compared with commercial diesel B2 as a fuel standard. The results suggested that the small amount of 0.1% wt nano-TiO2 additive provided the property improvement such as a decrease in kinematic

SESSION I

	viscosity and an increase in flash point, cetane index, and heating values. However, there are B2+0.1%TiO2 and B10+0.1%TiO2 providing their properties to be accepted in ASTM standard. The experimental results suggested that engine power and torque increased during the range of low engine speed (<2500 rpm) and became decreased during the higher range of engine speed (>3000 rpm). Carbon oxide (CO), carbon dioxide (CO2), and nitric oxide (NOx) emissions were measured directly at the tailpipe in order to observe the effect of POB fuel used on the gas emissions. It was found that nano-TiO2 additive significantly contributed the reduction of CO2 and NOx emissions.
MG086 **14:15-14:30**	Study on the Performance of Finely Ground Recycled Concretes in Cementitious Pastes **Václav Nežerka**, Zdeněk Prošek and Radim Hlůžek Czech Technical University, Czech Republic Abstract-Mobile grinders could be used for instant recycling of concrete waste, eliminating the need for transport of the demolition waste, storing, and possibly also landfilling. Even though partial replacement of aggregate by recycled one has become established practice, incorporation of concrete fines composed of fine sand and stripped mortar into concrete mix has been considered harmful. However, these fines could contribute to the concrete matrix and ITZ strengthening by the microfilling effect and through activation of residual anhydrous clinker (RAC). This study focuses on the content and possible reactivation of RAC from various sources in cementitious pastes using microscopy, calorimetry, and macroscopic testing of mechanical properties. The results indicate that proper sorting of the recycled material before grinding is crucial.
MG3002 **14:30-14:45**	A Study on Heavy Metals Contamination of Surfacial Materials by Environmental Magnetism and Chemical Analysis in Antaibao Open Pit Coal Mine, Shanxi Province, China **Manrong Chen**, Shangyi Wang, Binbin Yu, Weiguo Zhang and Lizhong Yu Yangzhou University, China Abstract-Antaibao Open Pit Coal Mine(AOPCM)'s mining activities have caused heavy metals contamination of surface, so it was urgent task to find a suitable method and survey full and prompt and long-term monitor on the heavy metals pollution. We chose methods of environmental magnetism and chemical analysis to analyze the surface materials on heavy metals contamination, by correlation of magnetic parameters and contents of chemical analysis, we can greatly reduce workload of chemical analysis and then achieve greater, faster, better, non-destructive, less chemical pollution and more economical results. The magnetic parameters and its groups act as proxy for the contents from chemical analysis. Three different sample areas sediments: loess or loess-like sediments, sedimentary rocks and alluvium, samples have different values of magnetic parameters. The values of magnetic susceptibility in this study were lower than others sediments and soils, secondly, the base rock and sedimentary rocks from the FD were of lower values of magnetic susceptibility than others of AOPCM. Contamination of Pb and Cd are more serious than other heavy metals. we can infer the contaminated level of anthropogenic heavy metals, DS > OD > FD. The mechanism may be mainly by the origin of the magnetic fraction in the anthropogenic particulate pollution and connected with the high-temperature technological processes during production and/or processing materials which have significant Fe content. Another point, when we want to study mechanism of magnetic properties used as proxy of heavy metals, the weak magnetic samples were measured and analyzed, we should be carefully.
MG077 **14:45-15:00**	Pyrolysis Oil Production from Polypropylene Plastic Waste Using Molybdenum Modified Alumina-Silica Catalysts

SESSION Ⅰ

Sasiradee Jantasee, Natacha Phetyim, Komm Petchinthorn, Tunyahpat Thanupongmanee and Nuntiporn Sripirom

Rajamangala University of Technology Thanyaburi, Thailand

Abstract-The production of pyrolysis oil from polypropylene plastic waste was examined over molybdenum modified alumina-silica catalysts (Mo/Al-Si). The reactions were carried out with 1 L of batch reactor under atmospheric pressure at 430 °C. The pyrolysis oil yield was in the order, 10% Mo/Al-Si > 5% Mo/Al-Si > 1% Mo/Al-Si > the absence of catalyst. The 10% Mo/Al-Si was highest activity due to the stronger acidity facilitating the pyrolysis reaction. It accelerated the reaction to produce the pyrolysis oil at lower temperature. Comparison of the pyrolysis oil properties to the standards of the diesel fuel from Thai Department of Energy Business shows that the color and the distillation were within standards. Moreover, the results reveal that the kind of raw material affected the product yield of pyrolysis process.

MG067 **15:00-15:15**	Rethinking Regional Cooperation – A New Layer in the European Energy Governance **Diyun Huang** Katholieke Universiteit Leuven, Belgium Abstract-The elements that motivate and shape the boundary formation of regional cooperation for cross-border market operation and investments are examined in this paper: 1) scenario and technology uncertainty; 2) externality; 3) energy security under climate policies. While the first two aspects represent the potential benefit of pursuing the regional cooperation to lower the market operation and investment costs, the energy security factor is determinant as it sets the norms and beliefs that lay the foundations for cross-border cooperation.
MG074 **15:15-15:30**	Assessment of Natural Radioactivity Level and Annual Effective Dose of Amber Rice Samples Cultivated in the South of Iraq **Abdulridha Younis** and Nada Tawfiq Al-Kitab University, Iraq Abstract-In this work, the activity concentrations of naturally occurring radioactive material including ^{238}U, ^{232}Th, and ^{40}K were measured of some amber rice samples cultivated in southern Baghdad and Al Najaf governorate and used in Baghdad governorate–Iraq at 2018, using gamma-ray spectrometer with NaI (Tl) detector. The results show that the activity concentrations for ^{238}U ranged from (2.68 to 10.81) Bq/kg with average 5.94 Bq/kg, ^{232}Th ranged from (B.D.L to 3.37) Bq/kg with average 2.65 Bq/kg, and for ^{40}K ranged from (4.48 to 35.7) Bq/kg with average 16.84 Bq/kg. The annual effective dose from rice consumption by adults for ^{238}U, ^{232}Th, and ^{40}K ranged from $(0.41$ to $1.6) \times 10^{-5}$ Sv/y with average 0.9×10^{-5} Sv/y, $(B.D.L$ to $0.42) \times 10^{-5}$ Sv/y with average 0.2×10^{-5} Sv/y, and $(0.17$ to $1.2) \times 10^{-5}$ Sv/y with average 0.45×10^{-5} Sv/y respectively. All values of the average specific activities are less than the global average values of ICRP, and the annual effective dose from rice consumption by adults was lower than the permissible limit of (1 m Sv/y) recommended by the International Commission on Radiological Protection.

Coffee Break | <16:00-16:15>

August 20, 2019
Session II

[Energy Science]

🕐 13:30-16:00

◎ Berlin @ ground floor

Chaired by Dr. Daniel Villanueva

University of Vigo, Spain

10 Presentations—

MG001-A, MG016, MG034-A, MG038, MG036-A, MG045-A, MG049, MG054, MG027, MG033-A

*Note:

⚠ Please arrive 30 minutes ahead of the sessions to prepare and test your PowerPoint.

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SESSION II

MG001-A **13:30-13:45**	Thermal Performance of Plate-Fin Heat Sink with Lateral Perforation **Sakkarin Chingulpitak** and Somchai Wongwises King Mongkut's University of Technology Thonburi, Thailand Abstract-This research aims to study on the flow and heat transfer characteristics of solid-fin heat sink (SFHS) and laterally perforated plate-fin heat sink (LAP-PFHS). The SFHS and LAP-PFHSs are investigated on the same fin dimensions. The LAP-PFHSs are performed with a 27 perforation number and two different diameters of circular perforation (3 mm and 5 mm). The experimental study is conducted under various Reynolds numbers from 900 to 2,000 and the heat input of 50W. The experimental results show that the LAP-PFHS with perforation diameter of 5 mm gives the minimum thermal resistance about 25% lower than SFHS. The thermal performance factor which take into account of the ratio of the Nusselt number and ratio of friction factor is used to find the suitable design parameters. The experimental results show that the LAP-PFHS with the perforation diameter of 3 mm provides the thermal performance of 15% greater than SFHS. In addition, the simulation study is presented to investigate the effect of the air flow behavior inside the perforation on the thermal performance of LAP-PFHS.
MG016 **13:45-14:00**	Biomass-Alternative Renewable Energy Source and Its Conversion for Hydrogen Rich Gas Production **Elena David**, Janez Kopac, Adrian Armeanu, Violeta Niculescu, Claudia Sandru and Viorel Badescu National Research Institute for Cryogenic and Isotopic Technologies, Romania Abstract-This paper presents biomass as a renewable energy source and defines the resources as well as the ways through biomass energy is converted into fuels, the technologies used for extracting the energy from biomass as well as the advantages and disadvantages that appear by using of biomass as a energy source. In addition ,it is known hydrogen is an important alternative energy vector and a bridge to a sustainable way for the energy future. Hydrogen is an energy carrier and can be obtained bydifferent production technologies from a large variety of primary energy sources. At present, many researches are focused on getting energy from biomass, a sustainable and non-polluting way to replace fossil fuels, because the biomass can be considered as the best option with high potential, which meets energy requirements and could insure fuel supply in the future. Biomass and residual biomass can be used to produce hydrogen rich gas sustainably. Biomass pyrolysis and gasification offers an efficiency and economical route for the renewable hydrogen production and this is also discussed in the paper.
MG034-A **14:00-14:15**	Investigation and Analysis on Energy Structure of World Megacities and Their Enlightenment to Beijing **Xinxin Zhang**, Zhenggang Lu and Jingfu Wang Beijing University of Technology, China Abstract-As the capital of China, the city of Beijing has an important strategic position in the new era. In order to profoundly implement the goal of building Beijing into a world-class harmonious and liveable capital city, Beijing's energy system adjustment is imperative. It is undoubtedly impossible to substantially adjust the total energy consumption in the current period when there is no revolutionary breakthrough in new energy utilization. In contrast, based on the current status of Beijing's urban development, optimizing the energy structure and accelerating the construction of a fast, efficient, clean, safe and sustainable energy system is the most practical strategy. Taking London, New York, and Tokyo as examples, this study investigated and analyzed the establishment of energy structure system

SESSION II

	and related urban planning experience of world-class megacities. Moreover, the planning strategies of low-carbon cities were also summarized. The summary of international cases can play a certain reference role in the adjustment of Beijing's energy structure and related urban planning practice.
MG038 **14:15-14:30**	Modeling and Thermal Analysis of a CCP Collector System Based on Fractal Architecture: Receiver Proposal **Angélica Palacios**, Darío Amaya Hurtado and Olga Lucia Ramos Sandoval Universidad Militar Nueva Granada, Colombia Abstract-Solar concentrator technology has been researches in different fields in order to enhancement efficiency and energy storage of these systems. Some changes in fluid and numerous components of the collectors has been proposed in recent years. In this context, this paper present results associates to the modeling and thermal analysis of a concentrating system based on parabolic through collector with receiver piper, designed with fractal geometry with the aim of improve system heat transfer. Founded on thermal modeling of heat transfer phenomena as radiation, convection and conduction, physical and mathematical relations between fractal geometrical parameters and transfer heat coefficient were established to find the influence of a chaotic structure on thermal behavior. Proposed designs were simulated through Solid works ® Flow Simulation tool. Was possible obtain maximum temperatures in air with fractal and cylindrical pipes of de 89°C, 86°C y 81°C respectively. The gap between fractal geometry results and cylindrical geometry is 10°C around.
MG036-A **14:30-14:45**	Study on Torrefaction and Steam Gasification Characteristics of Biomass **Jingfu Wang**, Lei Wen and Xinxin Zhang Beijing University of Technology, China Abstract-As a renewable energy source, biomass energy has attracted more and more people's attention. Biomass fuel has the disadvantages of low fixed carbon content and low calorific value, torrefaction pre-treatment is an important technical measure to increase biomass energy density. In this paper, peanut shell, sawdust and bamboo were selected as raw materials. Firstly, the torrefaction pre-treatment of different torrefaction conditions were used to study the effects on fuel properties such as biomass composition, mass yield and energy yield. The steam pyrolysis gasification characteristics of the torrefacted biomass were then studied by thermogravimetric analyzer and the chemical reaction kinetic parameters were calculated. Finally, Aspen plus software was used to simulate the gasification of torrefacted biomass, the gas production characteristics under different torrefacted biomass, different gasification temperature and different water vapour biomass ratio were studied.
MG045-A **14:45-15:00**	Ocean Energies: Resources and Utilization **Emad Nasserian** HM engineering, Germany Abstract-Energy is an expensive and scarce commodity. Renewable energy sources are aimed at providing the earth population with cheaper energies. This has been the main concern of the researchers in this field for decades. Ocean energy is one of these renewable energies that are being used by some countries around the world. Should they be administered within the environmental guidelines and procedures, no damage is done to the marine environment. In this paper, the various kinds of ocean energies namely tidal energy, marine currents and wave energy are reviewed. The

SESSION II

	investigation of possible technologies for extracting electrical energy from them will be described. Finally, using life cycle, the feasibility and applicability of this kinds of energy are explained.
MG049-A **15:00-15:15**	Profiles of Blades and Paddles for Turbines with Geometry Design Inspired by Nature George Poteraş, György Deák, Marius Viorel Olteanu, **Iasmina- Florina Burlacu** and Cristina Sîrbu National Institute for Research and Development in Environmental Protection- Bucharest, Romania Abstract-Exploitation of the main renewable energy sources (hydraulic, wind and solar radiation) in different installations involves the use of considerable surfaces, whether they are located on land or on water, having a negative impact on the environment. With the aim to dispose this deficiency, an installation that captures and integrates the three renewable resources has been proposed and patented. Therefore, their simultaneous exploitation in order to obtain electricity has the highest efficiency per unit area. In the laboratory, an installation was built and tested that integrates all three sources of renewable energy: the movement of water currents from flowing waters, the movement of air currents and solar radiation. Improvements that have been made to this pilot installation regarding the efficiency increasing of blades will be presented in the present communication, being analyzed the performance of using the profile blades with geometry inspired by nature.
MG054 **15:15-15:30**	Economic Feasibility of Developing Large Scale Solar Photovoltaic Power Plants in Spain **Javier Menéndez** and Jorge Loredo University of Oviedo, Spain Abstract-In 2017, electricity generation from renewable sources contributed more than one quarter (30.7%) to total EU-28 gross electricity consumption. Wind power is for the first time the most important source, followed closely by hydro power. The growth in electricity from photovoltaic energy has been dramatic, rising from just 3.8 TWh in 2007, reaching a level of 119.5 TWh in 2017. Over this period, the contribution of photovoltaic energy to all electricity generated in the EU-28 from renewable energy sources increased from 0.7% to 12.3%. During this period the investment cost of a photovoltaic power plant has decreased considerably. Fundamentally, the cost of solar panels and inverters has decreased by more than 50%. The solar photovoltaic energy potential depends on two parameters: global solar irradiation and photovoltaic panel efficiency. The average solar irradiation in Spain is 1,600 kWh m-2. This paper analyzes the economic feasibility of developing large scale solar photovoltaic power plants in Spain. Equivalent hours between 800-1,800 h year-1 and output power between 100-400 MW have been considered. The profitability analysis has been carried out considering different prices of the electricity produced in the daily market (50-60 € MWh-1). Net Present Value (NPV) and Internal Rate of Return (IRR) were estimated for all scenarios analyzed. A solar PV power plant with 400 MW of power and 1,800 h year-1, reaches a NPV of 196 M€ and the IRR is 11.01%.
MG027 **15:30-15:45**	Assessment of Various Parametric Effects on the Performance of a Commercial Grade Photovoltaic Solar Panel **Susanta K. Das** and David Frank Kettering University, United States of America Abstract-This paper presents the implementation of an integrated photovoltaic solar panel model which includes all the necessary parameters in order to simulate and analyze using Matlab/Simulink software. The integrated photovoltaic model is validated with Matlab/Simulink simulation for a

	commercially available 100W photovoltaic solar panel module. Using the commercial solar panel specifications, such as solar irradiation, panel temperature, etc. the integrated model solved with Matlab/Simulink returns an I-V and P-V performance characteristics under various conditions which enabled detailed analysis, assessment of parametric effect on the performance of the solar panel. According to the model simulation results for a commercial RNG-100D solar panel, it was found that panel performance was mostly affected by the variations of solar radiation/insolation, panel surface temperature, series resistance, shunt resistance and band gap energies of the semiconductor materials. The commercial solar panel simulation results show that a photovoltaic panel output power reduces as module temperature decreases. Taking the effect of sunlight irradiance and cell temperature into consideration, the output current and power characteristics of PV model are simulated and results can be optimized using the proposed model. The integrated model enables the dynamics of PV power system to be easily simulated, analyzed, and optimized.
MG033-A **15:45-16:00**	Experimental Investigation of Heat Flux on Gas Diffusion Layer of a Proton Exchange Membrane Fuel Cell Cheng Ren Qiao, **Hang Guo**, Fang YE and Chong Fang MA Beijing University of Technology, China Abstract-Monitoring heat flux in fuel cells can provide data for proper heat management. In this work, heat flux on the surface of the gas diffusion layer at the anode of a proton exchange membrane fuel cell is experimentally measured using thin film sensors. The results show that heat flux increase with current density, and the heat flux is low at high reactants mass flow.

Coffee Break | <16:00-16:15>

SESSION Ⅲ

August 20, 2019
Session Ⅲ

[Power System]

⏱ 16:15-18:45

⊚ Vienna + Moscow @ ground floor

Chaired by Assoc. Prof. Susanta K. D

Kettering University, USA,

10 Presentations—

MG002-A, MG021, MG055, MG076, MG022, MG090, MG1001-A, MG053, MG082, MG089

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SESSION Ⅲ

MG002-A **16:15-16:30**	Condensation Heat Transfer and Pressure Drop of R-134a Flowing Inside Dimpled Tubes **Kanit Aroonrat** and Somchai Wongwises King Mongkut's University of Technology Thonburi, Thailand Abstract-An experimental investigation is conducted to determine the condensation heat transfer and pressure drop of R-134a flowing inside dimpled tubes. The test section is a counter-flow double-tube heat exchanger, which the refrigerant flows in the inner tube and water flows in the annulus. The inner tubes are one smooth tube and three dimpled tubes with different helical pitches. All test tubes are made from copper with inside diameter of 8.1 mm and length of 1500 mm. The experiments are conducted over mass fluxes ranging from 300 to 500 kg/m²s, heat flux ranging from 10 to 20 kW/m², and condensing temperature ranging from 40 to 50 ˚C. The results show that all dimpled tubes provide higher heat transfer coefficient and frictional pressure drop compared to the smooth tube. In addition, the heat transfer coefficient and frictional pressure drop increase with decreasing of helical pitch. It can be observed that the dimpled tube with lowest helical pitch yields the heat transfer enhancement in the range of 60-89% with the frictional pressure drop increase of 289-674% in comparison to the smooth tube.
MG021 **16:30-16:45**	The Impacts of Power Infrastructure Development on Socio Economic Growth in Sub-Sahara Africa Ngcobo Ntebo, Kasenge Mathe and **Emmanuel Oikelomen Ayorinde** University of Johannesburg, South Africa Abstract-Infrastructural development is fundamental in nations economic growth and development. Power infrastructure is imperative for nation building and helps create employment and improve the well being of its citizens. This research paper identifies the impact of power infrastructure development on economic growth in sub-Saharan Africa (SSA). The study adopted a quantitative research approach with data gathered from the respondents within power infrastructure development in the region. Information gathered was analysed using mean item score, standard deviation and factor analysis. The findings revealed economic benefits of power development in SSA to be wealth creation, boost in citizens' income, health care improvement, improved educational systems. These were seen as the direct impact of infrastructure development on the economic situation in sub Sahara Africa. Since the lack of infrastructural facilities of an economy can lead to various setbacks in the nation's economic development, it thereby requires adequate participations by stakeholders to deliver sustainable power infrastructure development in the society. The study of power infrastructure development can contribute to regional and national growth, urbanization challenges, and improvement in the environmental through the provision of clean energy which foster social and economic inclusion.
MG055 **16:45-17:00**	Power Energy System Sustainability Performance Evaluation and Improving Path of Two Regional Economic Circle in China Xiangyu Yi, Jinchao Li, Yunna Wu and **Wenjun Chen** North China Electric University, China Abstract-The power energy system is the foundation of the sustainable development of the human society and has an important impact on the economic, environmental and security of human society development. This paper first establishes the input and output evaluation index system of sustainable development capability of power energy system from the economic, social, environmental and security

	dimensions, and then uses the CCR-DEA model considering the undesired output and Malmquist index to dynamically measure the sustainable development efficiency of the power system in the Beijing-Tianjin-Hebei and Yangtze River Delta from 2005 to 2016 and decompose the corresponding items. The future development situation was analyzed through scenario analysis. The results show that: (1) Beijing and Shanghai is better than that in other provinces and cities in the same region, showing an upward trend; (2) The changes in the efficiency of sustainable development of power energy systems in Beijing, Shanghai, Zhejiang and Anhui provinces are mainly caused by technical efficiency changes. That in Tianjin, Hebei and Jiangsu are from two aspects: technical efficiency and scale efficiency; (3) The sustainable development capacity of the power system in the Beijing-Tianjin-Hebei economic circle is higher than that of the Yangtze river delta power system, and this gap has the tendency of further widening according to the strategic development plan of the two regional power energy systems; (4) In the future, China's regional electric energy system development plans should draw on the energy development strategic plan of the Beijing-Tianjin-Hebei region, especially the Xiong'an National New District, so as to achieve coordinated and sustainable development of power energy systems in various regions.
MG076 **17:00-17:15**	Optimal Operation of Two Cascaded Reservoir System for Maximizing Hydropower Generation based on Particle Swarm Algorithm **Phoutthavanh Sorachampa**, Nakorn Tippayawong and Kanchit Ngamsanroaj Chiang Mai University, Thailand Abstract-Hydropower is one of the most significant renewable energy resources, especially for mountainous countries like Laos PDR. Expansion and development of many hydropower projects in the country have presented a challenge to the operation of multiple reservoir system. Nam Ngum river was the focus of this work, where there are two or more cascading reservoirs. Optimal operation of such system is of interest, with the main goal of maximizing power generation. A multi-objective particle swarm optimization (PSO) was adopted in this study, applying to two cascading reservoirs of Nam Ngum 1 and 2 hydropower plants. It was demonstrated that increases in hydroelectric power generation could be realized for all cases of normal, dry and wet years, compared to the traditional actual operation of the hydropower plant system. Similar approach may be adopted to assess opportunities in other water management problems.
MG022 **17:15-17:30**	A Theorectical Overview of Power Infrastructure Financing: the Brazil and India Approach Kasenge Mathe, **Emmanuel Oikelomen Ayorinde** and Ngcobo Ntebo University of Johannesburg, South Africa Abstract-Infrastructure development promotes human capital development. Access to quality education and health care are some of the incentives of Infrastructure development. The development of power infrastructure in Brazil and India has greatly facilitated its gross domestic product (GDP) and social-economic development. This study assesses the approach of development of power infrastructure in Brazil and India as a possible model for other emerging nations' economy to follow. A confirmatory literature involving power infrastructure development in India and Brazil was explored for the purpose of this study. The paper highlights the challenges, policy effects, legislations effects, ways to finance, philosophical approach and the economic benefits of power infrastructure development in Brazil and India. Power infrastructure will strive when the challenges involved in its development are addressed. The adoption of this approach of implementing the developmental challenges, better

	policies, innovative financing scheme and effective legislations that has aided the development of power infrastructure development and should be replicated in emerging nations i.e. sub-Sahara Africa (SSA). Also, direct implementation of this approach will bring forth the benefits of infrastructure development. This will contribute to the knowledge of power infrastructure development in emerging nations across the globe.
MG090 **17:30-17:45**	The Effect of Number of Thermocouples on Photovoltaic-Thermoelectric (Pv-Teg) Hybrid Power Generation System Abhishek Tiwari and **Shruti Aggarwal** University School of Basic and Applied Sciences, Guru Gobind Singh Indraprastha University, India Abstract-In this present paper, a model has been developed for an opaque PV module integrated with a Thermoelectric Generator (PV-TEG) and simulated in MATLAB under clear day condition in the month of May for New Delhi climatic condition. The effect of number of thermocouples of TEG (N) on the power output and electrical efficiency of PV module, thermoelectric generator (TEG) and the PV-TEG hybrid system on whole has been studied and analysed. The variation in the temperature of the opaque PV module (Tpv) and the temperature difference across the Thermoelectric Generator (ΔTteg) due to variation in the number of thermocouples has been analysed. The results show that the power output of PV module, power output of TEG module and the power output of PV-TEG hybrid system achieved their maximum value at N=127. It has been observed that the maximum temperature of the PV module and minimum efficiency of PV module both were obtained at N=1.In case of TEG module, maximum temperature difference was obtained at N=1 and minimum efficiency was obtained at N=127. The hybrid system behaviour, in terms of its power output and electrical efficiency, was strongly affected by PV module and less affected by TEG module.
MG1001-A **17:45-18:00**	Fabrication of Lithiophilic Copper Foam with Interfacial Modulation toward High-Rate Lithium Metal Anodes **Liguang Qin** and Jian Chen Southeast University, China Abstract-Although metallic lithium is regarded as an ideal anode material for high-energy-density batteries, the low cycling efficiency and safety issues hinder its practical application. In this study, a three-dimensional (3D) lithium composite anode was developed through infusing molten lithium inside the Cu foam anchored by ZnO nanoparticles. The introduced ZnO layer provides the driving force for infusion, leading to the spontaneous wetting of molten lithium. Benefiting from well-confined preloaded lithium in the Cu network, the anode displays ultralow internal resistance and stabilized interface. The fabricated anode for the symmetric cell shows extraordinarily low overpotential at high current densities (15, 33, and 50 mV at 3, 5, and 8mA cm−2 after 100 cycles, respectively). When paired with Li4Ti5O12 electrode, the half-type cell demonstrates superior rate capability and longterm cycling stability after 1000 cycles at an ultrahigh rate of 10C. To the best of our knowledge, this anode shows the lowest overpotential and the highest rate capacity ever reported for 3D design anodes, confirming their great potential as lithium metal anodes.
MG053 **18:00-18:15**	A Hybrid Model for China's Power Grid Investment Demand Forecasting Based on Variational Mode Decomposition, Regularized Extreme Learning Machine and Support Vector Machine Qianqian Wu, Shaowen Zhu, **Jinchao Li**, Wenjun Chen and Yunna Wu North China Electric University, China

SESSION Ⅲ

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<td>Abstract-With the continuous maturity of China's power grid as well as the advancement of electricity market reform in China, accurate and efficient investment decision has become an inevitable requirement of power grid enterprises. However, China's Power grid investment demand has complicated nonlinear and non-stationary characteristics due to it's complex causes of formation, thus make it hard to be forecasted. Aiming at this problem, this paper puts forward a novel hybrid VMD-RELMLOO-PSOSVM forecasting model based on variational mode decomposition (VMD), leave-one-out cross validation error based optimal regularized extreme learning machine (RELM-LOO) and support vector machines optimized by particle swarm optimization algorithm (PSO-SVM). Firstly, the VMD method is employed to decompose the original power grid investment data sequence into several modes which have specific sparsity properties while producing main signal. Then, according to the different characteristics of each subsequence, the RELM-LOO and PSO-SVM model will be used to forecast different modes, respectively; Next, the prediction results of all modes are aggregated to obtain the final prediction results of China's power grid investment demand. Finally, this paper predicts China's power grid investment demand from 2018 to 2020 under 5 different scenarios based on the proposed VMD-RELMLOO-PSOSVM hybrid forecasting model.</td>
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<td>MG082
18:15-18:30</td>
<td>Synthesis of Phosphorus Solution for n+ Si Selective Emitter Solar Cell by Spin on Doping
Thipwan Fangsuwannarak, Supanut Laohawiroj and Kamonchanok Mekmork
Suranaree University of Technology, Thailand

Abstract-A strong requirement in manufacturing of high-efficiency solar cells is its cost reduction. One approach of aim is to merge several steps of n+ Si selective emitter processing into one step without degrading the performance of solar cells. By varying the doping level in the selective area, intrinsic fields can be built into solar cells with potential benefits long recognized. In this paper, the spin-on doping (SOD) method was used for the purpose of important tasks, different phosphorus diffusion to form n+ Si selective area consisting of the lightly and heavily doping emitter areas with 35Ω/sheet and 121Ω/sheet. The main solution containing different concentrations of phosphorus doped-SOD source was synthesized in this work. The sheet-resistance dependence of n-Si emitter layers on the concentration of phosphorus acid in the SOD solution was studied in term of the volume ration of TEOS: H3PO4, as well as the thermal diffusion temperature. The suitable condition for forming n+ Si selective emitters in one process step is 1000°C diffusion temperature for 30 minutes with the complementary SOD volume ratio of 4:1 and 2:1. SOD solution can be patterned by a screen printing or an inkjet printing.</td>
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<td>MG089
18:30-18:45</td>
<td>A Long-term Period Performance Assessment of a Building Integrated Photovoltaic System
Mustafa Araz, Emrah Biyik and Arif Hepbasli
Yasar University, Turkey

Abstract-Building Integrated Photovoltaic (BIPV) systems can be defined as PV modules, which can be integrated in building's envelope by replacing conventional building materials such as windows, tiles etc. and have an impact on the functionality of the buildings. Considering the huge share (40%) of buildings in total energy consumption and nearly zero-energy building target of the European Union (EU), BIPV systems present a sustainable solution and have gained increased interest in last years. In this study, the performance of a BIPV system, which was installed on Feb. 8, 2016 on the façade of a campus building at Yasar University, İzmir, Turkey within the framework a EU/FP7 project and has a</td>
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	capacity of 7.44 kWp, is evaluated for a three-year period using first and second laws of thermodynamics. Within this context, real (experimental) monthly and yearly electricity productions are determined and compared with the results obtained from the simulations. Energy and exergy efficiencies and performance ratios of the system are also calculated based on the cell and total areas.

Dinner | <19:00-21:00>

SESSION Ⅳ

August 20, 2019
Session Ⅳ

[Wind Energy System]

🕐 16:15-18:15

⊚ Berlin @ ground floor

Chaired by Lecturer Florin Onea,

"Dunarea de Jos" University of Galati, Romania

8 Presentations—

MG035, MG020, MG029, MG042, MG051, MG009, MG030, MG048-A

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SESSION Ⅳ

MG035 **16:15-16:30**	Wind and Wave Energy Resource of Germany Reported by ERA-Interim Reanalysis Data Eugen Rusu and **Florin Onea** ''Dunarea de Jos'' University of Galati, Romania Abstract-The aim of this work is to identify the most suitable offshore wind farms from Germany that present relevant wave conditions, suitable for the development of a wave energy project. By using the ERA-Interim data (wind and waves) reported for the time interval from 1999 and 2018, was possible to identify the more important areas, by taking also into account the seasonal distributions. Several wave energy converters were considered for assessment, for which a capacity factor located between 2.5% and 14% was reported, better results being accounted by the Seabased system (rated at 15 kW). Finally, we can concluded that the North Sea represent an important area in terms of the marine energy and since at this moment there are operational wave projects, this will represent a suitable area for the development of a mixed wind-wave project.
MG020 **16:30-16:45**	A New Pitch Angle Control Method of Wind Turbine Generators Based on Feed forward Wind Speed Information **Mouayad Sahib** and Thaker Nayl University of Information Technology and Communications, Iraq Abstract-In this work, a new strategy to control the pitch angle of wind turbine generator is proposed. The strategy is based on designing an intelligent control system capable of maintaining a stable minimum fluctuating power generation. This can be achieved by providing the wind speed information to the controller in advance and hence allowing the controller to take the optimum action in controlling the blade pitch angle. A model based optimizer uses Model Predictive Control (MPC) technique to predict the wind turbine generator future behaviour and select the optimal control actions assisted by the wind speed information while satisfying the power generation constraints. The simulation results show that a significant improvement can be made using the proposed control method.
MG029 **16:45-17:00**	Interior Point Algorithm Applied to the Optimization of the Power Supplied by a Wind Farm with a BESS Pablo Durán, **Daniel Villanueva**, Andrés Feijóo and Neeraj Bokde University of Vigo, Spain Abstract-Wind power constitutes a variable energy source that introduces unbalance in electrical network management because it cannot be programmed. Then, the possibility of storing wind energy becomes very important. The lack of control is a drawback that disappears when the combination of a wind farm (WF) and a battery energy storage system (BESS) is considered. In that case, the goal is to adjust the power plant output and the load requirements of electrical network, i.e., to contribute to system adequacy as much as possible. Considering the features of the problem, it can be defined as an optimization problem. Two algorithms are proposed to solve it: the primal dual algorithm and the Mehrotra predictor-corrector one. In both cases, the best solution of the proposed problem is reached in an efficient manner. The primal dual algorithm performs better in terms of time and the Mehrotra predictor-corrector one needs fewer iterations.
MG042 **17:00-17:15**	Assessment of The Romanian Onshore and Offshore Wind Energy Potential **Florin Onea** and Liliana Rusu ''Dunarea de Jos'' University of Galati, Romania

SESSION Ⅳ

Abstract-A general assessment of the wind energy potential from the eastern part of Romania was carried out in this work by taking into account onshore and offshore wind conditions. First, a perspective of the importance of the renewable resources into the Romanian electricity system was provided, from which was noticed that the wind production cover almost 15% from the demand (reported to 2017). From the analysis of the wind data significant differences were noticed between the onshore and offshore regions, the last one presenting more important wind resources, that significantly increase during the winter time (with almost 22%). According to the performance reported by an offshore wind turbine (rated at 3 MW), such generator will operate at full capacity in a maximum 9% from the time, if we consider a hub height of 119 m.

MG051 **17:15-17:30**	A Holistic Approach for the Optimization of Offshore Wind Farm Layouts Considering Cable Layouts **Ilayda Ulku**, Cigdem Alabas-Uslu Istanbul Kultur University, Turkey Abstract-A wind farm, mainly, is composed of a set of turbines, one or more transmitters and a set of electrical cable connections between turbines and transmitters. Determination of turbine locations within the farm to maximize total power generation is called turbine location (TL) problem. Relative turbine positions affect the amount of overall energy because of wake effects. Determination of cable connections among turbines and transmitters to collect produced energy by turbines at transmitters is called cable layout (CL) problem. While TL problem is directly effective on the total energy production in the farm, CL problem indirectly affects the total energy due to the power losses. In the literature, TL and CL problems are solved sequentially where the layout found by solving of TL is used as an input of CL problem. To minimize wake effects in TL problem, distances between turbine pairs should be increased, however, as the distances are increased the cable cost increases in CL problem. A new mathematical model is developed to deal with simultaneously solving of TL and CL problems. A set of test instances are used to show the performance of the proposed model. The experiments show the practical use of the proposed holistic model.
MG009 **17:30-17:45**	Potential Assessment of Hybrid Pv-Wind Systems for Household Applications in Rural Areas: Case Study of Morocco **Lhoussaine Tenghiri**, Yassine Khalil, Farid Abdi and Anas Bentamy Al Akhawayn University, Morocco Abstract-Proper combination of wind and solar photovoltaic (PV) systems can result in optimal configurations that maximise the Annual Energy Production (AEP) while being economically attractive. This paper presents a typical approach to the design of a hybrid PV-Wind system for household applications in rural areas. Based on the capacity factor of the hybrid system components, a design methodology was developed to maximize the AEP and to minimise the investment cost. The electricity generated will be used to meet the load requirements of the user while the potential excess of the power will be stored in the battery system or dissipated in a dump resistor. This design methodology is suitable for household applications presenting limitations in the available roof area where the PV panels will be installed. Implementing the PV panels on the house's roof intends to eliminate the shadow over the panels, to avoid the material damage, and to prevent vandalism. Four different cities were selected to conduct the study which are: Tetouan, Essaouira, Dakhla, and Ouarzazate. For the present design approach, the installed cost of the hybrid system includes the price of the storage

	system.
MG030 **17:45-18:00**	A Strategy for Power Generation Optimization in a Hybrid Wind-BESS Power Plant **Daniel Villanueva**, Andrés Feijóo and Neeraj Bokde University of Vigo, Spain Abstract-The wind is an uncontrollable primary resource, although its energy can be stored. This fact can be used for the design of strategies for a better management of electric power networks. An option for achieving this goal is to install Battery Energy Storage Systems (BESS) in the wind farms (WF). When dealing with WFs combined with BESSs the most important is to manage the power production in order to meet the requirements of the network or those related with the owner of the plant. Both challenges constitute an optimization problem. This paper proposes an Evolutionary Algorithm (EA) to solve it, where a fitness function must be maximized under the consideration of certain constraints. The fitness function depends on the target of the power production, which may be either to help the network become more stable or to maximize the profit, assessing each scenario and accepting the best one. The constraints of the optimization problem are related to the levels of the BESSs: the maximum power transferred to or from it and the output power of the plant.
MG048-A **18:00-18:15**	Numerical Investigation of Tip Speed Ratio Effect on the Performance and Wake Region of Vertical Axis Tidal Turbines **Sercan Yagmur** and Faruk Kose Konya Technical University, Turkey Abstract-The energy flow rate per unit flow area of water flow is considerably higher than air flow, because of high density of water. Therefore, turbines for wind applications will obtain higher energy when used as water turbines, and one of them is the Darrius type vertical axis turbines. In this study, the 2-dimensional numerical investigations are carried out to study performance and wake characteristics of three bladed Darrius type turbine configuration with NACA 0018 blade profile for varying tip speed ratios (TSR) at a solidity of 0.382. The maximum power coefficient is occurred at the TSR=1.15 in the range of 1.0-1.4 where the uniform velocity of water is constant and 0.58m/s. The effect of TSR on the wake characteristics of a Darrius water turbine is examined to determine the streamwise distance for its use as hydro farm. A minimum distance to flow recovery along the streamwise direction is defined 10D at TSR= 1.15 where the maximum performance is obtained. However, considering the recovery length for a hydro farm application the minimum recovery length is provided at TSR=1.3. As a result, to obtain the optimum power generation from per length along the channel, the TSR=1.3 is found to be appropriate.

Dinner | <19:00-21:00>

SESSION Ⅴ

August 21, 2019
Session Ⅴ

[Air Quality Assessment]

🕐 **9:45-11:45**

◎ **Berlin @ ground floor**

Chaired by Assoc. Prof. Spiru Paraschiv,

"Dunarea de Jos" University of Galati, Romania

8 Presentations—

MG008-A, MG017, MG014-A, MG023, MG010-A, MG024, MG060-A, MG-062

*Note:

⚠ Please arrive 30 minutes ahead of the sessions to prepare and test your PowerPoint.

⚠ Certificate of Presentation will be awarded to each presenter by the session chair when the session is over.

⚠ One Best Presentation will be selected from each parallel session and the author of best presentation will be announced and awarded when the session is over.

SESSION V

MG008-A **09:45-10:00**	A Case Analysis of Online Monitoring and Compositions and the Contribution of Regional Transport for Submicron and Fine Aerosols in Beijing, China **Hanyu Zhang**, Shuiyuan Cheng, Xiaoqi Wang and Sen Yao Beijing University of Technology, China Abstract-High concentrations of aerosols are frequently observed during the autumn in Beijing, resulting in serious atmospheric pollution and human health concerns. We have investigated the characteristics of non-refractory submicron aerosols (NR-PM1) and chemical composition in Beijing University of Technology (BJUT) by an Aerosol Chemical Speciation Monitor (ACSM) from October 1 to 30, 2016. Meanwhile, the measurement of comprehensive chemical components in submicron and fine aerosols was conducted in Beijing Normal University (BJNU) based on the filter sampling during October 10-30, 2016. The monthly average concentration of NR-PM1 was 60.20 ± 53.48 μg/m3, with organics being the major fraction (42.33%), followed by NO_3^- (22.87%), SO_4^{2-} (18.70%), NH_4^+ (12.24%) and Cl^- (3.86%). The correlation between online and offline methods for submicron particles and species performed better, which was higher than 0.80 except Cl^- (r=0.61). The PSCF and CWT methods indicated that common high potential source regions, located in the western Shandong, northern Henan and southern Hebei Provinces played a crucial role in the NR-PM1 pollution in Beijing. The WRF-CAMx model was used to simulate the impact of PM2.5 transported from its surrounding prefecture-level cities on PM2.5 concentrations in Beijing during the whole month, haze days and clean days. Note that the PM2.5 inflows for Beijing mainly came from Baoding and Langfang, and outflows towards Chengde and Zhangjiakou, identifying two key PM2.5 transport pathways: the southwest-northeast pathway and the southeast-northwest pathway. The PM2.5 inflow fluxes from Baoding and Langfang were much higher than outflows from Beijing, leading to the peaking PM2.5 pollution, with the highest concentrations occurring from 00:00 to 11:00 LT, 14 October 2016. Comparatively speaking, net PM2.5 fluxes showed smaller fluctuations near 0 and remained stable from 0:00 28 October to 12:00 the next day, and then increased markedly after 12:00 28 October . In addition, based on the PM2.5 transport flux with different altitudes, we found that the total net transport fluxes mainly occurred at the altitude of 400 m to 800 m during the entire month, and at 600 m to 1000 m for 14 October, all followed by the southwest-northeast transport pathway. However, the PM2.5 fluxes were far lower for 28 October, and followed by the northwest-southeast transport pathway. While the PM2.5 fluxes increased at various altitudes on 29 October, especially above 300 m, causing an increase of PM2.5 concentration. Therefore, more efforts should be made to strengthen the joint air pollution control aiming at regions located on the transport pathways, especially for heavy pollution episodes.
MG017 **10:00-10:15**	Development of a Statistical Forecasting Model for PM2.5 In Macau based on Clustering of Backward Trajectories **Tong Xie**, Kai Meng Mok, Ka Veng Yuen and Ka In Hoi University of Macau, Macau Abstract-A daily PM2.5 forecasting model based on multiple linear regression (MLR) and backward trajectory clustering of HYSPLIT was designed for its application to small cities where PM2.5 level is easily affected by regional transport. The objective of this study is to investigate the regions that affect the fine particulate concentration of Macau and to develop an effective forecasting system to enhance the capture of PM2.5 episodes. By clustering the HYSPLIT 24-hr backward trajectories originated at

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	Macau from 2015 to 2017, five potential transportation paths of PM2.5 were found. A cluster based statistical model was developed and trained with air quality and meteorological data of 2015 and 2016. Then, the trained model was evaluated with data of 2017. Comparing to an ordinary model without backward trajectory clustering, the cluster based PM2.5 forecasting model yielded similar general forecast performance in 2017. However, the critical success index of the cluster based model was 11% higher than that of the ordinary model. This means the cluster based model has better model performance in PM2.5 concentration prediction and it is more important for the health of the public.
MG014-A **10:15-10:30**	Exploring the Three Red Alert Periods in Beijing: Pollution Process and Effect Evaluation **Zhe Lv**, Wei Wei, Shui-yuan Cheng and Xiao-qi Wang Beijing university of technology, China Abstract-In December 2015 and 2016, Beijing authorities issued three red alerts. Based on the data from the environmental and meteorological monitoring stations in Beijing, the PM2.5 concentrations, meteorological conditions, weather conditions and air mass transmission were analyzed during the red Alerts. All the three red alerts were affected by secondary transformation of pollutants, but the cause of high concentrations of PM2.5 was mainly affected by meteorological conditions. During the first and second red alerts, the ground in Beijing was controlled by the uniform pressure field, the regional transportation was mainly affected by the southwest and southern transmission, respectively. While during the third red alert, the ground was under the control of the wide range of the low pressure, and affected by the southwest transmission and local air mass superposition. Under the low pressure field control, southwest and local air mass transmission conditions, PM2.5 pollution is the most serious in Beijing. PM2.5 average concentration was the highest at 273.6µg/m3 during the third red alert, which was 1.2 times and 1.3 times that of the previous two alerts, respectively. Moreover, combined with the pollutant emission reduction ratio, the WRF-CMAQ model was used to evaluate the effect of the third red alert emergency measures. The results showed that: Increased coal-fired source and enlarged traffic source control in emergency measures, early alert start-up time and inter-region joint prevention and control effectively mitigated the increase in PM2.5 concentration. The average PM2.5 concentration in Beijing during the red alert decreased by 79.1µg/m3, the average reduction ratio was 26.9%, which reflects the effective of emission reduction in air pollution control.
MG023 **10:30-10:45**	Improving Local Air Quality in Cities by Reducing Nitrogen Dioxide Pollution from Road Traffic **Spiru Paraschiv** "Dunarea de Jos" University of Galati, Romania Abstract-Trucks and buses play a major role in our lives, transporting goods and thousands of people to cities every day. But these vehicles, although in a much smaller number than the car generates a significant amount of air pollutants. The daily NO2 concentrations measured by a traffic monitoring station over a period of two years are used to identify the temporal variation of NO2 pollution as a result of measures to ban the circulation of trucks that do not meet the EURO 6 standard on Stresemannstraße Street in Hamburg. The data shows a decrease in NO2 concentration due to the measure taken so that in January 2017 the maximum daily NO2 concentration was 86 µg/m3 compared to 63 µg/m3 in 2019. There was also a difference between the daily minimum concentrations during the same period, being approximately 28 µg/m3 in 2017 and 10 µg/m3 in 2019. The daily NO2 observations show a significant decrease in concentration since May 2018 when the non-EURO 6 trucks were banned. The largest decrease in daily concentrations was recorded in March

	2019 compared with levels in March 2018, with a lower concentration for 28 days. A different situation was observed in October 2018, when compared to October 2017, showed an increase in concentration for 23 days.
MG010-A **10:45-11:00**	Analysis on Typical Heavy Air Pollution in Beijing in Winter Based on Online Observations **Shushuai Mao**, Shuiyuan Cheng and Chuanda Wang Beijing University of Technology, China Abstract-Pollution Characteristics and formation mechanism of a typical heavy pollution process in Beijing in the beginning of January, 2017 was researched through vertical and horizontal observation based on online-monitoring instruments. The results showed that PM2.5 concentrations in yongledian and liulihe, which are located in southeast and southwest of Beijing, were higher than chegongzhuang located in city center during heavy pollution period, the concentrations individually were（323.1±86.2）µg/m3,（336.8±118.6）µg/m3,（278.7±138.7）µg/m3. Concentration peak of PM2.5 suggested the transmission contribution of pollutants from southwest region to this pollution process was obvious. Compared with non-heavy pollution days, higher relative humidity, lower air pressure and weaker wind speed were the meteorological features during heavy pollution days. SNA and OC were the dominating components of PM2.5, which account for 37.33%~53.73% and 15.86%~26.40% of PM2.5 mass concentration, respectively. Proportion of SNA in the total chemical component increased in heavy pollution period, and the concentration rise of SO_4^{2-} was the most significant, rising from 16.73% to 22.29%. Secondary chemical reactions was strong and the range of SOR and NOR in three sites were 0.46~0.71 and 0.18~0.27, respectively. Stronger extinction coefficient monitored by radar mainly occurred in the surface of ground during heavy pollution period, which suggested air pollutants accumulated near surface ground. The results of comprehensive observation analysis revealed that the decline of PBL height and the contribution of pollutants transmission from southwest regions induced this heavy pollution. Meanwhile, secondary chemical reactions and accumulation of pollutants aggravated the heavy pollution.
MG024 **11:00-11:15**	Quantifying Total Environmental Impact of The Power Sector Using Input-Output Life Cycle Assessment: a case study for Thailand **Isara Muangthai** and Sue Jane Lin Solent University, United Kingdom Abstract-The electricity generation is vital to industries and economic development in Thailand. In this study, the input-output life cycle assessment (IO-LCA) is applied to estimate the direct and indirect impacts from the power generation sector for the years 2005 and 2010. Based on the input-output analysis, more than 90% of the total environmental impact of Thailand's power sector involves ten relevant sectors. Results reveal that the most significant environmental damage was on natural resources followed by human health, climate change, and ecosystem quality. The most dominant environmental impacts were non-renewable energy, global warming and respiratory inorganic effects. Furthermore, the power sector, which accounts for 80% and 61% of total each impact in 2010 respectively, had a large direct impact on climate change and human health. On the contrary, the coal and lignite, and metal ore sectors contributed significantly to indirect impacts on ecosystem quality and resources. Regarding the results, some additional suggestions can be made to improve current policies in Thailand, including the implementation of green manufacturing in the iron and steel production, and installing control devices in all power plant units. Consequently, IO-LCA can be applied

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	to other industries for assessing their total environmental impacts, and planning CO2 mitigation strategies.
MG060-A **11:15-11:30**	Optimal Design of a CO2 Capture Process with Rotating Packed Bed Reactors **Julio David Aguilar Cardoso** and Miguel Ángel Gutiérrez Limón Universidad Autonoma Metropolitana, Mexico Abstract-In the actuality the study for CO2 capture has been developed using different processes such as chemical absorption, being the most accepted due to the high efficiency and low cost. The chemical absorption has been used different devices for CO2 capture. Recently the use of rotating packed bed reactors (RPB) has proven to have advantage over conventional methods. Nevertheless, research related to these equipment have been mainly in its design and absorbents for a high efficiency of CO2 capture. So the optimization of this process is the next logical step in the development of this new technology. This job presents the optimal design values for CO2 capture minimizing the use of energy. The optimization problem of process design is posed from a mathematical model with adequacy obtained from the literature defining as the objective function the minimization of the process energy. The solution shows a better efficiency in CO2 capture with smaller devices than those currently occupied in the industry, in addition to a reduction in the use of energy of the process.
MG062 **11:30-11:45**	Using Life Cycle Assessment to Determine the Environmental Impacts Caused by Solar Photovoltaic Systems **Anushka Pal** and Jeff Kilby Auckland University of Technology, New Zealand Abstract-The paper presents research that investigated the Life Cycle Assessment of multi-crystalline photovoltaic (PV) panels, by considering environmental impacts of the entire life cycle for any solar PV systems. The overall manufacturing process of a solar PV panel ranging from silica extraction, crystalline silicon ingot growth, wavering to module fabrication and packing of the solar PV panel. The finds from this research showed after the analysis using SimaPro that the module assembly and cell processing of the manufacturing process contributed to that main environmental impacts of the life cycle of solar PV systems.

Lunch | <11:45-13:30>

SESSION Ⅵ

August 21, 2019
Session Ⅵ

[Material Science]

🕐 9:45-11:45

⊙ St. Petersburg @ ground floor

Chaired by Lecuter Cosmin Spirchez

Transilvania University of Brasov, Romania

8 Presentations—

MG1003, MG039-A, MG041-A, MG050, MG056, MG073-A, MG052, MG2001-A

*Note:

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SESSION VI

MG1003 **09:45-10:00**	A Comparative Study Regarding to Physical and Calorific Properties of Briquettes from Vegetable Biomass **Cosmin Spirchez**, Aurel Lunguleasa and Catalin Croitoru Transilvania University of Brasov, Romania Abstract-The paper makes a comparison between four types of briquettes: first was wheat and rapeseed briquettes, second was wheat briquettes (batch 2018), third was wheat briquettes (batch 2017), and fourth was lucernes briquettes, from the point of view of the physical and energetic characteristics, in order to choose the best ones and their corresponding market. The main properties studied are the density and moisture of the briquettes as physical properties, and also calorific power and ash content as energetic properties. Research results show that wheat and rape briquettes have had high calorific value but low density, compared to other types of briquettes. A general conclusion rise from whole paper, respectively the vegetable biomass is a renewable material and briquettes from it remains one the best option of combustible materials.
MG039-A **10:00-10:15**	Study on Additives for Control of Particulate Matter Precursors using an Electron Beam Seo Hee Seo, Min-Ku Kwon, Sang-Hee Jo, Tae-Hun Kim and **Youn-Suk Son** Pukyong National University, South Korea Abstract-This study was conducted to investigate the effect of additives on removal efficiency in controlling NO, NO_2 and SO_2 by electron beam irradiation. In order to obtain the maximum removal efficiency, various influential factors such as additives (NH4OH, NaCl, and NaOH) and mole ratio (1:0.5, 1:1, 1:2) of additives were investigated. As a result, NO, NO_2 and SO_2 showed the highest removal efficiency when NaOH was added as an additive. Also, it was confirmed that the removal efficiency of NO, NO_2 and SO_2 increases as the mole ratio increases.
MG041-A **10:15-10:30**	Feasibility of a Novel Two-stage Gasification Concept for Biomass with Low Ash Fusion Temperature **Haipeng Pei** and Baosheng Jin Southeast University, China Abstract-A pilot scale system was established to verify the feasibility of a new gasification concept, which coupled a fluidized bed and a cyclone furnace. Briquette particles based on rice straw are used as fuel. The operation temperature of the fluidized bed was ranged in 650–700 oC using air as oxidant, and the one of the cyclone furnace of 1200–1300 oC using oxygen as oxidant. The fuel particles were first gasified in the fluidized bed reactor to form crude gas, tar, char, etc. Subsequently, these products entered the cyclone reactor to take deep gasification and completely crack the tar at high temperature. Gas concentrations of primary syngas were as follows: CO 26.76%, CO2 18.30%, H2 19.19% and CH4 0.90%. No tar was detected in the final syngas. The gas yield and the carbon conversion were 0.986 Nm3/kg and 98.6%, respectively. The results suggest that the concept can efficiently convert the rice straw into tar-free syngas of medium-high heating value. Besides, gasification performance of this concept is heavily impacted by operating conditions and should be optimized considering the overall plant efficiency and costs.
MG050 **10:30-10:45**	Advanced Algorithmic Model for Poly-Optimization of Biomass Fuel Production from Separate Combustible Fractions Of Municipal Wastes as a Progress in Improving Energy Efficiency of Waste Utilization **Krzysztof Gaska**, Agnieszka Generowicz, Mykhailo Lobur, Nazariy Jaworski, Józef Ciuła and Myroslava

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	Vovk Silesian University of Technology, Poland Abstract- Usage of generated fuel components from segregated municipal waste groups in combined combustion processes with traditional fuels results in significant savings by partial replacement of fossil fuels and the reduction of environmental inconvenience that arises directly from the migration of waste to the environment. This article develops technological process of fuel components production which is controlled by advanced embedded SCADA control systems, providing monitoring of process parameters, process visualization and implementation, with the help of logic controllers of freely programmable PLC and complex control algorithms (including adaptive, predictive and inferential control algorithms) by implementation of the polymorphic model of fuel components obtaining process multi-stream optimization.
MG056 **10:45-11:00**	Dew, Fog and Rain Collector in a Hyper-Arid Climate: Case Study in Abu Dhabi **Banu Sizirici Yildiz** Khalifa University of Science and Technology, United Arab Emirates Abstract- Dew condensers collect dew via thermal radiation and cooling affect without the use of external energy. The aim of this project was to design the 1m x 1m with 30o angle square funnel dew, fog and rainwater collector to calculate the dew yield in Abu Dhabi urban area. In addition, studies were conducted to determine whether the collected dew quantity is significant for practical use and to verify the cooling effect in condenser surface using temperature sensors. Aluminum was chosen as dew collector material due to its high emissivity. Square funnel was chosen as condenser shape due to easiness of the assembly and feasibility of its design. The quantity of the collected water depended on the weather condition. The average collected water was 0.016 ml/day (0.016 mm/m2/day). Temperature sensor analysis showed that there was a 3.5 oC temperature difference between condenser top and bottom indicating the cooling effect of square funnel.
MG073-A **11:00-11:15**	State Observer Designs in Bioprocesses for Biofuel Production: A review **Hilario Flores-Mejia**, Jose Vian-Pérez, Ricardo Aguilar-López and Hector Puebla Universidad Autonoma Metropolitana Azcapotzalco, Mexico Abstract-Renewable bio-energy production has been addressed by the process engineering community aimed to optimize and improve the process operation. The operation of such bioprocesses is not a simple task since the raw material varies continuously, and the microbial consortium also changes under the influence of internal and external factors. Moreover, the lack of on-line sensors that allow the real-time monitoring of the process state has been an obstacle to improve the operation and performance of corresponding bioreactors. Although considerable effort has been devoted to the development of sensors that allow the on-line monitoring of bioprocesses, nowadays its operation is usually restricted to the monitoring of secondary variables such as pressure, liquid, and gas flow rates, temperature and pH. In the literature, it has been proposed state observers to estimate unmeasured states in biological systems. A state observer is a dynamical system that reconstructs unmeasured states of a system using a base dynamical model of the system and available measurements. Several state observer designs are available. In this work, we review the most relevant contributions in the state estimation for bioprocesses for biofuel production. We use two benchmark models of biogas production to illustrate the features of main state observer's designs.

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MG052 **11:15-11:30**	Iron Oxide Coated Gravel Fixed Bed Column Study Performance to Remove Mixed Metals from Landfill Leachate **Ibrahim Yildiz** and Banu Sizirici Yildiz Khalifa University, United Arab Emirate Abstract-Iron oxide-coated gravel as an adsorbent was employed in continuous fixed bed column study to remove $Fe(II)$, $Ni(II)$, and $Zn(II)$ simultaneously in synthetic leachate samples. Experimental and modeled adsorption capacities derived from the breakthrough curves showed the adsorption capacity order of $Zn(II)>Fe(II)> Ni(II)$. Iron oxide-coated gravel column removed 58.24% of $Zn(II)$, 47.71% of $Fe(II)$, and 39.45% of $Ni(II)$. Desorption process was studied in order to test the regeneration capability of iron oxide- coated gravel. It was seen that 99.64 % of $Ni(II)$, 99.54% of $Fe(II)$ and 6.75% of $Zn (II)$ were recovered through the first cycle of adsorption/desorption. In the second cycle, the recovery rates dropped to 81.4% for $Ni(II)$, 80% for $Fe(II)$ and 4% for $Zn(II)$. Based on these results, iron oxide coated gravel has potential to remove mixed metal ions simultaneously in aqueous solutions.
MG2001-A **11:30-11:45**	Heat Dissipation Optimization of Lithium Battery Pack Based on Orthogonal Experimental and Bp Neural Network Xiao Qian, **Dongji Xuan**, Xiaobo Zhao, Zhuangfei Shi Wenzhou University, China Abstract-In this paper, the cooling efficiency of lithium battery packs under air cooling conditions was improved by optimizing the spacings between lithium batteries within a pack. Above all, we proposed an innovative arrangement of batteries, intensive in the front and sparse in the back. Then, batteries in the battery pack were grouped to reduce the number of independent variables to be optimized. The computational fluid dynamics method was applied to simulate the temperature field and the velocity field of the battery pack for different battery spacing arrangements. There were 5 variables which control the spacings of batteries and each variable choose 6 levels. A full test would cost long time, to improve efficiency, orthogonal experimental was applied. By this method, typical battery spacing arrangements were simulated and series of maximum temperature and maximum temperature difference values for the pack of batteries were obtained. The inputs and the corresponding simulation outputs were used as train set of the BP neural network. After an intensive training, a neural network was obtained in which the inputs and outputs were respectively the spacings of the batteries and the maximum temperature and the maximum temperature difference of the batteries. With this model, the best arrangement of spacings was found to be that minimizing the maximum temperature and temperature difference. The results showed that this neural network model can accurately describe the relationship between the battery spacings and the temperature. By adjusting the battery spacings, the temperature difference and the maximum temperature of the battery pack can be effectively reduced and the optimized spacing arrangements was found. This optimization process represents an effective and time-saving method to design the battery spacings distribution and to improve the cooling performance of battery thermal management systems (BTMSs).

Lunch | <11:45-13:30>

POSTER

MG018-A	F-DEMATEL-MCDA Criteria Selection for Sustainable and Flipped Science Education in Online-Learning Platforms Jin Su Jeong and David González-Gómez Universidad de Extremadura, Spain Abstract- Sustainable education is acquiring an increasing notice with raising public consciousness as to improve and expand a long-term and life-long learning program. Yet, in higher education, sustainable education is a starting point and has still limited cases in numerous universities. This work demonstrates an operational method of Fuzzy-DEcision-MAking Trial and Evaluation Laboratory-Multi-Criteria Decision Analysis (F-DEMATEL-MCDA), which can classify and analyze criteria and sub-criteria of sustainable and flipped science education in online-learning platforms. To satisfy the objectives of this paper, the key criteria have been selected after the experts' consultation and various literatures' and directives' examination. They are technological course, science-education course, online-learning course and sustainable course contents and each criterion is subdivided into four sub-criteria, which will show weight calculation coefficients, influence, affect and analysis. Then, with the Weighted Linear Combination (WLC) and Sensitivity Analysis (SA), we can find out the most important criteria and the probability for six strategies implemented along with their sub-criteria. The results conclude that the most important criterion of sustainable and flipped science education in online-learning platforms is sustainable course contents (Strategy F, 0.54 in the scale used of 0 to 1) and, among sub-criteria, environmental contents (0.57 in the scale used of 0 to 1) is the most important sub-criteria. Hence, the suggested operational method can verify the most important aspects of sustainable and flipped science education in online-learning platforms with comparable education occurrences when have required data.
MG057	Thermal Sensation Significance on Thermal Condition for Workers in Hot-humid Climate: Study of the Air Temperature and Humidity Condition and Sensation Angela Upitya Paramitasari, Mochamad Donny Koerniawan, Risa Kawakami, Hisashi Hasebe, Vebryan Rhamadana and Rachmawan Budiarto Institut Teknologi Bandung, Indonesia Abstract-Around 50% of energy consumption is usually associated to indoor space with its HVAC system, especially in tropical Asia case. There were some challenges regarding controlling the indoor air condition in hot humid climate like Indonesia. To see the occupant's responses, humidity and air temperature become one of the important controlled parameters. This paper aim to find the relation and significance between the controlled thermal condition, such as the air temperature and humidity in the climate chamber with the temperature sensation and humidity sensation from occupant's responses after adapted inside the test room. Based on analysis, the most neutral sensation comes from 25℃ air temperature and 50% humidity. Air temperature has more significant relation with thermal and humidity sensation, while the humidity only influencing the humidity sensation.
MG058	Measurements of Hot-Humid Climate Worker's Productivity by Thermal Comfort: An Early Consistency Study for Physiology and Psychology Measurements Akhlish Diinal Aziiz, M. Donny Koerniawan, Risa Kawakami, Hisashi Hasebe, Angela Upitya Paramitasari and Rachmawan Budiarto Institut Teknologi Bandung, Indonesia

POSTER

Abstract-The productivity of the occupants is a certain parameter that led to the energy consumption for air conditioning in the office building, which has been highly reported to be the largest allocation. This research works' objective is to observe the workers' productivity by measuring the physiology in the environment provided in a hot-humid climate situation. Psychology test relating to the overall environment and their bodily feeling is questioned to the subject to observe the consistency of the result. Four levels of air temperature and three levels of humidity were set in the room designed as a climate chamber for the respondent role as workers. The multivariate analysis presented to review the value of the significance to be discussed further. Analysis of Variants and Bivariate Analysis then used to understand the cause-effect of the result gained. These methods simply conducted to understand the occupants' response to productivity. So in the long-term, it could help the efforts to control the using of the air condition to achieve its efficiency. The result shows that the skin temperature and heart rate was the most significance that reacts to the air temperature, following up by the concentration level which presents a particular pattern. Meanwhile, the physiology and psychology test consistently reveal that tropical natives highly react to hot temperature than colder temperature by agreeing to the label of uncomforted or dissatisfied and inform that the air temperature around 220C to 280C is suited for working productivity in the office in a hot-humid climate.

MG059	Efficiency of Indoor Temperature Conditioning Based on Thermal Comfort for Workers in Indonesia; Based on Psychological Factors Vebryan Rhamadana, Mochamad Donny Koerniawan, Risa Kawakami, Hasashi Hasabe, Akhlish Aziiz and Rachmawan Budiarto Institut Teknologi Bandung, Indonesia Abstract-High energy consumption of air conditioners or AC requires efficiency through proper air temperature settings. Thermal comfort can be used as a basis for determining the air temperature. Thermal comfort values in this study were obtained based on psychological factors felt by respondents in an environment arranged in several temperature levels. This value is obtained through a questionnaire filled out by respondents after experiencing a certain environment. Temperature 25 degrees Celsius is concluded as the temperature with the highest comfort level that is not much different from the comfort at a temperature of 22 degrees Celsius. It was found that there was a large variation in thermal comfort values especially at temperatures of 22 and 25 degrees Celsius which showed that the assessment of the level of comfort especially in cold temperatures for each person was very diverse. To get better results on this topic, it is necessary to do a test that focuses on the temperature range between 22 to 28 degrees Celsius because in this study the temperature is only limited to a number of values so that comfort values at other temperatures cannot be seen specifically.
MG065-A	Detecting Leaks in Water Pipe Networks Using a Multi-variate Statistical Data Analysis Suwan Park and Jae Hong Ha Pusan National University, South Korea Abstract-As one of the areas of smart water management technology, studies on the development of techniques for estimating the leakage in water pipe networks such as the artificial neural network and statistical data analysis technique had been developed. Contrary to the previous methods the principal component analysis (PCA) technique, which is one of the statistical multi-variate data analysis techniques, does not need to train an artificial neural network and can still be applied to data sets that have missing values. In this study, the PCA technique was applied to the flow data observed in a water

supply network and the relationship between the detected statistical outliers and the maintenance records related to leakage of the water supply pipelines was evaluated. Based on the results of the analysis the applicability of the principal component analysis to the early detection of leakage of water pipe network was analysed. A method to improve the efficiency of detecting the outliers of the PCA model was also developed that uses a portion of flow data among the hourly flow data rather than the whole 24-hour flow data. Using the developed Matlab computer program the 'effective outlier detection rates' (EODRs) were calculated for the hourly flow data inside all of the possible time windows in a day which were generated for all possible combinations of 'center times' and 'time ranges'. An EODR was calculated using the flow data in each time window. The best time window(BTW) which has the highest EODR(maximum EODR, M-EODR) was obtained for each district metered area (DMA) using the developed algorithm. It was considered that if the BTWs does not change much in a recent period, say for 6 months, the calculated M-EODR may be used to determine whether pre-emptive leak detection work is performed for a DMA. The technique developed in this study may be used by a manager of a water pipe network to confirm whether the flow data of the previous day at present analysis time is calculated as the outliers by performing the developed PCA algorithm. Occurrence of the outliers and the calculated values of the M-EODRs may assist the manager of a water pipe network in deciding whether to conduct a leakage test for a suspected leak zone in a DMA.

MG078	Bioelimination of Sulfur from High-Sulfur Coal by Selected Strains of Microorganisms Raushan Samet, Azhar Zhubanova, Nuraly Akimbekov, Xiaohui Qiao, and Anel Kadyrzhanova Al-Farabi Kazakh National University, Kazakhstan Abstract-In this study, low-rank lignite coal sample collected from Lenger coal deposit (Turkestan province) in Kazakhstan was subjected to desulfurization by using three bacterial strains isolated from soil with silt and coal itself. The molecular identification of the 16S rRNA gene revealed that the isolated bacteria were Atlantibacter sp., Pseudomonas sp., Bacillus sp. denoted as S1, S2, and T1, respectively. Pseudomonas sp. showed the best result in removing organic sulfur (93%) and total sulfur (52%), while Bacillus sp. was effective in removing pyritic sulfur (19%) compared to other strains. However, Atlantibacter sp. had no significant influence on sulfur content after treatment, thereby reducing its chances to be used in decreasing sulfur content in lignite in future investigations. Additionally, this research would be valuable to develop an innovative biotechnological method for producing an environmentally friendly briquetted smokeless fuel from lignite.
MG080	Study of The Destructive Activity of Microorganisms Isolated from Soil Contaminated by Pesticides Azhar Malik, Gulzhamal Abdieva, Perizat Ualieva and Nuraly Akimbekov The al-Farabi Kazakh National University, Kazakhstan Abstract-Chemical pollution of natural and agricultural habitats is a growing global problem and a serious threat to the sustainability and health of people. Among various chemical ecotoxicants of anthropogenic origin, organochlorine pesticides are among the most stable and dangerous for the environment and humans. Pesticides are chemical plant protection products, the intensive and not always justified use of which has led to the fact that recently they are also considered among the most dangerous pollutants. One of the serious environmental problems is the pollution of natural objects with organic pesticides with high toxicity and persistence. Toxic substances can enter the environment and pose a threat to all living organisms, including the microbial population of the soil. Microorganisms isolated from ecosystems exposed to long-term exposure to pesticides, can quickly decompose these

compounds. The problem of the decomposition of pesticide residues in the soil is an important environmental issue. Microorganisms are able to most effectively decompose xenobiotic substances alien to the biosphere. The ability of microorganisms to decompose pesticides is associated with biochemical reactions and a high level of their adaptation. In this study, the microbial diversity of the soil in the territories adjacent to the pesticide burial sites was studied.

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