2021 8th International Conference on Geological and Civil Engineering (ICGCE 2021)

January 28-30, 2021|Vitual Conference

SPONSORED BY

PUBLISHED AND INDEXED BY

www.cbees.org | www.icgce.org

Welcome Address

We are pleased to welcome you to attend 2021 8th International Conference on Geological and Civil Engineering (ICGCE 2021) during January 28-30, 2021. Due to COVID-19 pandemic, we will hold virtual conference this time.

With the important efforts of the whole committee, the evaluation of all the accepted papers will be performed based on the reports from anonymous reviewers, who are qualified in the field of Geological and Civil Engineering. We wish to express our sincere appreciation to all the individuals who have contributed to ICGCE 2021 conference in various ways.

This conference program is highlighted by four Keynote Speakers: Prof. Kondo Akira from Osaka University, Japan; Prof. Derek W. Bunn from London Business School, UK; Prof. Jim P. Zheng from State University of New York at Buffalo, New York, USA; Prof. Rodney Stewart from Griffith University, Queensland, Australia.

There are ten sub-sessions with different topics: Environmental Engineering and Environmental Analysis; Ecological Environment Management and Environmental Risk Assessment; Building Energy Conservation and Sustainable Architecture; Solar Photovoltaics and Photovoltaic System Assessment; Energy and Power Engineering; Energy Market and Energy Economics; Environmental Engineering and Biotechnology; Energy and Power Engineering; Solar Radiation Analysis and Solar Power and Power Engineering and Power Electronic Technology.

ICGCE 2021 is dedicated to building an overarching technology platform for researchers in academics. As part of the event, the ICGCE issue means to look far out enough in time, space and across disciplines and focusing on Geological and Civil Engineering.

Special thanks to organizing committee and the volunteers who had dedicated their time and efforts in planning, promoting, organizing and helping the conference. We would also express our sincere gratitude to all session chairs and the technical program committee members for their great efforts.

At last, we wish all of you enjoy ICGCE 2021 conference!

Hong Kong Chemical, Biological & Environmental Engineering Society (HKCBEES)

AGENDA

Conference General Co-Chairs

Prof. Akira Kondo, Osaka University, Japan
Prof. Rodney Stewart, Griffith University, Queensland, Australia
Prof. Ngai Weng Chan, Universiti Sains Malaysia, Malaysia

Program Co-Chairs

Prof. Sang Whan Han, Hanyang University, South Korea
Prof. Guangming Yu, Qingdao University of Technology, China
Prof. Norhashimah Morad, Universiti Sains Malaysia, Malaysia
Assoc. Prof. Wan Yaacob W.Z., Universiti Kebangsaan Malaysia, Malaysia

Organizing Chair

Ms. Tracy Yang, Hong Kong Chemical, Biological & Environmental Engineering Society, Hong Kong

Publication Chair

Ms. Alice Lin, Hong Kong Chemical, Biological & Environmental Engineering Society, Hong Kong

Technical Program Committee

Prof. Edén Bojórquez Mora, Universidad Autónoma de Sinaloa, México
Prof. Syahrul Nizam Kamaruzzaman, University of Malaysia, Malaysia
Prof. Kyooil Lee, Sahmyook University, South Korea
Prof. Wong Wah Sang, University of Hong Kong, Hong Kong
Prof. Fadi Hage Chehade, Lebanese University, Lebanese
Prof. Sari Bahagiarti Kusumayudha,University of Pembangunan Nasional Yogyakarta, Indonesia
Assoc. Prof. Ubolrat Wangrakdiskul, King Mongkut's University of Technology North Bangkok, Thailand
Assoc. Prof. Sharifah Fairuz Syed Fadzil, Univertiti Sains Malaysia, Malaysia
Assoc. Prof. Muna Hanim Abdul Samad, Universiti Sains Malaysia, Malaysia
Assoc. Professor. Mohammad Arif Kamal, Aligarh Muslim University, India
Assoc. Prof. Azman Bin Kassim, Universiti Teknologi Malaysia, Malaysia
Dr. Salma Yahia Mohamed Mahmoud, University of Science and Technology, Sudan
Dr. Fatemeh Hajivalie, Iranian National Institute for Oceanography and Atmospheric Science(INIOAS), Iran
Dr. Mohammad Firuz Ramli, Universiti Putra Malaysia, Malaysia
Dr. Rahul V. Ralegaonkar, India Curently University of Texax, USA
Dr. Shahiron Shahidan, Universiti Tun Hussein Onn Malaysia, Malaysia
Dr. Ramadhansyah Putra Jaya, Universiti Teknologi Malaysia, Malaysia
Dr. Haryati Yaacob, Universiti Teknologi Malaysia, Malaysia

AGENDA

Dr. Mohammadreza Vafaei, Universiti Teknologi Malaysia, Malaysia
Dr. Zhibin Lin, North Dakota State University, USA
Dr. Nor Zurarairahetty Mohd Yunus, Universiti Teknologi Malaysia, Malaysia
Dr. Trong-Phuoc Huynh, Can Tho University, Vietnam
Dr. Hamid Brahmi, Bechar University, Algeria
Dr. Khairulzan Yahya, Universiti Teknologi Malaysia, Malaysia
Dr. Muhammad Afief Ma'ruf,University of Lambung Mangkurat, Banjarmasin, Indonesia
Dr. Worapong Lohpaisankrit, Rajamangala University of Technology Isan, Khon Kaen, Thailand

AGENDA

Online Presentation Instructions.....6

January 28 | Thursday

10:00-18:00 Test Meeting ID I: 62527988016 & Meeting ID II: 62827934418.....7

January 29 | Friday

Opening Remarks | Meeting ID: 62827934418

08:55-09:00 Prof. Kondo Akira.....11

Keynote Speeches | Meeting ID: 62827934418

09:00-09:40 Prof. Rodney Stewart.....13
09:40-10:20 Prof. Jim P. Zheng.....14~15

Session Details

Session 1&3&5 Meeting ID: 62827934418
Session 2&4&6 Meeting ID: 62527988016

10:30-12:45 Session 1.....16~20
10:30-12:45 Session 2.....21~25
13:30-15:15 Session 3.....26~29
13:30-15:15 Session 4.....30~33
15:40-17:40 Session 5.....34~37
15:40-17:40 Session 6.....39~43

January 30 | Saturday

Keynote Speeches | Meeting ID: 62827934418

10:40-11:20 Prof. Kondo Akira.....44~45
11:20-12:00 Prof. Derek W. Bunn.....46

Session Details

Session 7&9 Meeting ID: 62827934418
Session 8&10 Meeting ID: 62527988016

14:00-15:45 Session 7.....47~50
14:00-15:45 Session 8.....51~54
16:30-18:45 Session 9.....55~59
16:30-18:45 Session 10.....60~63

Special Session.....64~70

AGENDA

Instructions for Online Presentations

➢ **Time Zone**

The time shown in this schedule is **Greenwich Mean Time (GMT+09:00) Please set-up your laptop time in advance.**

➢ **Equipment Provided by the Presenters**

1. A computer with an internet connection (wired connection recommended)
2. USB plug-in headset with a microphone (recommended for optimal audio quality)
3. Webcam (optional): built-in or USB plug-in

➢ **Environment requirement**

1. Quiet Location and Proper lighting
2. Stable Internet Connection
3. Suitable Background

➢ **Duration of each Presentation**

Keynote Speech: about 35 Minutes of Presentation and 5 Minutes of Question and Answer
Regular Oral Presentation: about 12 Minutes of Presentation and 3 Minutes of Question and Answer

How to use ZOOM

Step 1: Download Zoom from the link: **https://zoom.us/download**

China Mainland Users: https://www.zoom.com.cn/download

Step 2: Sign up an account.

Step 3: Set up the languages and do some basic test.

Step 4: Get familiar with the basic functions: Rename, chat, raise hands, and screen share, etc.

1. **Rename:** Before you enter the conference room, please change your name to Paper ID + Name
2. **Chat and raise your hand:** During the session, if you have any questions about the operation of zoom, please let us know by clicking "raise your hands" and use "chat" to communicate with conference secretary

   During the Question section, if you have any questions about keynote speakers or authors, you can also click "raise your hands" or "chat"
3. **Share Screen:** Please open your power point first, and then click "share screen" when it's your turn to do the presentation.

Notes: How to join the conference online

1. Find your paper ID and suitable meeting ID on the conference program.
2. Open the ZOOM, click the join, paste the meeting ID, then you can join the conference.
3. Click the stop share after you finish your presentation.

AGENDA

Test Session

January 28, 2021 (Thursday) | GMT+09:00

Committee Test

10:00-12:00 | Meeting ID: 62527988016

Author Test

10:00-18:00 | Session1-Session6 | Meeting ID: 62827934418

14:00-18:00 | Session7-Session10 | Meeting ID: 62527988016

PS: 1. Please pay attention to your online test time duration and attend the test on time on January 28, 2021.

2. If China mainland users have trouble signing up an account of Zoom, please just ignore the sign-in step and click join a meeting with the correct meeting ID.

3. Please pay attention to the remind tips from the computer screen during online test.

4. If there are a lot of testers in the conference test room at the same time, please wait for a moment patiently. The staff will invite you to test soonest. After finishing the test, you can choose to leave the conference test room by yourself.

5. The content of test includes renaming, chatting, raising hands and screen sharing.

AGENDA

Formal Online Presentations

Keynote Speeches and Conference Presentations

January 29, 2021 (Friday) | GMT+09:00

Meeting ID: 62827934418

08:55-09:00 **Opening Remarks**

Prof. Kondo Akira, Osaka University, Japan

09:00~10:20 **Keynote Speeches Chair: Prof. Kondo Akira**	09:00-09:40 **Keynote Speech I** Prof. Rodney Stewart Griffith University, Queensland, Australia Topic: "Integrated Intelligent Energy-Water Metering Systems and Informatics for Enhanced Utility Operations and Customer Engagement"
	09:40-10:20 **Keynote Speech II** Prof. Jim P. Zheng State University of New York at Buffalo, New York, USA Topic: "Lithium-ion Sulfur Battery as a Potential Candidate for Electric Grid Energy Storage"

Break Time 10:20-10:30

10:30-12:45 **Sub-Session (in Parallel)**	**Meeting ID: 62827934418** **Session 1** **Topic**: "Solar Photovoltaics and Photovoltaic System Assessment" **Session Chair**: Prof. Jim P. Zheng **9 Presentations:** F6016, F5004, F6017, F6003, F6026, F5005, RE2001, F6050, F6015	**Meeting ID: 62527988016** **Session 2** **Topic**: "Environmental Engineering and Environmental Analysis" **Session Chair**: Assoc.Prof. Giovene Pérez Campomanes & Dr. Lee Hwang Sheng **9 Presentations:** F5007, F6033, F5010, F5009, F6067, F5012, F5016, D6002, RE003

AGENDA

Break Time 12:45-13:30

13:30-15:15 **Sub-Session (in Parallel)**	**Meeting ID: 62827934418** **Session 3** **Topic**: "Energy and Power Engineering" **Session Chair**: Prof. Kondo Akira **7 Presentations:** F6027, F6042, F6032, F5002, F6031-A, F6054-A, F6041	**Meeting ID: 62527988016** **Session 4** **Topic**: "Energy Market and Energy Economics" **Session Chair**: Assoc.Prof. Willyanto Anggono **7 Presentations:** F6030, F5001-A, F6001-A, F6002, F5008-A, RE001，F6048

Break Time 15:15-15:40

15:40-17:40 **Sub-Session (in Parallel)**	**Meeting ID: 62827934418** **Session 5** **Topic**: "Building Energy Conservation and Sustainable Architecture" **Session Chair**: Professor Dr. Hashem Al-Mattarneh **8 Presentations:** F6061, F5003, F6056, F6066, F6055,F6053, F1002, F1003	**Meeting ID: 62527988016** **Session 6** **Topic**: "Ecological Environment Management and Environmental Risk Assessment" **Session Chair**: Prof. Rodney Stewart **8 Presentations:** F6040, F6063, F5011, F6064, F0001, F6049, RE2002, H6003

AGENDA

Formal Online Presentations

Keynote Speeches and Conference Presentations

January 30, 2021 (Saturday) | GMT+09:00

Meeting ID: 62827934418

10:40~12:00 **Keynote Speeches Chair:** **Prof. Jim P. Zheng**	10:40-11:20 **Keynote Speech III** Prof. Kondo Akira Osaka University, Japan **Topic**: "Preservation of Indoor and Outdoor Environment by Data Assimilation Method"
	11:20-12:00 **Keynote Speech IV** Prof. Derek W. Bunn London Business School, UK **Topic**: "The Post-Liberalised Electricity Market"

Break Time 12:00-14:00

14:00-15:45 **Sub-Session (in Parallel)**	**Meeting ID: 62827934418** **Session 7** **Topic**: "Solar Radiation Analysis and Solar Power" **7 Presentations:** KM1-027, KM1-018, KM1-028, KM2-014, KM2-005, KM2-008, KM2-016	**Meeting ID: 62527988016** **Session 8** **Topic**: "Power Engineering and Power Electronic Technology" **7 Presentations:** KM2-004, KM1-009, KM2-010, KM2-012, KM2-1001, KM1-014, KM2-017

Break Time 15:45-16:30

AGENDA

	Meeting ID: 62827934418	Meeting ID: 62527988016
16:30-18:45 **Sub-Session (in Parallel)**	**Session 9** **Topic**: "Environmental Engineering and Biotechnology" **9 Presentations:** KM1-023, KM1-025 KM1-024, KM1-1001, KM1-007, KM1-008, KM1-019, KM1-012, KM1-021	**Session 10** **Topic**: "Energy and Power Engineering" **8 Presentations:** KM1-026, KM2-009, KM2-003, KM2-015, KM2-018, KM2-1002, KM1-015, KM2-1003
Speical Session	F6014, F5006, F1001-A, KM2-1001-A, KM2-1002-A, KM2-1003-A, KM2-1004-A, KM2-1005-A, KM2-1006	



Please join the test session on time. *On January 28, 2021, we will have the test session and online sign-in. Please join the test session before the formal session.*

- Please pay special attention to the **jet lag** and all schedules are arranged based on **GMT+09:00**. You can change the time on your watch and phone to **GMT+09:00** in advance in case you are confused with the jet lag.
- Please try to find a **quiet environment**. In addition to the presentation and question section, the host will mute your microphone all the way.
- Please get familiar with the basic functions: **Rename, Chat, Raise Hands, and Share Screen.**
- Please join the session 10 minutes earlier and attend the whole conference. **Official electronic receipt and certificate** will be sent to you via e-mail after the conference.
- To effectively control the time and avoid some unexpected situations, we advise you **record your presentation** ahead of time (12 minutes of presentation and 3 minutes of Question and Answer for each report) and send video to the conference mailbox before conference date.
- Only the organizer can record the video. Please **do not record** the video during the meeting.

AGENDA

Opening Ceremony & Keynote Speeches

08:55-10:20, GMT+09:00 | January 29, 2021 Friday

Meetings ID: 62827934418



Opening Remarks

08:55-09:00 (GMT+09:00)

Prof. Kondo Akira

Osaka University, Japan

Prof. Kondo Akira was graduated from Faculty Engineering, Osaka University in 1982 and from Graduated School of Engineering, Osaka University in 1984. After that, he had worked in Matsushita Electric Industry (Panasonic) for 5 years. From 1989, he has been working in Osaka University as an assistant professor, associated professor and professor. He received PhD in 1999 and its thesis is "Study on development of numerical simulation model in order to mitigate urban atmospheric environment". He is researching on the environmental dynamics modeling in the wide ranges from global scale to indoor scale. Moreover he carried out the joint researches in South-East Asia; Nepal, Indonesia, Korea, China, Vietnam, and Thailand. Throughout these researches, he received the best paper award from The Society of Heating, Air Conditioning and Sanitary Engineering of Japan in 2010 and received the best paper award from the Society of Environmental Science of Japan in 2012 and received the best academic award from Atmospheric Environmental Society of Japan in 2015. He is also the author of more than 90 peer-reviewed articles including articles written in Japanese, and 80 international conference papers with limited peer review.

AGENDA

Keynote Speeches Chair: Prof. Kondo Akira



Keynote Speaker I

09:00-09:40 (GMT+09:00)

Prof. Rodney Stewart

Griffith University, Queensland, Australia

Rodney Stewart is a Professor in the School of Engineering & Built Environment based at Griffith University, Gold Coast City, Queensland Australia. He is a specialist in engineering and environmental management research, particularly related to intelligent water and energy networks and digital utility sector transformation. He is currently leading or completed a number of projects with industry partners implementing smart energy-water metering systems. More recently, his work is exploring the residential end use water-energy nexus as well as the development of intelligent algorithms for managing distributed battery storages in smart electricity grid networks. Professor Stewart has published over 300 research articles, receives over 1,000 new citations per year, has a H-Index of 49 (Scholar), and received over AUD$8 million in competitive research funding.

Topic: "Integrated Intelligent Energy-Water Metering Systems and Informatics for Enhanced Utility Operations and Customer Engagement"

Abstract—Integrated intelligent energy-water metering systems coupled with advancements in big data informatics provides an opportunity to better manage urban water and energy resources. However, the uptake of these high-resolution metering technologies has been slow due to a number of impediments; many of which can be overcome with evidence-based research, pilot trials, and effective knowledge transfer. Professor Stewart will discuss research and pilot trials undertaken in the Australian context that demonstrate the role of integrated multi-utility energy-water metering systems and big data informatics for better managing and conserving urban water and energy resources. Some specific demonstration projects presented include understanding customer benefits from digital metering, using such technology for better network management, deploying customer resource usage interfaces, infrastructure asset life cycle management, optimised water and power quality management, and enhanced water reservoir treatment management. Professor Stewart will focus on the environmental benefits of implementing intelligent sensor networks and big data analytics for best managing urban water and energy resources.



Keynote Speaker II

09:40-10:20 (GMT+09:00)

Prof. Jim P. Zheng

State University of New York at Buffalo, New York, USA

Dr. Jim P. Zheng is Empire Innovation Professor at the Department of Electrical Engineering of State University of New York at Buffalo. He was Sprint Eminent Scholar Chair Professor at the Department of Electrical and Computer Engineering of Florida State University. He is the recipient of National Academy of Inventors Fellow, National Research Council Fellow, Army Research & Development Achievement Award, NASA Faculty Research Award, and Progress Energy Professional Development Award. He has published more than 170 articles in scholarly journals, and 140 papers in conference proceedings in the fields of energy storage, fuel cells, nano-sensors, photonics, and thin film growth, and been awarded 21 patents, and 5 patents have been licensed by private companies. He serves many journal editorial boards, and is a senior member of the Institute of Electrical and Electronic Engineers, and member of the Electrochemical Society, the Material Research Society.

Topic: "Lithium-ion Sulfur Battery as a Potential Candidate for Electric Grid Energy Storage"

Abstract—The energy storage plays a critical role in renewable energy systems. It can mitigate power variations, enhances the system flexibility and stability, and enables the storage and dispatching of the electricity generated by variable renewable energy sources such as wind and solar. However, the dominating factor that determines which energy storage system can be applied to the renewable energy systems is the cost per storage cycle that is defined as cell cost ($/kWh) divided by cell cycle number and round trip efficiency. Only those energy storage cells which have cost per storage cycle is only part of electricity price (such as $0.1-0.2/kWh in USA) can be accepted by the market. Therefore, to develop low cost battery cells with long cycle life and high energy efficiency has a strong motivation.

Lithium-sulfur (Li-S) batteries hold great promise as energy storage systems for electric grid applications because of their low cost and high theoretical energy density. The cathode material of sulfur in Li-S batteries is one of most abundant element on earth and is only one-fifth to one-tenth of the price of cathode materials in Li-ion batteries (LIBs). The theoretical energy density of Li-S batteries is 2,500 Wh/kg, which is almost ten times greater than that of LIBs. Unfortunately, both cathode and anode of Li-S batteries have some very serious challenges to be overcome. And although, over the years there have been many consistent efforts to tackle them, nonetheless, those challenges still prevail. The challenges plaguing the Li-S batteries include, the formation of intermediate lithium polysulfides (LiPS) in the electrolyte, which limits the battery capacities at low

electrolyte/sulfur ratios and results in severe shuttle effects over long-term cycles; additionally, the use of the lithium metal anode introduces some persistent issues which need to be addressed, such as dendrite formation and surface passivation.

The novel Li-ion-sulfur batteries (LISBs), in which use sulfur-polyacrylonitrile (S-PAN) as cathode material, LIB anode, and pre-lithiation technique to introduce Li source to the (LISBs). The S-PAN will be used as the active cathode material due to its good chemical and electrochemical stabilities during charge and discharge, therefore, no formation of intermediate LiPS in the electrolyte, which limits the battery capacities at low electrolyte/sulfur ratios and results in severe shuttle effects over long-term cycles. Because of using of Li-ion anodes in LISBs, some concerns about Li-S batteries, including dendrite formation and surface passivation, will be greatly eased up. The cycle performance and power density will be also significantly improved. Another uniqueness of this project is that the pre-lithiation will be applied to the LISB in order to provide sufficient Li atoms to the anode or cathode; therefore, the Li-ions can shutter between two electrodes during charge and discharge. The pre-lithiation technique will also use to compensate for active Li losses in anode during initial cycle and, therefore, to increase the practical energy density. In this talk, we will present some preliminary results of LISBs.

AGENDA

Session 1

Solar Photovoltaics and Photovoltaic System Assessment

10:30-12:45, GMT+09:00 | January 29, 2021 Friday

Meeting ID: 62827934418

Chaired by: Prof. Jim P. Zheng

Session 1 Presentation 1 10:30-10:45 F6016	Case Study: Optimization of Grid-Connected Photovoltaic Self-Consumption Systems for the Commercial Sector in Honduras **C Lara Monge**, L Vásquez Márquez and A M Reyes Duke Universidad Tecnológica Centroamericana UNITEC, San Pedro Sula, Honduras *Abstract*—It is common to see how the installation of photovoltaic systems is being used in the commercial sector to minimize costs on the electric bill, so if the aim is to obtain the greatest benefits from the photovoltaic system, it is necessary to carry out a correct sizing of its nominal DC capacity prior to installation. To achieve this in a more reliable way, the initiative was taken to develop a program with LabVIEW where it is possible to find the most profitable sizing based on the selection of the best scenario from a variety of simulations that it will carry out, this choice is based on the Net Present Cost (NPC) resulting from simulations. For the correct operation of the program, meteorological data of the hourly annual global irradiance were included. The data for the consumption analysis for each case was obtained from the load profiles of 8 selected banks. This research was carried out in the county of Santa Rosa de Copán, Honduras. The program developed in this research was able to determine the optimal result for each banking agency according to each scenario analyzed. The cases were categorized depending on their annual energy consumption, which are between 30 and 200 (MWh/year). Each bank was analyzed in 3 scenarios: no surplus compensation, net billing, and net metering. The development of this research determined the average nominal DC capacity required by an installation located in the proposed consumption categories and that with the current scheme that is managed in the country (without compensation of surpluses), it is economically attractive to optimize a grid-connected photovoltaic system for self-consumption, due to the significant amount of economic benefits it represents for the user, which in this research are between 28,000 and 165,000 (USD).

Session 1 Presentation 2 10:45-11:00 F5004	Development of Active PV Array Using Real-Time Scanning Method K Itako, **C Xu**, T Kudoh, K Koh and Q Ge Kanagawa Institute of Technology, Kanagawa, Japan *Abstract*—This paper presents a novel control strategy for active photovoltaic (APV) array using real-time scanning method. This proposed technology reduces extreme power drops due to the partial shading conditions (PSCs). In this paper, PSIM software is used to simulate the conventional photovoltaic (PV) array and the newly proposed active PV array. The comparative analysis results show that this newly proposed technology can effectively reduce the power loss caused by the PSCs to the PV generation system. Assuming a practical system, we will verify the practicality of the proposed system by conducting a demonstration experiment with a large array scale. We also built a monitor system to monitor the generated power of each unit.
Session 1 Presentation 3 11:00-11:15 F6017	Techno-Financial Comparison between Photovoltaic Systems with Bifacial and Monofacial Technology in the Location of Naco and Marcovia, Honduras **C Núñez** and A Reyes UNITEC Central American University of Technology, San Pedro Sula, Honduras *Abstract*—Technology is constantly growing, however, in the same way energy demand; over the years, different ways have been sought to better use of renewable resources in order to achieve better results in energy generation and supply that energy demand, but in turn to be feasible methods, an example of this is bifacial photovoltaic systems. This research carried out a Techno-Financial comparison between bifacial and monofacial systems for the locations of Naco, Cortés and Marcovia, Choluteca. In which the design of a bifacial photovoltaic installation was carried out assuming three types of land, being grass, soil and white gravel, with the purpose of analyzing the increase in albedo, and consequently the increase in energy production. Similarly, a monofacial system was designed for the same locations with the same capacity. The research made use of a quantitative methodology with a correlational focus, in which LCOE was established as the main research variable. In this way it was determined which photovoltaic system of those analyzed presents the lowest LCOE for both locations, of which it was made based on two assumptions, considering the value of the terrain and without considering it. Finally it was possible to determine that the lowest LCOE in a scenario where the value of the terrain is considered is obtained by the monofacial system for both localities, otherwise the scenario without considering the value of the terrain, the lowest LCOE presented by the bifacial system.
Session 1 Presentation 4 11:15-11:30	Characteristics of Energy Production and Consumption in Sichuan Province and Development Strategies

F6003	**L Zhang** and Fang Du Sichuan University, Chengdu, China *Abstract*—The new energy revolution has put forward new requirements for energy production and consumption. This study systematically analyses the characteristics of energy production and consumption in Sichuan Province from 2015 to 2018. According to our analysis, natural gas and hydropower were the main sources of energy production in Sichuan Province, while the outputs of coal and, in particular, oil did not match consumption demand. Meanwhile, the industrial sector and household consumption were the main energy-consuming sectors in Sichuan. This study opines that, on the one hand, Sichuan Province should continue to develop and expand the production and consumption of clean energy and explore expanding the production of wind and solar energy. On the other hand, the province should devote attention to research and development for improving the efficiency of high-carbon fossil energy utilisation. Additionally, Sichuan Province also needs to focus on increasing the inventory of coal- and oil-based energy. The three aspects above require technological innovation. Hence, developing and introducing related technologies and talents is a long-term energy development solution for Sichuan Province.
Session 1 Presentation 5 11:30-11:45 F6026	Techno-Economic Analysis of a Solar Tower CSP Plant with Thermal Energy Storage in Southern Honduras **L Martel Rivera** and H Villatoro Flores Universidad Tecnológica Centroamericana, San Pedro Sula, Honduras *Abstract*—For many years, solar thermal energy has been relegated to second place to photovoltaic solar energy in terms of electricity generation. At the end of the 1980s, an alternative to solar photovoltaic plants emerged, Concentrated Solar Power (CSP) technology. This type of technology presents a commercial option for grid-connected solar plants for the utility market due to its high performance and efficiency in energy conversion, as well as its clean generation of electricity without greenhouse gas emissions. Currently, in Honduras the use of solar thermal energy is reduced to heating processes and product sanitation in the industrial sector, wasting the country's great solar thermal potential. This document focuses on the evaluation of a Solar Tower CSP plant with 10 hours thermal storage in the southern area of Honduras, analyzing the departments of Valle and Choluteca. The methodology used for this research is a quantitative approach based on collecting meteorological data of the solar resource in the area and costs associated with the plant, this to test a hypothesis. This evaluation was carried out from a technical, economic and environmental point of view. The research managed to determine values of Levelized Cost of Electricity (LCOE), Net Present Value (NPV), Internal Rate of Return (IRR) and project recovery period for the different scenarios presented in the two departments analyzed. Putting all the results together, it was found that the department of Valle has the lowest LCOE compared

	to the department of Choluteca. Likewise, the values of NPV, IRR and recovery period determine that the project is more profitable in the department of Valle.
Session 1 Presentation 6 11:45-12:00 F5005	Cost-benefit Analysis of the Implementation of Off-Grid Photovoltaic Systems in the Northwest Residential Sector of San Pedro Sula, Honduras **S Tinoco** and A M Reyes Duke Universidad Tecnológica Centroamericana, San Pedro Sula, Honduras *Abstract*—This research analyzed the implementation, from a technical and financial point of view, of off-grid solar photovoltaic systems in the Northwest sector of San Pedro Sula, Honduras. The energy demand of the residential sector was studied, the monthly energy consumption data of 17 neighborhoods in the sector were processed and three main monthly energy consumption levels were determined. The sizing of the systems was carried out considering PV arrays connected to hybrid inverters. In addition, the nominal capacity of the battery banks of the three systems was defined based on 1 day of autonomy and a nominal voltage of the installation of 48V. PVsyst was used to approximate the energy that the photovoltaic array will potentially generate, and the specific yield value was used to project the energy to be generated throughout the life of the project. Homer Pro was used to determine the optimal configuration to find the lowest net present costs for each project. The financial analysis determined that the cost-benefit ratio is greater than 1 for systems with nominal DC capacity greater than 15.8kWp.
Session 1 Presentation 7 12:00-12:15 RE2001	Performance Analysis of 10MWp Grid-Connected Photovoltaic System in the Mediterranean Climate using PVsyst Software **Ibrahim M.Ibrahim,** Ahmed S.Shehata , Ali I.Shehata, Mohamed A. Abbassy Arab Academy for Science, Technology and Maritime Transport, Alexandria, Egypt ***Abstract***—.This paper presents performance analysis and assessment of a simulated $10MW_p$ grid-connected Photovoltaic System in the Mediterranean climate of Alexandria, Egypt using PVsyst simulation tool. The Photovoltaic plant was designed to achieve the highest performance. The system has a performance ratio of 84% when using polycrystalline module type and 83% using monocrystalline modules, the energy injected into the grid for the full year of 153.5 GWh/year and 152.6 GWh/year using polycrystalline and monocrystalline modules respectively, as results under the total amount of incident energy in collector plan of 2279.5 kWh/m^2.day. The system showed a good performance and viability of installation. However, it is not on one of the hottest spots in Egypt, but as per cities planning and electrical energy distribution in the country, this results would give a good indicator helping taking the decision before starting any installations of photovoltaic power plants in Egypt for future projects, especially locations with a Mediterranean climate.

AGENDA

Session 1 Presentation 8 12:15-12:30 F6050	Analysis of PV Generation in Honduras by a Mathematical Model in MATLAB / SIMULINK **J Santos Ramirez**, G Sánchez Villela, A Reyes Duke and H Villatoro Flores Universidad Tecnológica Centroamericana UNITEC, San Pedro Sula, Honduras *Abstract*—Today it is common to see how many countries are seeking to reduce their dependence on fossil fuels, so the incorporation of photovoltaic systems has become an alternative to such dependence. In Honduras, it is predicted that by the year 2038, 80% of the energy matrix will be renewable, and approximately 20% of the energy generated is through photovoltaic systems [1]. The objective of this document is to present a procedure for the mathematical modeling of PV modules with a significant volume of data from the different active weather stations distributed throughout the country as input parameters into Matlab/Simulink, and based on this, the electricity generation at the location of these stations is shown according to their solar hours. The model presented is based on equations obtained from an equivalent circuit of a diode that will be able to denote the I-V and P-V output characteristics of a typical 435 W solar module. These characteristics will be determined by the models developed under the meteorological conditions of temperature and solar irradiation that are present in the different departments of the Honduran territory where the weather stations are located. The design of the module is through easy to use icons, and a dialog box that the Simulink libraries provide.
Session 1 Presentation 9 12:30-12:45 F6015	Application of PCCS Method to PCS in a PV Generation System K Itako and **R Fujii** Kanagawa Institute of Technology, Kanagawa, Japan *Abstract*—This paper proposes a new peak current control switching (PCCS) method for single-phase inverter in a PV generation system. This method minimizes the difference between a peak current and the current command with a constant switching frequency. In this paper, the principle and the simulation results of this proposed method are described. From the results, it is clarified that the proposed switching method is effective.

AGENDA

Session 2

Environmental Engineering and Environmental Analysis

10:30-12:45, GMT+09:00 | January 29, 2021 Friday

Meeting ID: 62527988016

Chaired by: Assoc.Prof. Giovene Pérez Campomanes

Dr. Lee Hwang Sheng

Session 2 Presentation 1 10:30-10:45 F5007	Effects of Climate Change on the Surface Waters of the Santa River, La Rinconada- Ancash –Peru **Giovene Pérez Campomanes** and José Iannacone Universidad Federico Villarreal (EUPG –UNFV), Lima, Perú *Abstract*—The effect of climate change on the surface waters of the Santa River, the town center la Rinconada, Ancash, Peru, was assessed. Climate change was modeled between 2006 - 2015, through temperature, precipitation, and historical evapotranspiration versus surface waters based on water availability, and the best regression equations were selected. A validated survey of users of the Rinconada Irrigation Commission (CRR) was also taken. The best equation was exponential type for surface water and average precipitation. In contrast, for surface water and climate change the most appropriate was multiple linear regression. In relation to the survey, 83.33% fully agree that they are concerned about climate change, and 81.37% agree that they are fully prepared for climate change caused by high temperatures. 27.5 % totally disagree that the amount of water available in the canals has decreased because of climate change. It is concluded that it is possible to predict water availability in the face of the presence of climate change by applying regression users equations, and that there is concern of CRR users, in the face of the presence of climate change.
Session 2 Presentation 2 10:45-11:00 F6033	Numerical Assessment of Total Nitrogen (Tn) Load Discharged from Rivers into Harima-Nada, the Seto Inland Sea, Using A Numerical Coupled Hydrological-Water Quality Model **V Pintos Andreoli**, M Mori, Y Koga, H Shimadera, M Suzuki, T Matsuo and A Kondo

	Osaka University, Osaka, Japan *Abstract*—Harima-Nada region, located in the east of Seto Inland Sea, is a semi-enclosed sea-area next to Osaka Bay that has been suffering a sustained oligotrophication process during the past 25 years. A hydrogeological model, coupled with a water quality model, was applied to assess the numerical discharge of freshwater and total nitrogen (TN) load from rivers into the sea. The model was validated for the main rivers from the northern and southern regions (the Kako River and the Yoshino River, respectively). The obtained results showed that the main contribution of freshwater and TN load to the sea comes from Hyogo Prefecture Rivers. The type of activities developed on each watershed showed to be substantially more relevant on TN load contribution than the size itself of the considered watershed. For the eight years considered in this study (2009 - 2016), the annual average of TN discharged into Harima-Nada was almost constant, while the volume of discharged freshwater showed more variations. Additionally, the sustained decrement in nitrogen concentration in Harima-Nada seemed not to be directly bonded with riverine TN load, suggesting that nitrogen availability is closely related to sea nutrients mechanisms more than to TN inland contribution.
Session 2 Presentation 3 11:00-11:15 F5010	Formation of Nitrogenous Disinfection By-Products (N-Dbps) in Drinking Water: Emerging Concerns and Current Issue **Yucheng Shen** Monsh University, Melbourne, Australia *Abstract*—Nitrogenous disinfection by-product (N-DBPs) has always been one of the most concerned disinfection by-products (DBPs) in recent years. The toxicity of regulated DBPs is generally less than that of N-DBPs, which have been widely detected in finished drinking water. Despite the fact that N-DBPs are highly toxic, there are currently no N-DBPS species officially regulated by governments around the world. This paper provides a review of the formation mechanism and precursors of nitrogen-containing disinfection by-products in drinking water treatment. Also, the spcieces and inducing factors of N-DBPs were summarized. The data were mainly collected from 2000-2002 and 2006-2007 US Survey in effluents of US WTPs. Because nitrogen source is a prerequisite for the formation of nitrogen-DBP in drinking water, the occurrence of N-DBPS may increase due to the influence of sewage and algae blooms on water sources. Chloramine disinfection are used in most of developed countries for preferred secondary disinfection to reduce the formation of chlorine-related by-products, but this increases the formation potential of N-DBPs. Furthermore, the safety control of N-DBPs and suggestions for the further exploration of for efficient drinking water are discussed. Coagulation and filtration are not very effective in removing precursors (such as amino acids) of N-DBPs and the precursors need to be removed before disinfection.

AGENDA

Session 2 Presentation 4 11:15-11:30 F5009	Removal Ability of Antibiotic Resistant Bacteria (ARB) and Antibiotic Resistance Genes (ARGs) by Membrane Filtration Process **Yuting Guo** Xiamen University Tan Tah Tee College, Xiamen, China *Abstract*—Recently, the environmental pollution caused by the extensive use of antibiotics is becoming more and more serious, and the existence of antibiotics may accelerate the prevalence and spread of antibiotic resistance genes (ARGs) and antibiotic resistant bacteria (ARB), and thus endangering human health. The need for wastewater reuse is increasing due to the water scarcity, and membrane process including microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and reverse osmosis (RO) has been widely used in wastewater reclamation process. Consequently, understanding the removal efficiency of ARB and ARGs in membrane filtration process is of great significance. The main purpose of this study was to determine the removal efficiencies of ARB and ARGs by different membrane filtration processes (i.e., MF, UF, NF and RO), analyze the influencing factors, and summarize the removal ability of different membrane filtration processes. In addition, the removal ability of ARB and ARGs by membrane-based integrated processes was studied, and suggestion on future wastewater reclamation was also proposed.
Session 2 Presentation 5 11:30-11:45 F6067	Lead Removal by Hydrochar from Hydrothermal Carbonization of Food Waste Thi Hoang Tuyen Do, Thai-Hoang Le and **Thi Phuong Thuy Pham** Ho Chi Minh City University of Food Industry, Ho Chi Minh City, Vietnam *Abstract*—Food waste recently emerged as a resource with a potential to be converted to hydrochar which could be utilized in various applications. In this study, we focused on investigation of the lead removal of hydrochar obtained from hydrothermal carbonization of food waste. Hydrochar was collected after hydrothermal liquefaction of food waste at 180oC for 2 h. The adsorption of hydrochar towards Pb2+ in aqueous solution was conducted in batch mode to investigate the sorption kinetics, isotherm and pH edge. The results showed that hydrochar derived from food waste exhibits high performance in adsorption of lead from aqueous solution, achieving 160.21 mg g-1 removal capacity within the first 2 h of reaction. This indicated promising application as heavy metal sorbents of hydrochar from hydrothermal conversion of food waste.
Session 2 Presentation 6 11:45-12:00 F5012	Field Dielectric Sensor for Soil Pollution Application R Ismail1, M Dahim, A Jaradat, R Hatamleh, D Telfah, M Abuaddous and **H Al-Mattarneh** Yrmouk University, Irbid, Jordan *Abstract*—This paper presents a new dielectric sensor which could be used for

	assessment and evaluation of soil pollution in the field. The new device determines the dielectric properties of soil from the measured soil impedances. The dielectric properties used as indirect method to estimate type and pollution content in soil. The new device was calibrated and validated for accurate measurement of soil dielectric properties in the frequency range of 1 kHz to 30 MHz. The new proposed dielectric sensor was used to measure the dielectric properties of clean and contaminated soil. The measured dielectric properties of soil using the proposed sensor could be used to estimate soil moisture content, hydrocarbon diesel and salinity in sand soil. The results also show that the dielectric properties of clay soil were higher than the dielectric properties of san due to existing bound water in clay minerals. Further testing is necessary to evaluate the effects of other parameters such as temperature and various type of soil prior to adopt the sensor for field testing.
Session 2 Presentation 7 12:00-12:15 F5016	Raw Industrial Wastewater Treatment Using Fenton, Photo Fenton and Photo Catalytic: A Comparison Study **Sri Martini**, Sharmeen Afroze and Kiagus Ahmad Roni Universitas Muhammadiyah Palembang, Ulu Palembang, Indonesia *Abstract*—This work implemented solar TiO2 photocatalysis, Fenton, and photo-Fenton separately for treating raw petroleum refinery wastewater (PRW) in terms of its COD and TOC removal. The effect of irradiation and reaction time along with initial pH on the degradation profiles was assessed and compared. The experimental work then revealed that maximum removal efficiency of COD and TOC by solar TiO2 photocatalysis was 48.2 and 53.3%, respectively while photo-Fenton reached 54.1 and 59.1%, respectively. Photo-assisted process was found significantly better than dark mechanism, especially for TiO2 catalysis. In addition, employing acidic condition in the range of 3 to 5 in both photocatalysis and photo-Fenton processes resulted in the obvious improvement of pollutant degradation. Eventually, the kinetic study indicated that the degradation of COD and TOC is suitable to pseudo-first-order pattern by reaching high R2 values.
Session 2 Presentation 8 12:15-12:30 D6002	Urban Air Quality and Its Causal Networks **Chen Chen** Carmel High School, Carmel, USA *Abstract*—Fine Particulate Matter (PM) concentration is one of the most important air quality indicators that have dramatic implication on the health conditions of natural and human systems. PM2.5 in particular (PM with a diameter of less than 2.5 micrometres) has been widely used to understand the urban air quality, given the devastating role of PM2.5 on respiratory diseases. The production and turnover of PM2.5 are controlled by the complex local environmental factors such as air humidity, wind speed, and temperature. In this study, the PM2.5 concentration dynamics at three mega-cities in China was

	investigated. Furthermore, multiple metrics from linear correlative coefficient to non-linear information transfer were used to reconstruct the relationships and causal networks that relevant to PM2.5 dynamics at each individual city. The results showed that precipitation in general was not a good indicator of the PM2.5 dynamics, consistently across different cities. Depending on local conditions, PM2.5 was mainly driven by either surface temperature, pressure, or humidity. Finally, this study highlighted the nonlinearity of the system should be considered in order to improve the understanding of causal relationships between urban PM2.5 concentration and its physical environments.
Session 2 Presentation 9 12:30-12:45 RE003	Occurrence and Distribution of Hexachlorohexane (HCH) Concentration in Agricultural Soils in Albania Using Gas Chromatography **Armela Tafa,** Iva K ërtusha, Ambra Xhafka American University of the Middle East, Eqaila, Kuwait *Abstract*—Pesticides play an important role in agriculture to control or eliminate weeds, pests, insects and plant disease. Due to their wide usage in past years, pesticides are known as environmental pollutants. They can contaminate water, soil, biota and air. The objective of this study is to determine the occurrence and distribution of Hexachlorohexanes (HCH) isomers in soil samples. HCH are measured in soil samples collected from nine agricultural stations in Durres city in Albania. They are extracted using Soxhlet apparatus and Hexane as a solvent and analysed via GC – MS. The highest levels of HCH are detected in Station 8 due to the high agricultural activity in this area.

AGENDA

Session 3

Energy and Power Engineering

13:30-15:15, GMT+09:00 | January 29, 2021 Friday

Meeting ID: 62827934418

Chaired by: Prof. Kondo Akira

Session 3 Presentation 1 13:30-13:45 F6027	Cost benefit of a Small-Scale Vertical Axis Wind Turbine for Residential Use in Honduras **Sophia Eloise Ayestas Rivera** and A M Reyes Duke Universidad Tecnológica Centroamericana UNITEC, San Pedro Sula, Honduras *Abstract*—This paper presents the results of a study on the cost benefit (B / C) of the implementation of a wind power system consisting of a small-scale vertical axis wind turbine for residential use in the municipality of Puerto Cortés, Honduras. The cost of electricity in Honduras and its growth in recent years calls for a search for self-consumption technologies to meet electricity demands. Photovoltaic solar systems are being used to power households with this purpose, however, wind energy has not been used in residential applications yet. The investigation was carried out with a mixed approach, part of the research will be a numerical analysis through a technical and financial study and the determination of factors such as the location and type of wind turbine constitutes the qualitative approach. The investigation considered the cost effectiveness of the system by evaluating monthly energy consumptions of 250, 500, and 750 (kWh). As the main conclusion, a B/C greater than "1" was obtained for the considered consumptions, indicating that the project is profitable for the urban residential sector of the area.
Session 3 Presentation 2 13:45-14:00 F6042	Thermodynamic Multi-Objective Optimization of an Orc-Lng Combined Cycle System **Zhaokuo Yuan**, Lijun Wu and Ping Zhang Tongji University, Shanghai, China *Abstract*—A thermodynamic model of a dual loop organic Rankine cycle (ORC) combined with liquefied natural gas (LNG) expansion system has been developed to analyze the thermodynamic performance for the purpose of recovering LNG cold energy and blast furnace slag water waste heat. Furthermore, a multi-objective genetic algorithm (GA) is employed to solve the optimal solutions

	from the viewpoints of maximizing thermal efficiency and exergy efficiency simultaneously over the whole operating range of the combined cycle system. The results show that the optimal evaporation temperature and the intermediate condensation temperature of the first ORC (cycle A) are 83 ℃ and 19 ℃ separately. The optimal condensation temperature of the secondary ORC (cycle B) is -63 ℃. The optimal gasification pressure and the supply pressure of the LNG expansion are 3.92 MPa and 0.20 MPa. At the rated condition, the ORC-LNG combined cycle system has the maximum thermal efficiency of 46.12% and exergy efficiency of 51.67%, with a 4.39 MW total net power output.
Session 3 Presentation 3 14:00-14:15 F6032	Wind Resource Assessment: Analysis of the Vortex Bladeless Characteristics in Puerto Cortés, Honduras **O Ordoñez** and A M Reyes Duke Central American Technological University, San Pedro Sula, Honduras *Abstract*—In the department of Cortés, many cities have self-consumption facilities in the residential sector; however, Puerto Cortés is a city that does not currently have any incentive or interest to implement distributive generation based on renewable resources. Under this criterion, it was sought to study a renewable resource suitable for self-consumption facilities in Puerto Cortés other than solar energy, resulting in wind energy using Vortex Bladeless technology. A technical analysis of the Vortex NANO prototype was carried out in a residential area of Puerto Cortés to determine its viability by monitoring power generation with respect to the magnitude of the wind.
Session 3 Presentation 4 14:15-14:30 F5002	Replacement of Palm Methyl Ester to Rapeseed Methyl Ester for Tar Removal in the Nong Bua Dual Fluidized Bed Gasification Power Plant **P Tonpakdee**, J Hongrapipat, V Siriwongrungson, S Pang, R Rauch, M Messner, C Henrich, P Pessl and M Dichand King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand *Abstract*—The blockage problem of tar in a biomass power plant is a main problem and it must be removed. Rapeseed methyl ester (RME) was imported and used as scrubbing solvent to scrub tar at a 1 MWel Nong Bua prototype Dual Fluidised Bed (DFB) gasifier in Nong Bua district, Nakhonsawan province, Thailand. Using local oil in Thailand is an attractive choice from economic viewpoint. Pervious lab test study on naphthalene solubility in different local oils in Thailand was investigated. Local palm methyl ester (PME) shows the competitive performance to the RME. In this research, PME was tested to scrub tar in an oil scrubber at the Nong Bua DFB gasifier plant. Gravimetric tar content after passed a PME scrubber was measured and compared to that from a RME oil scrubber. The results show that both solvents have similar tar removal performance due to their contents of ester, methanol, and glycerin are similar. In addition, viscosity of both solvents has no significant effect on tar removal. From

	the current research, therefore, PME has been used as solvent in an oil scrubber at 1 MWel Nong Bua prototype DFB gasifier with technical and economic reasons.
Session 3 Presentation 5 14:30-14:45 F6031-A	Experimental Study on the Characteristics of Ethanol Gasoline Explosion Under Double-Point Ignitions **Guochun Li**, Xiaolong Zhu and Xishi Wang University of Science and Technology of China, Hefei, China *Abstract*—The ignition source is one of the most important factors affecting the explosion. The effects of double or multi points ignition on explosion are still not clear. To reveal the explosion characteristics of ethanol gasoline explosion under double-point ignitions at first, a serious of experiments were conducted under different initial ignition positions along the horizontal direction of a vented rectangular chamber (with a cross section of 100 mm × 100 mm, 1000 mm long and a 60 mm side length vent on its top). The explosion overpressure and flame propagation were obtained by PCB pressure sensors and Phantom high-speed camera, respectively. The results indicate that, with the distance between two ignition points increased, the boundary between the merged and separated states of two flame was determined. Compare to the cases with a single point ignition, a tulip flame would be formed at the back of the front flame under the separate state, and the maximum explosion overpressure is increases more than twice under double-point ignitions. The results of this study would be helpful in deepening the understanding of the ethanol gasoline explosion and the assessment of the influence of double-point ignitions on explosion.
Session 3 Presentation 6 14:45-15:00 F6054-A	Effect of Reduction Temperature on Cu-Ceo2 Interface and Catalytic Activity of Cu/Ceo2 Catalysts **Bowen Lu**, Yongqing Xu, Zewu zhang and Liqi Zhang Huazhong University of Science and Technology, Wuhan, China *Abstract*—High active and stable catalysts are required for CO2 utilization to decrease the high concentration of CO2 in the atmosphere, which is the major cause for the greenhouse effect and climate change. Previous research reported that the interface of metal and oxide support are important in reverse water gas shift (RWGS, CO2+H2=CO+H2O) reaction, and metal-oxide interface may serve as active sites for RWGS reaction. Little work about how does metal-oxide interface work in RWGS reaction has been done before. In order to learn more about the interface effect in RWGS reaction, Cu/CeO2 catalysts had been prepared with ethanol impregnation method. CeO2(rods) was used as support, and Cu was loaded on the surface of CeO2, then the sample would be reduced with a certain amount of H2 flow under 300, 400, 500, 600 ℃ to get the Cu/CeO2-RT catalysts (defined as Cu/CeO2-RT300, Cu/CeO2-RT400, Cu/CeO2-RT500, Cu/CeO2-RT600,respectly). Cu size distribution of Cu/CeO2 RT catalysts has

	been studied with TEM images. And found that Cu size on Cu/CeO2-RT400 catalysts was 5.1±1.2 nm, which was smaller than that on other three Cu/CeO2-RT catalysts. These results corresponded well with XRD results. CO2 hydrogenation activity of the Cu/CeO2-RT catalysts had been investigated, and the activity of Cu/CeO2-RT400 catalysts could reach 1.2 mol/gcat.h CO (nearly 100% selectivity) at 400 ℃ under atmosphere pressure. The apparent energies of RWGS reaction were similar among Cu/CeO2 RT catalysts, which indicated that the kinds of active sites on Cu/CeO2-RT400 catalysts were almost the same. The Raman spectrum of Cu/CeO2-RT catalysts had been conducted, and found that the CeO2 F2g peak shifts to lower wavenumbers in comparison to that of CeO2. These results indicated that some Cu ion had been doped into CeO2 lattice, and more vacancy would be formed in the Cu-CeO2 interface. Combined with the CO2 hydrogenation activity and vacancy information, oxygen vacancy formed in the Cu-CeO2 interface would enhance CO2 hydrogenation. CO2-TPD results revealed that more CO2 would be adsorbed on Cu/CeO2-RT400 catalysts, which may mainly rely on the effect of vacancy on the Cu-CeO2 interface. Vacancy on the Cu-CeO2 interface promotes CO2 adsorbed on the surface of Cu/CeO2-RT catalysts, and CO2 got reacted with active hydrogen to form formate species, which could be found in DRIFTS spectrum. Formate species would be dissociated into CO and OH adsorbed on the surface of Cu-CeO2. These results would give insights into design a high effective catalyst for CO2 hydrogenation.
Session 3 Presentation 7 15:00-15:15 F6041	The Effect of the Number of Blades on the Efficiency of A Wind Turbine **Kehinde Adeseye Adeyeye**, Nelson Ijumba and Jonathan Colton University of Rwanda, Kigali, Rwanda *Abstract*—In this paper, we examine existing literature on the way that the number of blades of a wind turbine affects its efficiency and power generation. A wind turbine blade is an important component of a clean energy system because of its ability to capture energy from the wind. The power that a wind turbine extracts from the wind is directly proportional to the swept area of the blades; consequently, the blades have a direct effect on power generation. The number and configuration of the blades is very important because it affects the speed and efficiency of turbine. Unfortunately, as the number of blades increases, so does the slipstream effect. Too few a number of blades results in poor efficiency and thus inadequate performance. Too large a number of blades increases weight and production cost. The correct number of blades is important to fit the generator performance curve to optimize overall turbine performance and efficiency.

AGENDA

Session 4

Energy Market and Energy Economics

13:30-15:15, GMT+09:00 | January 29, 2021 Friday

Meeting ID: 62527988016

Chaired by: Assoc. Prof. Willyanto Anggono

Session 4 Presentation 1 13:30-13:45 F6030	Economic Evaluation of a Time of Use Tariff for the Residential, Commercial, and Industrial Sector in Cortés, Honduras **Febe García**, Gretta Escobar and Héctor Villatoro Universidad Tecnológica Centroamericana UNITEC, San Pedro Sula, Honduras *Abstract*—The implementation of a time of use (TOU) tariff is a new stage, resulting from the modernization of the electric subsector in Honduras. The economic repercussions of a TOU tariff for the residential, commercial, and industrial sector are currently unknown. In this investigation, a TOU tariff will be compared to a fixed tariff through the calculation and comparison of electric bills, establishing in this way, which tariff is more convenient for the consumer. The electricity consumption data was obtained from two different circuits for each consumption sector. These were processed to know the monthly consumption. The prices for the TOU tariff were obtained by extrapolating the prices established in a 2016 tariff schedule for each of the tariff categories. The results have shown that the implementation of a TOU tariff would represent an average saving for the residential sector of 28.635% and for the industrial sector of 5.405% compared to a fixed tariff. On the other hand, in the commercial sector an average increase of 0.38% has been identified. This investigation aims to be used as a reference to get the consumers of each consumption sector to know the impact they would have on their bills with a TOU tariff.
Session 4 Presentation 2 13:45-14:00 F5001-A	Does Coal-to-gas Policy Reduce Air Pollution? Evidence from a Quasi-natural Experiment in China **Yu Chenyang** and Kang Jijun Chongqing University, Chongqing, China *Abstract*—Whether the use of cleaner energy can reduce air pollution is the focus of debate among scholars, but there is still no unanimous conclusion. This study seeks to explore the net impact of coal-to-gas policy, an energy transition policy in China, on air pollution. Utilizing prefecture-level city data from 2003 to 2016, we

	apply the PSM-DID method to estimate the policy's net impact. Further, we examine the dynamic effects of coal-to-gas policy and its impact mechanism on air pollution. The results show that 1) The coal-to-gas policy has an average reduction effect of 20.64%, 29.33%, and 38.36% on air quality index (AQI), industrial sulfur dioxide (SO2), and industrial smoke (dust). But the policy has limited effects on fine particulate matter (PM2.5) concentration; 2) the impact of the coal-to-gas policy is significant in the second and third years. It has no significant reduction effect on air pollution in the long term; 3) the coal-to-gas policy also reduces air pollution through industrial structure upgrading and de-industrialization. The robustness test results support the above conclusions. Practicable policies to reduce air pollution in China are suggested and applicable to other developing countries with resource-scarce and serve air pollution.
Session 4 Presentation 3 14:00-14:15 F6001-A	Does Market Segmentation Necessarily Discourage Energy Efficiency? **Yanjun Yang** Chongqing University, Chongqing, China *Abstract*—Prior research tends to propose and examine the negative relationship between market segmentation and energy efficiency. Does market segmentation necessarily impair energy efficiency? Considering the critical role that Chinese government plays in managing erergy efficiency, we propose a non-linear relationship between market segmentation and energy efficiency. Using data of 30 provinces in Mainland China during 2000 to 2017, we find an inverse U-shaped relationship between market segmentation and energy efficiency. Our findings remain robust after controlling endogeneity issues. Therefore, a moderate level of market segmentation is acceptable and beneficial for long-term improvement of energy efficiency in emerging economies.
Session 4 Presentation 4 14:15-14:30 F6002	Exploring Supply–Demand Patterns and Flow Determinants of Global LNG during 2000–2018 **Y X Wang** and N Wang Dalian Maritime University, Dalian, China *Abstract*—Entering the 21st century, global liquefied natural gas (LNG) flows have undergone a structural change. Especially over the past few years, LNG supply-demand landscape has increased the complexity and unpredictability in the face of ever-changing energy markets. According to the data for LNG export-import, production-consumption, gas proven reserve, sea transport distance, trade price and energy policy, this study thus endeavors to explore global LNG supply-demand patterns during 2000–2018, highlighting recent development of LNG by regions and nations. Further, seven factors are considered in an extended gravity model of LNG to quantitatively assess the driving factors of LNG flows. Finally, policy implications are put forward, which provide useful information for energy sectors to understand the dynamic LNG markets and the

	determinants of these changes.
Session 4 Presentation 5 14:30-14:45 F5008-A	Frequency Dynamics of Extended Joint Connectedness between Oil and Asset Classes Implied Volatilities:A Time-Varying Approach **SHI ZE-LONG** Chongqing University, Chongqing, China *Abstract*—This study use semiparametric time-varying parameter vector autoregression（SEMI-TVP-VAR）based extended joint connectedness approach in oder to charactersize connectedness of Oil and Asset Classes Implied Volatilities spanning from Mar 16,2011 to Oct 29,2020.And,relies on conditional forecasts to decompose variance,I propose frequency connectedness of the extended joint connectedness.The results suggest that oil implied volatility is a net volatility receiver of shocks,whereas stock markets's implied volatility is net volatility transmitters. The results suggest that volatility spillover effects in the USA are mainly generated by low-frequency,where the total spillover effect for high frequency band is relatively weak.
Session 4 Presentation 6 14:45-15:00 RE001	Issues and Potentials of Local PPS in Realizing a Japanese Version of Stadtwerke **Shuheng Zhao** and Hiroshi Onoda Waseda University, Tokyo, Japan *Abstract*—This paper presented an overview of local power producers and suppliers (local PPS) that were established in Japan since the general liberalization of the retail electricity market, with particular focus on the current situation and issues of the local PPSs in terms of their operations and their renewable energy-related efforts. Further, this paper analyzed relevant cases in Ishikari city in Hokkaido, Karatsu city in Saga prefecture, and Sakura city in Chiba prefecture, to discuss and inform future efforts towards realizing a Japanese version of Stadtwerke.
Session 4 Presentation 7 15:00-15:15 F6048	Effects of Biochemical Pretreatment and Nutrient Supplementation on Anaerobic Co-Digestion of Sugarcane Press Mud and Distillery Effluent **Jaira Neibel Bamba** and Michelle Almendrala Mapúa University, Manila, Philippines *Abstract*—Laboratory-scale anaerobic digesters were fabricated and used in the co-digestion of press mud and distillery effluent to investigate the effect of pretreatments (biological and chemical) and nutrient supplementation for enhanced biogas production. The findings of this study showed that maximum biogas yield (502.86 mL/g TVSadded) with maximum percentage of methane (55%) was obtained in combined enzymatic and alkaline (calcium hydroxide) pretreatment with addition of nutrients (i.e., D6). Combined alkaline pretreatment and nutrient supplementation resulted to a 55.07% increase in biogas yield

	compared to the control. Sole nutrient addition enhanced the yield by 64.38%. However, single alkaline pretreatment presented inhibitory effect which resulted to a 22.48% decrease in biogas production. Moreover, the percentage of methane gas in the biogas samples was between 14 and 55%. Samples dosed with enzymes resulted to better methane yields (>50%) than the samples without enzymes. Highest reductions in BOD, COD and TSS were also achieved in D6. Thus, enzymes, especially when combined with other methods, have potential for improving biogas production from sugarcane wastes.

AGENDA

Session 5

Building Energy Conservation and Sustainable Architecture

15:40-17:40, GMT+09:00 | January 29, 2021 Friday

Meeting ID: 62827934418

Chaired by: Professor Dr. Hashem Al-Mattarneh

Session 5 Presentation 1 15:40-15:55 F6061	Sustainable Asphalt Concrete for Road Construction and Building Material M Abuaddous, M Dahim, R Ismail, M Taamneh, A H Alomari, W Darwish and **H Al-Mattarneh** Yarmouk University, Irbid, Jordan *Abstract*—In this study, the possibility of producing new geopolymer concrete from olive oil waste in Jordan is presented. Olive oil residues in Jordan and many Mediterranean countries constitute a major environmental and health problem. So far, the waste is disposed of by means of sanitary landfill, and this poses an environmental risk and pollutes the groundwater, the main source of water in Jordan. The ash remaining from burning olive oil residues was used to produce geopolymer concrete by adding sodium hydroxide and without using any Portland cement. Mixtures were prepared using the central composite design. The focus was on the two most important factors affecting the properties of geopolymer concrete, which is the amount of ash and the amount of alkaline solution. After curing the concrete and passing 28 days, the compressive strength, slump, absorption, and porosity were measured. The Results of compressive strength, absorption and porosity was excellent in comparison with the results obtained from conventional concrete. Despite the promising results the slump of the proposed concrete is low, and the slump loss was very fast. Further studies are needed to improve the workability of geopolymer concrete from olive oil waste. This concrete allows to recycle a large amount of olive waste in Jordan and many other countries which reduce the impact on health and environment.
Session 5 Presentation 2 15:55-16:10 F5003	A Novel Design Of Energy-Saving and Prefabricated House System for Rural Area of Northwest China **Ge Song**, Liang Guo and Mengzhuo Wu Northwestern Polytechnical University, Xi'an, China

	Abstract—This research proposes a novel type of rural house design that combines a prefabricated steel frame and EPS cavity blocks as exterior envelop. It has the advantages of low energy consumption, moderate cost, and low assembly difficulty, so as to meet the sustainable development goals of rural areas of China, where status quo of industrialization and economic development is at relatively low level. The article introduces the prefabricated structural features of the system, a semi-industrial construction process, features of refined room modules design based on the size of furniture and residents need at different level, and an automated combination of room modules to house mode with the aid of computer programs to save design time and better meet residents needs. It satisfies China's goal of improving the liveability of rural areas and vigorously developing new prefabricated building systems. Finally, the article looks forward to the future research and development direction.
Session 5 Presentation 3 16:10-16:25 F6056	The Role of Building Sector in Preserving Occupant Health for A Sustainable Development: A Review **Razlin Mansor** and Low Sheau-Ting Universiti Teknologi Malaysia, Johor, Malaysia *Abstract*—There has been a dramatic rise in research on sustainable development but limited attention is given to human aspects such as their needs and requirements in a sustainable building. The majority of people spend their time mostly indoor, either for working, studying or living. Therefore, it is important to understand the health implications of building on occupants. The impact of indoor environment on occupant health has been largely disregarded. It should be part of the main agenda in progressing towards sustainable development. This paper aimed to discuss the interplay between indoor environment and occupant health and highlighted the role of building sector in preserving occupant health to ensure that buildings can be optimised for the benefit of occupants. A literature search on published works of indoor environment and occupant health has identified four indoor environment parameters that contribute to occupant health. These include indoor air quality, indoor lighting, indoor cleanliness and ergonomic. The impacts of each indoor environment parameter on occupant health were discussed in this paper. The findings will serve as reference for policy makers to preserve occupant health in buildings and as enhancement strategies for sustainable building development to fulfil the human requirements.
Session 5 Presentation 4 16:20-16:40 F6066	Effect of PV Shadow on Cooling Load and Energy Consumption of Zone Toward Achieving NZEB **M Ibrahim**, A Shehata, A Elharidi and A Hanafy College of Engineering & Technology, Alexandria, Egypt *Abstract*—Development strategy offers us the resources required to investigate the connection between today's environmental challenges and the possibility of their

	progress tomorrow. Currently, the world is facing the greatest surge of population expansion in modern history, which Forced governments to expand urbanization and establishing new cities to accommodate the massive population increase. As a result, the building sector's CO2 emissions have proceeded to grow by almost 1% a year since 2010, So there is an urgent need to find untraditional solutions to overcome upcoming energy, emissions problems and facing the expected increase of electricity prices. Nearly zero-energy buildings (NZEB) is one of the emerging technologies in the building sector which depend on enhancing building's energy performance and its extremely low energy demand is met with aid of renewable energy sources as PV solar panels. Via a study made on a conditioned zone located on the last floor of a university building belonging to Arab academy located in Alexandria, Egypt. The effect of the shadow caused by PV panels placed on the roof was studied. A 3D model of the zone was built, then a CFD analysis using the K-epsilon turbulence model was carried out to realize the essence of the shadow effect on this zone. For further clarity and using the DesignBuilder simulation tool the zone cooling load was calculated for both cases with and without PV on the roof, it was found that the zone cooling load reduced by 11.5% in case PV panels are installed on the roof.
Session 5 Presentation 5 16:40-16:55 F6055	Surface Capacitance Sensor for Road Pavement Application **Mohammed Dahim** King Khalid University, Abha, Saudi Arabia *Abstract*—This paper proposed a new simple surface capacitance sensor for the assessment of asphalt pavement material. The proposed device is a low cost, simple fast and portable which makes it easy to adapt for field investigation. The results obtained from testing several asphalt pavement materials indicate the usefulness of this sensor in evaluating several critical parameters to control pavement quality conditions. These parameters include asphalt moisture condition, the effect of filler additives, pavement thickness, and detection of pavement cracks. Several asphalt pavement materials were prepared to contain fly ash by-product waste of desalination and electrical power plants in Saudi Arabia. The electromagnetic properties of asphalt pavement were measured using the proposed sensor in the frequency range between 100 kHz to 1000 kHz at various moisture conditions. The proposed method also used to measure the dielectric properties of sound and cracked pavement in the field. The results show the applicability of the sensor to determine moisture and waste content in the pavement material. In addition, the sensor could be a useful tool to detect cracks of pavement and the thickness and crack orientation in asphalt pavement. Further testing is needed to include other factors that may affect the results such as other types of asphalt material and asphalt temperature prior to use this sensor in the field.
Session 5 Presentation 6	Assessment of CO2 Emissions Reduction Based on Different Insulation Materials in Residential Buildings: Example from Turkey

16:55-17:10 F6053	**A P AKAN** and A E AKAN Hacettepe University, Ankara, Turkey *Abstract*—In this study, the reduction of CO2 emissions caused by energy savings due to thermal insulation materials applied to the exterior of buildings was investigated. The study was implemented evaluating four different insulation materials, such as XPS, EPS, PUR and Rock Wool for all city centers in Turkey. Moreover, the optimum insulation thicknesses of the buildings that have both heating and cooling needs were determined for four different insulation materials by means of Life Cycle Cost Analysis. The annual energy needs per unit area of the external walls of the buildings, which are insulated according to their optimum insulation thickness were determined and correspondingly the amount of fuel needed to meet this energy was calculated. In the study, CO2 emission values that will release from buildings to atmosphere were compared in terms of fuel amounts obtained from total energy demands during heating supplied from natural gas and cooling supplied from electricity of the residential buildings insulated with diverse insulation materials. Consequently, when CO2 reduction potentials of the buildings insulated with materials in the optimum insulation thickness are compared with those of the uninsulated buildings, insulation material providing highest potential in CO2 emission reduction was to be found as Rock wool.
Session 5 Presentation 7 17:10-17:25 F1002	An Analytical Study on Flexible Joint Between Infill Walls-RC Frames Engin Emsen, **M. Musab Erdem**, Murat Bik œ and Osman F. Bayrak Iskenderun Technical University, Hatay, Turkey *Abstract*—Post-earthquake studies show that the infill walls, whose effects are neglected in the design, can change the earthquake behavior of the structure and cause unforeseen damages, and even collapse in some cases. Infill walls, which are generally regarded as dead loads in building design, actually affect the lateral rigidity of the frames. The analytical examination of the flexible connection between infill walls and RC frames is the basis of this study. The insulation of the infill wall from the frame was analyzed analytically and compared with the experimental results. Analytical models of bare, traditional filled, and flexible jointed frames under cyclic loads are evaluated. As a result, it has also been seen analytically that, unlike the traditionally filled frame behavior, the flexible jointed frame behaves close to the bare frame on initial drifts and retains its lateral resistance without damage until it is further drifts. It has been observed that the negative effects of the infill walls on the structural behavior can be reduced by making the infill wall-frame joint flexible in the frame plane.
Session 5 Presentation 8 17:25-17:40 F1003	An Experimental Study on Flexible Joint Between Infill Walls-RC Frames **Muhammet M. Erdem**, Engin Emsen,and Murat Bik œ Iskenderun Technical University, Hatay, Turkey

	Abstract—RC structures are generally designed by neglecting the lateral stiffness and resistance of the infill walls. Studies show that, due to negligence of infill walls in design, the actual structure behaves differently than expected, also in some cases causes structural element damages. To overcome this difference in behavior between the design and the actual structure, it is recommended that the infill wall-to-frame joint be provided with flexible elements. In this study, the in-plane behavior of a flexible joint type is experimentally investigated by comparing the bare and fully infilled frames. It has been observed that the flexible jointed frame eliminates the disadvantages of bare and fully infilled frames, minor damages occur only at the edges of the infill wall, and the lateral resistance is preserved until further drifts.

AGENDA

Session 6

Ecological Environment Management and Environmental Risk Assessment

15:40-17:40, GMT+09:00 | January 29, 2021 Friday

Meeting ID: 62527988016

Chaired by: Prof. Rodney Stewart

Session 6 Presentation 1 15:40-15:55 F6040	Electronic Waste Analysis and Characterization Study: Management input for Highly Urbanized Cities **J Novelero** and O Mariano Training Content Coordinator, Mandaluyong, Philippines *Abstract*—Electronic Waste (E-Waste) is said to be any electrical or electronic device that have reached the terminal of its useful life. The major issues are the volume and the raw materials used in crafting E-waste which is non-biodegradable and contains hazardous substances that are toxic to human health and the environment. The objectives of this study are to gather baseline data in terms of the composition of E-waste in the solid waste stream and to determine the top 5 E-waste categories in a highly urbanized city. The study utilized the data from the official 2014 WACS of Pasig City and taken the combined percentages of the special and hazardous waste from the overall waste composition. There were three major stages that were followed from the WACS process. These were; Preparation & Training, Actual E-Waste Characterization, and Data Processing and Analysis. Recommendations in managing these wastes for its reduction were provided to serve as guide for acceptance and implementation in the locality. Pasig City was the chosen beneficiary of the research output and through the collaboration of the City Government of Pasig and its Solid Waste Management Office (SWMO); the study successfully piloted the Electronic Waste Analysis and Characterization Study (E-WACS).
Session 6 Presentation 2 15:55-16:10 F6063	Environmental Ethics of Belu Society in Indonesia and Bobonaro Society in Timor Leste: An Ecological Reflection **F Fios**, Benny, N T Martoredjo and Gadis Arivia Bina Nusantara University, Jakarta, Indonesia

	Abstract—Environmental ethics deals with the moral dimensions of human relations with the environment. The focus of this research is to concentrate on an effort to construct environmental ethical values based on the local indigenous people of Belu, East Nusa Tenggara Province-Indonesia, and Bobonaro District-Negara Timor Leste. The research findings show local indigenous human relations with the ecological reality of the Belu community, namely Badu Tradition (prohibition), Sau (harvest), and traditional weaving crafts. Meanwhile the local indigenous people of Bobonaro District, namely: tara bandu (prohibition), na'in (guardian of nature), diversification of plants, terraced land and stone wall fences, traditional medicines, and guarding of water sources. This finding is an important basis for making an ecological reflection based on local wisdom in the context of environmental conservation to support sustainable development. The environmental ethics of the Belu and Bobonaro people are interpreted as natural resources and ecological culture, the legacy of traditions, and the reality of the spiritual nature of the Belu and Bobonaro people in building relationships with the environment. Efforts to care for the environment are shown by respecting the social rules and norms that govern the relationship between local Belu and Bobonaro people with the environment. This local wisdom of Belu and Bobonaro can be a theoretical reference in caring for the environment. Local indigenous-based environmental ethics thinking is very important in helping to solve the problem of less than ideal relations between humans and the environment that is still happening in the implementation of the development that is being carried out. The findings of this study can make an important contribution to environmental conservation efforts to support the big idea of sustainable development.
Session 6 Presentation 3 16:10-16:25 F5011	Investigation on the Impact of Covid-19 on Online Activities and Ecological Environment Yuexi Du, **Wenqi Zhang** and Zuogong Wang Henan University, Kaifeng, China *Abstract*—COVID-19 significantly increased people's online activity time and has a good impact on the ecological environment. School students and highly educated groups are more optimistic about the environmental changes caused by the increase of online communication. The government should strengthen the guidance of online life, learning and working mode and the education of ecological environment.
Session 6 Presentation 4 16:25-16:40 F6064	The Ecological Politics of the Belu Community in Preserving Nature and Supporting Sustainable Development **F Fios**, N T Martoredjo and Benny Bina Nusantara University, Jakarta, Indonesia *Abstract*—Political ecology is the relation between ecologically rooted social

	science and the principles of political economy and the reality of environment exploration. It aims to represent an alternative to apolitical ecology. The field synthesizes the central questions asked by the social sciences and ethics about the relations between human society and its bio-cultural-political complexity, and a significantly humanized nature. This article discourse the phenomenon on environment reality in Belu community, East Nusa Tenggara Province - Indonesia, especially the local community in Belu in relation with the environment. Research methods use phenomenological analyzes and literature review. Finding research that the local indigenous or community in Belu is doing political ecological to counter capitalism, strengthening indigenous local values, supporting sustainable development and protecting ecological justice. This finding can give inspiring to the local people in Indonesia and the other side of the world to take action to protect the environment and supporting sustainable development concept.
Session 6 Presentation 5 16:40-16:55 F0001	Research on Development Codes in Brisbane **Dongmei Zeng** and Dongjin Qi South China University of Technology, Guangzhou, China *Abstract*—Now, we are facing an important reforming period of national territory plan. If we still use the traditional development control means to solve the problem, we will not be able to face the rapidly developing world. Brisbane is the third largest city in Australia. The development codes of Brisbane originated from the development rules of the United Kingdom, but combined with the integrated development assessment system of Australia. It has formed an institutional system with performance development as the purpose, development codes as the means and multi-type permission as the result. In the form, all codes, laws, regulations and planning documents related to development are integrated into one folder. In the implementation of planning objectives, hierarchical management is adopted, and objectives are decomposed level by level to form detail control elements, so that planning objectives are closely combined with practice. In the management after approval, the "special channel" was adopted to improve the administrative efficiency. In this paper, we hope that through the analysis of its background, composition and control mechanism, we can get some enlightenment on the problems we are facing.
Session 6 Presentation 6 16:55-17:10 F6049	Analysis of the Fickle Fires in Global Regions **Leyan Yu** Guanghua Cambridge International School, Shanghai, China *Abstract*—Forest fires occur in a wide range with distinctive fire elements, including fire size, expansion, speed and duration. To investigate when and where fire occurs in recent years and how the four factors differ in various regions, we here to analyse the chronological and terrestrial distribution of these fires, seeing the tendency to change four main fire elements. We focus on fourteen regions,

	including BONA (Boreal North America), TENA (Temperate North America), CEAM (Central America), NHSA (Northern Hemisphere South America), SHSA (Southern Hemisphere South America), EURO (Europe), MIDE (Middle East), NHAF (Northern Hemisphere Africa), SHAF (Southern Hemisphere Africa), CEAS (Central Asia), SEAS (Southeast Asia), EQAS (Equatorial Asia), AUST (Australia and New Zealand), BOAS（Boreal Asia. We finally conclude that the high level of precipitation, decrease in vegetation coverage and human intervention account for the decreasing fires in NHAF, SHAF, CEAS, NHSA. We also confirm that the increasing fires in BONA, TENA and MIDE are because of the rising temperature globally or more specifically, in these areas.
Session 6 Presentation 7 17:10-17:25 RE2002	Modeling and Assessment of Accidental Gas Release from Damaged Subsea pipelines **Ahmed M. Ellethy,** Ahmed S. Shehata, Ali I. Shehata, Ahmed Mehanna Technology & Maritime Transport, Alexandria, Egypt *Abstract*—Due to the high demand on hydrocarbon exploration nowadays and in future overall the world, the risk potential of Subsea gas and oil leakage increases and can lead to a catastrophic incidents such as explosion, fire or loss stability of subsea constructions. Therefore, the purpose of this paper is to assess and control the potential of hazards for the gas flows from subsea pipelines rupture to sea surface with varying of influence parameters on gas plume. 2D Computational Fluid Dynamics (CFD) simulations have been carried out. The influence parameters that contained in the present paper leakage hole sizes and water depths. The Rotvoll experiment data is used in order to validate numerical computational fluid dynamics model. The subsea gas diffusion behavior is investigated for the risk assessment aspect. The main parameters which included to assess the gas dispersion are rising time and fountain height. Observed from our sceneries results that the water depth has a major effect on gas rise time where the deeper water depth is about 3 times longer than the lower water depth to reach water surface whilst the hole size has a high effect on the fountain height where the larges hole size is approximately 2.1 times higher than the smaller hole size. So our objective is helping the petroleum companies to find mitigation method in order to contain the subsea gas release.
Session 6 Presentation 8 17:25-17:40 H6003	Factor Analysis of Improving Water Drinking for the Elder People: An Explorative Study in China **Hubert Liu** and Cheng-Chung Tsai Putian University, Putian, China *Abstract*—This exploratory study aims to manifest impacting factors to the amount of water drinking for the elderly people in China, and meanwhile, this research is to propose some creative strategies for improving their living habit regarding water drinking. It can be seen that water drinking is a pivotal healthy

habit, which closely relates to the sustenance of the mankind, is beneficial to sustain healthy function both in physical and mental aspects for the elderly people. However, unlike food intake, drinking water is usually ignored by the elderly and their caregivers. Particularly, in practical field of long-term care services, some caregivers intend to reduce the amount of water drinking for the elderly due to limited manpower for taking care of urine. In this way, due to lack of sufficient water, the elderly might be threatened by dehydration, bacterial infection, and higher risk of death. Therefore, it is significant to explore the causal factors influencing the elder people's water drinking. Furthermore, in this research, we intend to propose innovative strategies to promote a habit of water drinking for the elderly in order to meliorate the deficiency of water drinking for the elderly. [Method] In this research, we adopted questionnaire survey through internet website. According to Knowledge-Attitude-Practice (KAP) theory, a healthy behavior of water drinking could be constituted by these three basic elements. Based on KAP theory, we designed online questionnaire to investigate the rudimentary information both regarding the elderly and their caregivers, including their knowledge, attitude and practices of water drinking. There are 77 cases collected successfully. We analyzed relevant factors through paired sample t-test analysis, chi-square analysis and explain the significant factors impacting water drinking to the elderly. [Results] There are mainly three research findings in this study. Firstly, we reiterate the explanatory function of KAP theory, which copes to the scenario of water drinking for the elderly. In addition, it enlightens a positive way to cultivate a healthy behavior for the elderly. Secondly, the actual behavior of water drinking for the elderly is closely related to their knowledge and attitude toward water drinking. However, the caregivers' knowledge and attitude are insignificant to influence the actual practice of water drinking for the elderly. This conspicuous finding is meaningful because it shows that self-health-management for the elderly should be emphasized, rather than only relying on caregivers. Thirdly, we found the concept of hygiene and health is almost taken account of by all of the elderly. The elderly who has stronger inclination to take health products also has positive correlation of water drinking. Hence, it proclaims that the health promotion and education regarding of water drinking for the elderly is necessary because they have high motivation to sustain their well-being. [Conclusion] In this research, we found several factors impacting the habit of water drinking for the elderly. Moreover, we propose relevant strategies for improving their habit of water drinking basing on KAP theory. According to our findings, consequently, we suggest that paying attention to the strategy on self-health-management for the elderly is an essential way to meliorate the lack of drinking water for the elderly.

AGENDA

Keynote Speeches Chair: Prof. Jim P. Zheng

10:40-12:00, GMT+09:00 | January 30, 2021 Saturday

Meetings ID: 62827934418



Keynote Speaker III

10:40-11:20 (GMT+09:00)

Prof. Kondo Akira
Osaka University, Japan

Prof. Kondo Akira was graduated from Faculty Engineering, Osaka University in 1982 and from Graduated School of Engineering, Osaka University in 1984. After that, he had worked in Matsushita Electric Industry (Panasonic) for 5 years. From 1989, he has been working in Osaka University as an assistant professor, associated professor and professor. He received PhD in 1999 and its thesis is "Study on development of numerical simulation model in order to mitigate urban atmospheric environment". He is researching on the environmental dynamics modeling in the wide ranges from global scale to indoor scale. Moreover he carried out the joint researches in South-East Asia; Nepal, Indonesia, Korea, China, Vietnam, and Thailand. Throughout these researches, he received the best paper award from The Society of Heating, Air Conditioning and Sanitary Engineering of Japan in 2010 and received the best paper award from the Society of Environmental Science of Japan in 2012 and received the best academic award from Atmospheric Environmental Society of Japan in 2015. He is also the author of more than 90 peer-reviewed articles including articles written in Japanese, and 80 international conference papers with limited peer review

Topic: "Preservation of Indoor and Outdoor Environment by Data Assimilation Method"

Abstract—In fluid dynamics engineering, it is important to exactly know both flow fields and scalar fields such as temperature and contaminants in a target domain. Observations and/or computational fluid dynamics (CFD) are usually used for knowing the flow and scalar fields. Both methods have some demerits. Since CFD has unavoidable errors due to discretization and numerical calculation method, it cannot completely reproduce them. Observed data also include unavoidable errors associated with measurement accuracy of apparatus. Therefore, observations cannot completely satisfy the governing equations, and cannot cover information in the entire target domain. As mentioned the above, it is difficult to exactly know them by only one method. In order to compensate demerits in both methods, the method combining both methods, which call data assimilation method, has been developed by many researchers.

In this lecture, I introduce three different data assimilation method. The 1st method is the variational continuous assimilation method. Using this method, the unknown intensity and location of

contaminant source in outdoor is estimated. The 2nd method is the method minimalizing the cost function which consists of the residual errors of the governing equations and the difference between observed data and the solutions to know the correct flow fields and scalar fields. The 3rd method is the source receptor (SR) method, which is one of method for solving inverse problems. In order to determine goal temperature at any place of a room, SR method is applied to control outlet air temperature in air conditioner.



Keynote Speaker IV

11:20-12:00 (GMT+09:00)

Prof. Derek W. Bunn, London Business School, UK

Derek is a Professor at London Business School. He is the author of over 200 research papers and 10 books in the areas of forecasting, decision technology and energy economics. He is a former Editor-in-chief of Energy Economics, the Founding Editor of the Journal of Energy Markets and has been Editor-in-Chief of the Journal of Forecasting for many years. He has worked with the electricity sector for over 35 years, advising many organisations including the House of Commons, and providing expert witness evidence in legal disputes. He is currently chairman of the UK Government's panel for the capacity market and an independent board member of the Balancing and Settlements Code.

Topic: "The Post-Liberalised Electricity Market"

Abstract—The vision of an electricity market that would work like other energy commodity markets motivated the liberalization and market designs 20 years ago. But as a consequence of the energy transition being achieved by extensive policy support, we see a more complex and pragmatic set of market arrangements to ensure decarbonisation, resource adequacy and operational flexibility. Efficient wholesale market trading is no longer enough. This talk will reflect upon the incentives and sustainability of infrastructure investment through capacity remuneration schemes, and the problems they present for ensuring energy security in the face of increasing storage, intermittency and interconnections.

AGENDA

Session 7

Solar Radiation Analysis and Solar Power

14:00-15:45, GMT+09:00 | January 30, 2021 Saturday

Meeting ID: 62827934418

Session 7 Presentation 1 14:00-14:15 KM1-027	Recovery of the Solar Irradiance Data using Artificial Neural Network Kah-Ching Ho, Boon-Han Lim and **An-Chow Lai** Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, Malaysia *Abstract*—Global solar irradiance (GHI) data plays a major role in the design, performance assessment, and monitoring of a solar energy conversion system. However, data loss happens sometimes due to various reasons. Hence, it is important to recover the lost data. Unfortunately, due to the high cost of measurement devices, other meteorological parameters are often not available to aid the data recovery. Nevertheless, a photovoltaic (PV) system could be installed nearby the site which the output power is recorded. This paper explored the capability of using output power from a PV panel to predict the lost or unavailable GHI data in the past via the Artificial Neural Network (ANN) technique. 1 day, 10 days, and 30 days of GHI data, time, and output power of a solar panel in July 2020 were used to train three ANN models. The ANN models were then used to predict one day and thirty days GHI data in July 2019 based on the PV output power of that period. The result shows that the ANN model with a higher number of training data can predict the GHI data with lower statistical errors. The results prove that PV output power can be used to recover the unavailable GHI data in the past with acceptable accuracy. This technique is useful for the industry to recover the historical time series of GHI for designing a new renewable energy project or assessing the past performance of a renewable energy project.
Session 7 Presentation 2 14:15-14:30 KM1-018	Application of Solar Radiation Analysis Technology in the Optimization of Campus Planting Design **Che-Yu Hsu** and Sheng-Jung Ou Chaoyang University of Technology, Taiwan *Abstract*—In recent years, the slogans and concepts of sustainable campus, eco-campus, and environmental protection campus have been continually put forward, but there is little ink about the maintenance and management of the most important plants on campus. However, landscape designers often neglect the

	requirements of plants for the growth conditions of sunlight, or the impact of surrounding buildings on the living environment of plants, resulting in an irreversible situation. To this end, this research hopes to use environmental analysis aided design software to simulate the solar radiation environment and provide references for campus planting design and suggestions for plant selection. The results show that sciophytes are suitable for planting in areas where solar radiation energy is less than 2.90 MJ/m2d; Heliophytes are suitable for planting in areas where solar radiation energy is greater than 5.40 MJ/m2d, and the area in between is suitable for planting mesophytes.
Session 7 Presentation 3 14:30-14:45 KM1-028	Imputation of Missing Values for Solar Irradiance Data Under Different Weathers using Univariate Methods Noor Bariah Mohamad, **Boon-Han Lim**, An-Chow Lai Universiti Tunku Abdul Rahman, Malaysia *Abstract*—Significant investment risks of large photovoltaic (PV) systems are uncertainties of energy yield predictions from a PV power plant. Unfortunately, solar irradiance weather datasets often have missing values due to operational issues; hence techniques of imputing or recovering the missing values become essential. This paper examined five statistical imputation methods that are frequently adopted in missing values analysis for daily solar irradiance series based on two different weather conditions in the tropical climate with 10% to 50% of missing values and the methods were evaluated using performance indicators such as normalised root-mean-square at standard test conditions (nRMSESTC). The results show that during Sunny weather, the Bezier curve and Stineman interpolation give the lowest nRMSESTC for 10% and 20% to 50% of daily missing values, respectively. Meanwhile, during Largely Cloudy weather, three methods share the best estimation, which are Linear interpolation for 10% missing values, Stineman interpolation for 20%, 30% and 50% missing values, and Spline interpolation for 40% of missing values.
Session 7 Presentation 4 14:45-15:00 KM2-014	Solar Field Optimization and its Impact on Overall Design and Performance of Solar Tower Thermal Power Plant in Bangladesh **Md. Sakib Hossain**, Soad Shajid Islamic University of Technology, Bangladesh *Abstract*—Electricity generation using solar thermal power systems can be made more efficient and both technically and economically feasible in countries receiving moderate solar radiation like Bangladesh through thorough optimization of different parts of the power plant. In this paper a theoretical and mathematical framework for optimization of a 150 MW solar tower thermal power plant in Bangladesh which uses molten salt as HTF has been developed by applying different methods of selecting crucial design aspects, such as design point DNI, solar multiple, design point temperature etc. after selecting the most appropriate

	location based on GHI and DNI data. The effect of these design aspects on the overall design of the power plant including the number of heliostats, solar field land area, tower height, receiver dimensions etc. have also been studied and finally the performance analysis of the power plant has been conducted. Analysis of performance reveals that the optimized power plant would be able to deliver 528.66 GW-h electricity annually to the national grid while operating at a capacity factor of 40.2% and gross-net conversion efficiency of 88.635%. The promising performance of the power plant would encourage further research and innovation regarding large scale electricity generation from solar energy in Bangladesh.
Session 7 Presentation 5 15:00-15:15 KM2-005	Design of a 100 MW Concentrated Solar Power Plant Parabolic Trough in Riyadh, Saudi Arabia Huda Mohammed Alotaibi, **Wael Al-Kouz**, Alberto Boretti Prince Mohammad Bin Fahd University, Saudi Arabia *Abstract*—The increase in energy demand and the awareness of renewable energy has been raised due to environmental and climate change and the need to establish sustainable energy development. Using fossil fuels has created a critical situation such as; climate change, air pollution, and emission of greenhouse gases also, the resources are in limited supply. The infinite source of energy such as; the sun can provide an effective and sustainable energy supply. Riyadh city in Saudi Arabia is one of the areas that receive a high quantity of direct solar radiation. An average direct normal irradiance (DNI) for the central region is equal to 2018 kWh/m2/year. This paper shows the design and the performance analysis of 100 MW Concentrated Solar Power (CSP) parabolic trough (PT) power plants with thermal energy storage (TES) for use in Riyadh city. The performance of this design plant is analyzed by using the system advisor model (SAM). Based on the analysis carried out for this design, the capacity factor is equal to 45.3% with an annual energy generation which is equal to 396,801,792 kWh. By varying two main parameters, the solar field size and the full load hours of TES to get the optimal design of this plant is done. Based on the simulation result, the proposed design of 100 MW parabolic trough at 1,150,000 m2 solar field size and 7 h TES gives the lowest Levelized Cost of Electricity (LCOE) with an assumed lifespan of the plant of 25 years.
Session 7 Presentation 6 15:15-15:30 KM2-008	Thermo-economic optimization of supercritical CO_2 Brayton cycle on the design point for application in solar power tower system **Tianye Liu,** Jingze Yang, Zhen Yang, and Yuanyuan Duan Tsinghua University, China *Abstract*—The supercritical CO_2 Brayton cycle integrated with a solar power tower system has the advantages of high efficiency, compact cycle structure, strong scalability, and great power generation potential, which can positively deal with the energy crisis and global warming. The selection and optimization of

	design points are very important for actual operating situations. In this paper, the thermodynamic and economic models of the 10 MWe supercritical CO2 Brayton cycle for application in solar power tower system are established. Multi-objective optimizations of the simple recuperative cycle, reheating cycle, and recompression cycle at different compressor inlet temperature are completed. The thermal efficiency and the levelized energy cost are selected as the fitness functions. The ranges of the optimal compressor inlet pressure and reheating pressure on the Pareto frontier are analyzed. Finally, multi-objective optimizations and analysis of the supercritical CO2 Brayton cycle at different ambient temperature are carried out. This paper investigates the influence of the compressor inlet temperature and ambient temperature on the thermal efficiency and economic performance of the supercritical CO2 Brayton cycle.
Session 7 Presentation 7 15:30-15:45 KM2-016	Overview of Maximum Power Point Tracking Techniques for PV System **Khairul Eahsun Fahim**, Shaikh M Farabi, Shaikh Shahrukh Farhan, Ishrat Jahan Esha and Taseen Muhtadi East China University of Technology, China *Abstract*—Fossil fuel is one of the major sources of the world's energy generation. Greenhouse gases are increasing in the atmosphere due to the excessive use of fossil fuels. To tackle global warming and the shortage of natural gases, researchers are always looking for alternative sources of clean energy. Solar energy is becoming popular due to its inexhaustible nature. To get the most of out of a solar system and to generate maximum power, it is important to operate the panel at maximum power point. In other words, it can be said that MPP techniques are used to maximize the output power. There is a wide range of MPPT algorithm available to calculate MPP. This paper gives a broad overview of the existing MPPT techniques used in practice.

AGENDA

Session 8

Power Engineering and Power Electronic Technology

14:00-15:45, GMT+09:00 | January 30, 2021 Saturday

Meeting ID: 62527988016

Session 8 Presentation 1 14:00-14:15 KM2-004	A Case Study: Broadband Over Powerline for Rural Area Deployment in Sarawak **Nancy. B,** Gary Loh C.W, M. Razi. Bazin and Panceras.T. M University College of Technology Sarawak, Malaysia *Abstract*—Broadband over powerline (BPL) is a technology that allows connectivity to internet connection riding via the low tension (LT) power line communication (PLC). A hybrid BPL technology was proposed to the rural area of Sarawak as an alternative option to expand the internet connection without the need to reform a new pathway for internet connectivity. The data signal is transmitted via a communication tower to the access point(s) that is mounted on an electricity pole that provides a low voltage (LV) line. There are three types of custom-designed equipment that has been integrated into the hybrid BPL: the Head End (HE), the Time Division Repeater (TDR) and the Customer Premise Equipment (CPE). Two longhouses at the Bawang Assan, Sarawak settlement has been chosen to initiate the pilot project that required the cooperation of the technology provider, power producer, and the internet service provider. This paper presents a proof of concept (POC) on the deployment, advantages, and limitations for the BPL in a rural setting.
Session 8 Presentation 2 14:15-14:30 KM1-009	The Improvement on the Efficiency of Photovoltaic Module using Water Cooling **Wan Ariff Fadhil Bin Wan Abdullah**, Chew Sue Ping, Razanah Nabila Binti Radzuan and Anis Shahida Niza Binti Mokhtar Universiti Pertahanan Nasional Malaysia, Malaysia *Abstract*—This study denotes an effective design for thermal regulating by integrating the water-cooling system on photovoltaic (PV) panel. The efficiency of the PV module will reduce the increasing temperature on the panel. Thus, the focus of this study is to improve the efficiency of the PV module by maintaining a low operating temperature. A modification on the rear part of the PV panel is executed by integrating the water-cooling system by using copper pipe. This study

	is conducted to compare the effects of the PV panel when it is tested in different circumstances, such as with and without water-cooling system as well as a variation of water flow rates at constant solar irradiance. Comparative analyses are performed by conducting I-V and P-V curve as well as temperature test where both tests take these different conditions into account. The study exhibits that the utilisation of water-cooling system will result to a reduced rear temperature of the PV panel. The efficiency of the PV panel has also experienced an increase of 3% for 300 l / h flow rates compared to the one without water-cooling system. The increase of flow rates of the water-cooling system will reduce the rear temperature of the PV panel. In other words, a more massive reduction of temperature on the PV panel with 16℃ is detected when the water-cooling system is utilised up to 300 l / h flow rates in 60 minutes duration at 350 W/m ²solar irradiance.
Session 8 Presentation 3 14:30-14:45 KM2-010	The Application of RBF Neural Network Optimized by K-means and Genetic-backpropagation in Fault Diagnosis of Power Transformer **Xinxin Mi,** Gopinath Subramani and Mieowkee Chan SEGi University, Malaysia. *Abstract*—Through the dissolved gas analysis (DGA) in transformer oil, the fault of the power transformer can be diagnosed. However, the DGA method has the disadvantage of low accuracy because it couldn't exactly reflect the nonlinear relationship between the characteristic gases and fault types. Radial basis function neural network (RBFNN) has the advantage of dealing with complex nonlinear problems, so it can be applied to transformer fault diagnosis based on DGA. The centers, widths and weights has important effects on the performance of the RBFNN. However, it is difficult to find the global optimal solution of these parameters when RBFNN training. This paper creatively designs a method to improve these parameters of RBFNN, firstly using the K-means algorithm to optimize the centers and widths of RBFNN, then using the genetic algorithm-backpropagation (GA-BP) algorithm optimize the weights. Finally, establish the K-means RBF-genetic backpropagation (KRBF-GBP) algorithm model through a large amount of training data. The test results show that the fault diagnosis accuracy of the KRBF-GBP algorithm is 96.4%, higher than the unoptimized RBFNN with 71.43%.
Session 8 Presentation 4 14:45-15:00 KM2-012	Lightning Performance of Unshielded 220kV Transmission Lines Equipped with Metal-oxide Arresters **Pengkang Xie,** Zhen Fang State Key Laboratory of Disaster Prevention & Reduction for Power GridTransmission & Distribution Equipment, China. *Abstract*—Overhead ground wires have been proved to be effective to protect conductors from direct lightning strikes, but breakouts of ground wires have been frequently reported. In order to prevent ground wire breakout incidents to happen,

	unshielded 220kV lines equipped with metal oxide arresters (MOAs) whole line have been proposed in this paper. After cancelling ground wire, lightning strike risk of transmission lines becomes much higher. In order to improve the anti-lightning abilities of unshielded transmission lines, it is necessary to obtain the lightning energy absorption ability of these MOAs. In this paper, simulation model of MOA equipped unshielded 220kV transmission line was built, the influences of lightning parameters, striking occurrence point and grounding resistance of transmission tower on the absorbed energy of MOAs were calculated, and the suggested energy absorption ability of MOA was given, which can give references for the improvement of power supply reliability of transmission lines.
Session 8 Presentation 5 15:00-15:15 KM2-1001	Research on DBN-based Evaluation of Distribution Network Reliability Zhang Kaiyu, Shi Shanshan, Liu Shu, Wan Junjie, **Ren Lijia** Shanghai University of Engineering Science, China *Abstract*—In order to accurately and efficiently analyze the reliability of distribution network, this paper proposes a method of analyzing the reliability of distribution network based on a deep belief network. The Deep Belief Network (DBN) is composed of limiting Boltzmann machine layer-by-layer stacking. It has a strong advantage of automatic feature extraction, which overcomes the shortcomings of traditional neural networks in extracting data features. The entire training process of DBN can be roughly divided into two stages: pre-training and fine-tuning.First of all, the pre-training of the DBN model is realized by training the Restricted Boltzmann Machine (RBM) layer by layer, then the BP algorithm is used for reverse fine-tuning to complete the training process of the entire network. finally, the reliability analysis of distribution network is performed by the trained DBN. Compared with the BP neural network method and the traditional Monte Carlo simulation method, it is verified that the proposed model of distribution network reliability analysis has high accuracy.
Session 8 Presentation 6 15:15-15:30 KM1-014	A Novel Method for State of Charge Estimation of Lithium-ion Batteries using Embedded Cubature Kalman Filter Jinli Xu, **Wei Xu**, Fengyun Huang, Wei Xia and Baolei Liu Wuhan University of Technology, China *Abstract*—The accurate estimation of state of charge (SOC) of Lithium-ion battery is one of the most crucial issues for battery management system (BMS). This paper proposes a novel method for SOC estimation using the embedded cubature Kalman filter (ECKF). ECKF computes the cubature points with a weight depends on an optional parameter, which differs from the standard cubature Kalman filter (CKF). An online model identification method for a second-order RC networks equivalent circuit model using the forgetting factor recursive least squares (FRLS) algorithm has been presented. The Dynamic cycles

	are used to assess the superiority in improving the accuracy and stability of proposed method compared with the widely used algorithms. Experimental results show that, with 20% initial SOC error, the maximum estimation error is within 1%, which indicates that the proposed ECKF method has higher estimation accuracy and robustness for SOC estimation.
Session 8 Presentation 7 15:30-15:45 KM2-017	Study on the aging characteristics of silicone rubber materials for composite insulators **Pengkang Xie**, Kai Ning State Key Laboratory of Disaster Prevention & Reduction for Power GridTransmission & Distribution Equipment, China. *Abstract*—The electron beam radiation method is emitted by electronic accelerators, which can change the chemical physical properties of radiation. Silicone rubber samples after different irradiation intesities were carried out for the 1000h aging test, and the electronic scanning microscopy (SEM), mechanical tensile and hydrophhy angle of the silicone rubber sample were measured, the test results shows that: after 1000h aging test, the visual apperence of the sample did not changed, the SEM showed that the surface of the silicone rubber became rough and the porosity increased, and the mechanic tension decrease. For moderate Irradiation intensity(60KGy), the aging characteristics of silicon rubber can be improved.

AGENDA

Session 9

Environmental Engineering and Biotechnology

16:30-18:45, GMT+09:00 | January 30, 2021 Saturday

Meeting ID: 62827934418

Session 9 Presentation 1 16:30-16:45 KM1-023	The Utilization of Sedimentation Pond Acid Mine Drainage Sludge as Coagulant to Reduce COD and TSS Concentration in Domestic Wastewater **Nurul Shafira Daradjat** and Setyo Sarwanto Moersidik University of Indonesia, Indonesia *Abstract*—Acid mine drainage (AMD) treatment leaves residue in the form of sludge that contains large amounts of metal, silica, ferric, and alum. This research aims to determine the capabilities that AMD sludge-synthesized coagulant has in reducing COD and TSS concentration in domestic wastewater. The domestic wastewater sample used in this research is an artificial domestic wastewater with a COD concentration of 285 mg/l and a TSS concentration of 245.31 mg/l. After going through Acidification process, AMD sludge coagulant contains Si (43.66%), Fe (30.02%), dan Al (12.35%). A jar test is then performed in order to determine the optimal coagulant dosage. In this process, a coagulant dosage of 40 mg/; 60 mg/l; 80 mg/l; 100 mg/l; 140 mg/l; 180 mg/l; and 200 mg/l was used with 100 mg/l being the optimal coagulant dosage. The AMD sludge containing the optimal coagulant dosage of 100 mg/L is found to be able to reduce COD concentration by 34.74% and TSS concentration by 95.63% from the tested domestic wastewater sample. This research can illustrate the vast potential that the AMD sludge has as a coagulant.
Session 9 Presentation 2 16:45-17:00 KM1-025	Calculation of the Impact of Income Gap on Environmental Pollution **Yao Bo Shi** and Peng Ting Zhao Xi'an University of Technology, China *Abstract*—This article uses the panel data of 30 provinces (excluding Tibet autonomous region) from 2000 to 2018, and uses pm2.5 concentration as an indicator to measure environmental pollution. It starts from the traditional EKC curve and adds the Gini coefficient to measure income gap as the key explanatory variable, in order to study the impact of income gap on environmental pollution in

	China. Regardless of whether it is a static panel model or a dynamic panel instrumental variable model, the results show that China as a whole has an environmental Kuznets curve of pm2.5, and the widening of the income gap is not conducive to the improvement of environmental quality. Among the selected control variables, the increase of industrialization level, energy intensity and foreign direct investment will aggravate the environmental pollution. However, the good news is that the improvement of urbanization has played a positive role in the improvement of environmental quality.
Session 9 Presentation 3 17:00-17:15 KM1-024	Calculation of the Impact of Income Gap on Environmental Pollution **Yao Bo Shi** and Peng Ting Zhao Xi'an University of Technology, China *Abstract*—This article uses the panel data of 30 provinces (excluding Tibet autonomous region) from 2000 to 2018, and uses pm2.5 concentration as an indicator to measure environmental pollution. It starts from the traditional EKC curve and adds the Gini coefficient to measure income gap as the key explanatory variable, in order to study the impact of income gap on environmental pollution in China. Regardless of whether it is a static panel model or a dynamic panel instrumental variable model, the results show that China as a whole has an environmental Kuznets curve of pm2.5, and the widening of the income gap is not conducive to the improvement of environmental quality. Among the selected control variables, the increase of industrialization level, energy intensity and foreign direct investment will aggravate the environmental pollution. However, the good news is that the improvement of urbanization has played a positive role in the improvement of environmental quality.
Session 9 Presentation 4 17:15-17:30 KM1-1001	A Review in Tetracycline Removal from Water Environment by Carbon Nanotubes Adsorption **Dailin Yang** College of Metallurgy, Northeastern University, China *Abstract*—Owing to the unique properties, carbon nanotubes (CNTs) have been widely reported as a desirable adsorbent for environmental pollutants removal. In this paper, the synthetic strategies of different kinds of CNTs and CNTs based composites, as well as their application in tetracycline antibiotics (TCs) removal were discussed. The adsorption process, performance, influence factors involved in the adsorption of tetracycline (TC) are highlighted in this review. In addition, the adsorption mechanism and limitations in adsorption TCs with CNTs are discussed.
Session 9 Presentation 5 17:30-17:45 KM1-007	Cultivation of Chlorella vulgaris in Sequential Flow Photobioreactor System: Influence of Recycled Culture medium on Growth, lipid and Protein Content **Yaleeni Kanna Dasan**, Man Kee Lam, Suzana Yusup, Jun Wei Lim, Keat Teong Lee, Pau Loke Show, Inn Shi Tan and Henry Chee Yew Foo

	Universiti Teknologi Petronas, Malaysia *Abstract*—In the present work, the reusability of culture medium to grow Chlorella vulgaris was examined in an effort to reduce the freshwater footprint of microalgae cultivation. The microalagae was cultivated in a sequential-flow system equipped with five photobioreactors connected in series. Furthermore, the effect of recycled culture medium without additional nutrients on the growth, lipid and protein content of microalgae was evaluated under optimized cultivation conditions. Experimental results showed that biomass concentration and growth rate reduced when the culture medium was recycled more than once. The maximum biomass concentration was achieved in the fresh medium with a total biomass yield of 1.42 g/L. Meanwhile, lipid content was found to increase when the microalgae was cultivated in the recycled medium, in which the highest lipid content (58.01 wt.%) was attained from photobioreactor 5 (cycle 2). On the contrary, the protein content (11.98 wt.%) of the microalgae in the recycled medium was considerably lower than the fresh medium (49.20 wt.%). These results suggested that the reuse of culture medium to grow microalgae is possible, however, it has a significant impact on the biochemical compositions of Chlorella vulgaris. Therefore, it is important to determine the desired product prior to reusing the medium for subsequent cultivation process.
Session 9 Presentation 6 17:45-18:00 KM1-008	Heterotrophic and Mixotrophic Cultivation of Chlorella Vulgaris using Chicken Waste Compost as Nutrients Source for Lipid Production **Hong Li Tan**, Man Kee Lam, Yoke Wang Cheng, Jun Wei Lim, Inn Shi Tan, Chee Yew Henry Foo and Pau Loke Show Universiti Teknologi Petronas , Malaysia *Abstract*—Microalgae have received global attention for the past decades as it shows promising results to be an alternative and sustainable energy resource due to their high growth rate and lipid production. In commercial microalgae cultivation, autotrophic method is always used to grow the microalgae. However, this method usually produces high biomass yield but low lipid content. One of the approaches to enhance the microalgae lipid yield is through heterotrophic and mixotrophic method, in which dark environment and organic carbon are introduced as a stress factor to induce the lipid productivity. In the present study, cultivations of microalgae were done using chicken compost and glucose under autotrophic, heterotrophic and mixotrophic conditions. The highest absorbance attained for both heterotrophic and mixotrophic cultivation conditions were 1.650 and 2.184 respectively when 1.0 g/L of glucose was used. Absorbance and biomass are correlated, therefore the absorbance in this study signifies the amount of biomass produced. Moreover, the highest lipid yield was successfully attained at 45 wt% under mixotrophic condition. Overall, the lipid yield of microalgae cultivated under mixotrophic was higher than the heterotrophic condition when compost derived from chicken waste was used as nutrients source.

Session 9 Presentation 7 18:00-18:15 KM1-019	A Study on Public Environmental Risk Perception and Environmental Behavior of Urban Space - A Case Study of the East District of Taichung City **Kuo-Wei Hsu**, Jen-Chih Chao and Ching-Yi Hsu Chaoyang University of Technology, Taiwan *Abstract*—The contemporary living environment in Taiwan is affected by traffic, industry, and seasonal air pollution. Wearing masks outside the home environment has become a daily habit for a number of people. The Taiwanese government encourages people to wear masks when using the mass transit system and in public spaces, to impose social distancing, and prohibits large-scale activities to reduce exposure to environmental risks after the outbreak of COVID-19. By April 13th 2020, no new local cases of COVID-19 had been reported for more than 30 consecutive days. This study examines open and semi-open spaces using non-participatory observation method to understand public mask-wearing of environmental behavior. The results of the study show that the proportion of people wearing masks in open spaces is only 16.8%, and that the proportion of those wearing masks in semi-open spaces is 61.1%. This shows that the public continues to maintain a cautious attitude towards COVID-19 and that their perception of the environmental risks and environmental behavior differs across different spatial environments.
Session 9 Presentation 8 18:15:18:30 KM1-012	Health Assessment in View of Environment AL Quality in Krasnoyarsk Territory (Siberia, Russia) **Natalia P Koptseva** Siberian Federal University, Russia *Abstract*—This article presents the results of comprehensive field studies carried out in the Krasnoyarsk Territory. The objective of the research is to assess the impact of the environmental situation in the Krasnoyarsk Territory on its population's health for expert analytical guidance in environmental management in the given region and to gain an objective picture of this assessment. Questionnaires were handed out that provided answers to 41 questions about environmental problems, including questions on assessing the impact of the environmental situation on the health of the Krasnoyarsk Territory population. The following data was obtained from 967 of these questionnaires: assessment of the impact of the environmental situation on the health of the Krasnoyarsk Territory population. The proportion of people who believe that the environmental situation has impacted their health adversely is 50.5%. The Krasnoyarsk Territory population is also convinced that air pollution is the most pressing environmental problem. The majority of respondents do not consider climate change or poor waste management to be the cause of the worsening environmental situation in the region that is leading to the deterioration of their health and that of their families.

Session 9 Presentation 9 18:30-18:45 KM1-021	The Role of Bioretention Plant on Nutrient Removal of Stormwater Runoff **Wafaa Ali**, Husna Takaijudin and Khamaruzaman W. Yusof Universiti Teknologi Petronas, Malaysia *Abstract*—Stormwater pollutants are one of the main problems causing environmental damage. The accumulated pollutants on urban impervious surfaces are carried by stormwater runoff and enter water bodies, therefore, caused ecological damage. To decrease the pollution effect of stormwater, best management practices (BMP), and low–impact development (LID) principles were introduced. Bioretention technology as one of these practices has been used to control stormwater quality. This technology stills not widely used in Malaysia. However, the design of bioretention system that used in Malaysia follows a conventional design and stills in the early stage. Therefore, this paper reviews the role of plants and their effect on bioretention performance in terms of nutrient removal. Bioretention system that vegetated with the plant was very effective on nutrient removal than without plant. In Malaysia, there is a need to develop the conventional bioretention system. Applying multispecies plant in bioretention system would be more effective on nutrient removal. However, limited studies have been conducted on the types of plant that are suggested in (MSMA). This paper recommends applying multispecies plant (mixture plants) to enhance the performance of conventional bioretention system in terms of nutrient removal.

AGENDA

Session 10

Energy and Power Engineering

16:30-18:30, GMT+09:00 | January 30, 2021 Saturday

Meeting ID: 62527988016

Session 10 Presentation 1 16:30-16:45 KM1-026	Numerical Study of NOx Generation in A Trapped Vortex Combustor Fuelled by Kerosene Blended with Ethanol **Peiliang Yan**, Weijun Fan, Hangqing Xu and Rongchun Zhang Beihang university, China *Abstract*—The study of alternative fuels is of great importance, and the study of ethanol blending in kerosene is necessary. The trapped vortex combustor is a new type of combustor and NOx emissions are important in the study of trapped vortex combustors. In this article, the NOx generation rate of trapped vortex combustor was studied using kerosene blended with ethanol in different mass fractions as fuel. The results show that the thermal NOx is the main source of NOx in the combustor, which is mainly generated at the back of the combustor, and the thermal NOx generation rate decreases with the increase of ethanol mass fraction. The prompt NOx generation rate decreases with the increase of ethanol mass fraction. NOx is also easily produced near the sidewall of the combustor.
Session 10 Presentation 2 16:45-17:00 KM2-009	Modeling, prediction and multi-objective optimization of the coal gasification system **Ran Li**, Zhen Yang , and Yuanyuan Duan Tsinghua University, China *Abstract*— As global energy demand continues to increase, coal as basic energy still accounts for a significant proportion. Under the pressure of environmental protection, clean and efficient coal utilization technologies are in great demand. Coal gasification technology has the potential to realize near-zero-emissions for coal utilization. This paper establishes the coal gasification system model and analyzes the effect of oxygen/coal ratio and water/coal ratio on the system performance index of cold syngas efficiency, effective component ratio, carbon conversion ratio, and production ratio of hydrogen. The results show that when the oxygen/coal ratio increases, the efficiency of cold syngas and effective components ratio increase first and then decrease, carbon conversion ratio first increases and then remains unchanged, hydrogen production ratio gradually decreases; When the steam/coal ratio increases, the cold syngas efficiency, and

	carbon conversion ratio first increase and then decrease, effective component ratio ingredients gradually decreases, and the hydrogen production ratio increases. Using BP neural network to realize the prediction of the gasification system, and the mean square error reaches the magnitude of 10e-7. Multi-objective optimization results show that the oxygen/coal ratio and steam/coal ratio corresponding to the highest production ratio of hydrogen is 0.52 and 0.05 respectively. The highest carbon conversion ratio corresponds to the oxygen/coal ratio of 0.95 and the steam/coal ratio of 0.05.
Session 10 Presentation 3 17:00-17:15 KM2-003	Power Coefficient Analysis of Double-blade Half-rotating Impeller Tidal Turbine Operating at Yaw Cong Liu, Xiaoyi Wang, Xiaofeng Yu, Yuhua Zhang, Zhizhen Qiu, Xiangrong Xu Anhui University of Technology, China *Abstract*—The double-blade half-rotating impeller tidal turbine (DHITT) is a new type of vertical shaft tidal current turbine with lift and resistance performance. The power coefficient of the DHITT is affected by the flow direction. In order to research the power coefficient (CP) of the DHITT under different flow direction, the optimal attack flow angle of a half-impeller turbine was explored, and the fluctuation of power coefficient of the DHITT operating at yaw was analyzed based on the optimal attack flow angle. The unsteady flow of the turbine was simulated by overlapping grid technique, and the fluctuation of the turbine's power coefficient under different flow directions was analyzed, which was verified by experiments. The results have demonstrated that the power coefficient at the optimal angle of attack is 0.53. As the yaw angle greater than 30 º, the power reduction is nearly 40%, but the average efficiency loss is only 3.7% in the range of -3 ºto 3 º.
Session 10 Presentation 4 17:15-17:30 KM2-015	Analysis on parameter switching methods for hydropower dominant system Shengjing She, Chongtao Li, Yiping Chen, Rongzhao Yang, Liang Xiao, Kehan Zeng and Qin Gao Xi’an Jiaotong University, China *Abstract*—With the rapid development of DC asynchronous interconnection, in order to ensure the frequency quality, higher requirements are put forward for the primary frequency control of hydropower units. In the high proportion hydropower system, it is difficult for the governor parameters to meet the requirements of primary frequency control and dynamic stability simultaneously. In order to solve the problem, this paper proposes a recommended parameter switching method by referring to the Nordic system. The parameter optimization methods before and after switching are proposed, and the effectiveness of the method is verified by time domain simulation.
Session 10 Presentation 5	Influence of the solidity ratio on the small wind turbine aerodynamics

17:30-17:45 KM2-018	Karol Zawadzki1, **Wojciech Śmiechowicz**, Małgorzata Stępień, Anna Baszczyńska, Michał Tarkowski Lodz University of Technology, Poland *Abstract*—Increasing popularity of individualised electricity generation from wind by prosumers creates a strong demand for profitable and highly efficient small wind turbines. This paper investigates the influence of rotor blade solidity parameter on device efficiency in hope of determining its optimal value as a part of the development process of the GUST small wind turbine. The study involved experimental analysis in the wind tunnel and numerical simulations performed in QBlade software. Different solidities of the rotor were achieved by alteration of (1) number of blades and (2) chord distribution along the blade span. The increase of rotor solidity resulted in augmentation of the aerodynamic efficiency in both approaches. The elongation of the chord by 33% in a 3-bladed rotor resulted in a bigger power coefficient increment than addition of a 4th blade with original chord distribution. Even though the solidity was the same, the 3-bladed rotor performed better, possibly due to lower form drag. The results emphasize the importance of the rotor solidity optimization during the small wind turbine rotor development and may significantly influence overall power output.
Session 10 Presentation 6 17:45-18:00 KM2-1002	Operational reliability assessment considering independency between wind power ramps and frequency sensitive loads Xiaolong Xiao, **Qingxu Gao**, Xiaoqing Han, and Dingkang Liang Taiyuan University of Technology, China *Abstract*—With the increasing wind power penetration, power system frequency is more vulnerable especially when gust wind periods. Frequency control is used to restore system frequency back to the rated value. But, during frequency control processes, demand of frequency sensitive load (FSL) is different from that of frequency-insensitive load and changes with the change in system frequency. It is necessary to consider load demand combined with dynamic frequency deviation. This paper proposed a new reliability evaluation method of generation systems based on blade-element theory and frequency control method. The blade-element theory is utilized to improve the evaluation accuracy of wind power output in the presence of wind power ramp events (WPREs). The frequency control considering dynamic demand of FSL is used to mimic frequency regulation processes and establish reliability evaluation model. Case studies are presented using wind data from a wind farm in Shanxi Providence, and the results suggest that reliability problems caused by FSL can’t be ignored in some cases.
Session 10 Presentation 7 18:00-18:15 KM1-015	Pathway Towards 100% Renewable Energy in Indonesia Power System by 2050 **Nadhilah Reyseliani** and Widodo Wahyu Purwanto Universitas Indonesia, Indonesia

	Abstract—This study assesses Indonesia's electricity system's transition pathway to reach 100% renewable energy in 2050. The pathway is determined based on the least cost optimization on VEDA-TIMES considering 30 technologies that were competed and hourly VRE operational profile. From this study, it can be concluded that the solar PV utility-scale will play an important role up to 50% of the total electricity production, corresponding to 1,110 TWh in 2050. This enormous contribution is coupled with the massive installation of energy storage, especially battery. Hourly generation profile shows that storage technology will only manage the variability in the hourly demand profile and store excess electricity at noon when the penetration of solar PV utility-scale is significant. The other technology will generate varying amounts of electricity as the VRE penetration increases. The 100% RE scenario results in higher investment costs about 4.5 times higher, 137 billion USD, and lower emission about one-ninth than in the BAU scenario, which is 92 million tonnes of CO2-eq.
Session 10 Presentation 8 18:15-18:30 KM2-1003	Influence of the COVID-19 pandemic outbreak on ground transport CO2 emission Michał Sikorski, Jan Majewski, **Wiktor Snarski** Lodz University of Technology, Poland *Abstract*—Coronavirus pandemic brought about stay-at-home strategies to diminish the danger of uncontrolled spread of the infection. This paper looks at the effect that these activities had on emissions caused by ground transport among different countries. CO2 emission year-to-date dropped by 5.4% with respect to the 2019 statistics, which means that the scope of the decrease is much more abrupt than during past financial crises or World War II. The circumstance of emissions relates to lockdown measures in every nation. By the beginning of July 2020, the pandemic's impacts on worldwide emission reduced as lockdown limitations were loosened and some monetary exercises restarted, although the air pollution is still lower in contrast to 2019. The article traces back the reasons for the observed decline from the perspective of different countries and economy sectors. While there is no doubt that the major vector of changes was the COVID-19 pandemic, an increasingly important role of climate changes is also visible from the analysed data.

Special Session

F6014	Prediction of Coal-Fired Power Generation Cost Yixiao Wang Dalian University, Dalian, China *Abstract*—China is not only a big country with coal production, but also a big country with coal consuming.The amount of coal used in coal-fired power generation in China accounts for 30% of the total production each year, but its power generation accounts for 75% of the total power generation. Although all kinds of coal is still the main energy source in China, the proportion of coal-fired power generation will gradually decrease from 2020, and the use of renewable energy will increase. CPPs in China are mainly distributed in the north and the east of China. However, coal reserves are distributed in the northern and western part on a national scale. The cost of coal-fired power generation has always been a hot topic. It is necessary to add fresh water cost and environmental cost to the total cost of coal-fired power generation. However, there are few studies to precisely consider all kinds of possible cost in the CPPs and estimate the cost of coal-fired power generation in the future. This article firstly revises the resources cost estimation in the existing literature. Water consumption for coal extraction, transportation, combustion and circulating cooling is estimated at 0.018 CNY/kWh. Based on the internal resources cost and external environmental cost, this paper established a fitting model to obtain the trend of cost over time. Lastly, it is predicted that the cost growth trend of coal-fired power generation will reach the peak in 2020 at around 0.908 CNY/kWh, and then it will rapidly decrease year by year.
F5006-A	Assess the Eligibility of Flow Battery and Lithium Battery Become Complementary Haiyi Zhao, Tongxin Qu and Ziqing Ou Agnes Scott College, Decatur, United States *Abstract*—Under many circumstances in modern times, there is no denying that sustainable development is so much concerned, and many countries begin to consider the importance of energy resources. The batteries are recent year innovation and have been increasingly developed and used for energy storage. The battery market consists of two main products: Lithium-ion batteries (LIB) and Vanadium redox batteries (VRB). LIB is commonly used for recharging electronic devices and electric vehicles. In contrast, VRB has been significantly used in new energy storage and clean energy production. However, VRB lacks the public's attention, although it has better performance and is more environmental-friendly than LIB. This study focused on LIB and VRB and made a comparison of their

	characteristics. Firstly, the data was obtained from many reports to analyze and compare the characteristics of LIB and VRB including working principles, designs, performance, security, cost, and applicable scenes. Results show that both batteries are capable of providing stable energy storage. LIB has an excellent performance on its portable size and specific capacity and power. VRB could be a promising choice for ample scale energy storage, as its outstanding flexibility on energy storage, output, and significant performance on large scale energy storage. Secondly, the assessment of two batteries' environmental issues shows that both batteries have vast potential: LIB works to substitute the demand of petrol in the engine car industry and can largely reduce the carbon dioxide emission from fuel-burning; whereas VRB is able to store and distribute energy at greatest capacity and also satisfy safety and environmental concerns. In conclusion, VRB has the potential to pose great functionality and more market share in the battery industry in the future. Furthermore, it has the possibility of reducing the burden of demand for LIB and possibly negate each other's negative influences during usage. It can also be anticipated that the benefits of this technology will cover the cost and many procured challenges. Therefore, the innovation of lowered production cost and more environmentally-friendly VRB could be a more favorable option in finding alternative batteries in the market, and as a complementary product in usage.
F5017-A	HIF-1α Targeting Nanobody Sensitizes Pancreatic Carcinoma to Gemcitabine Chemotherapy Guangbo Kang and He Huang Tianjin University, China *Abstract*—Gemcitabine is the first-line chemotherapeutic drug for advanced pancreatic cancer. However, poor efficacy has occurred because of a high degree of inherent and acquired gemcitabine resistance. Previous studies found that targeting HIF-1α could sensitize pancreatic ductal adenocarcinoma tumors to gemcitabine treatment. Dozens of inhibitors were designed for HIF-1α, but no targeted therapy has been clinically approved for pancreatic cancer treatment. This study developed an anti-HIF-1α intrabody VHH212, which directly targets the HIF-1α-PAS-B domain to inhibit the HIF-1 pathway. VHH212 is stably expressed in tumor cells with low cytotoxicity, high affinity, and specific subcellular localization. Here, we investigated the combined effects of VHH212 and gemcitabine in vitro. The co-treatment synergistically inhibited invasion, migration, and proliferation on pancreatic cell lines PANC-1 and Mia PaCa-2. Furthermore, we provide a novel approach for intracellular HIF-1α targeted therapy in vivo. An adenovirus encoding the VHH212 was developed to intracellular targets HIF-1α, which inhibits the HIF-1 pathway and sensitizes gemcitabine treatment for pancreatic cancer. Remarkably, co-treatment with anti-HIF-1α intrabody VHH212 and gemcitabine significantly suppressed tumor growth in a xenograft model, with a tumor inhibition rate of 80.44%. Taken

	together, our study shows that anti-HIF-1α VHH212 synergistically increased the antitumor activity of gemcitabine by inhibiting the HIF-1 pathway, which suggests the co-treatment regimen might be a valuable treatment strategy for pancreatic cancer therapy.
F1001-A	Why the Electric Cars are not Environment Friendly Chaoyang Liu[1],Guowei zhen[2] 1 Zhengzhou NO.7 High School, Zhengzhou, Henan, China; 2 Northwestern Polytechnical University, Xi'an, China *Abstract*—Switching to electricity does not mean an immediate switch away from fossil fuels, particularly in China, which are also likely to generate electricity, according to experts at the Center for Strategic and International Studies. According to the trend in recent years, although non-fossil energy power generation has increased significantly, the domestic power supply structure will remain dominated by thermal power for a long time, and the growth of electric vehicles will inevitably drive the demand for thermal power. The rise of electric cars, they argue, is merely "shifting pollution from one place to another". The Harvard and Tsinghua studies are certainly more accurate. According to the results from both sides, China's new-energy vehicles (including hybrid, plug-in hybrid and pure electric vehicles) produce 50% more greenhouse gas emissions in the production stage than their internal-combustion counterparts. In conclusion(1) The operation of electric vehicles also need power, but its power generation from oil to electricity just. Although the use of electric energy will not produce pollution, but the pollution in the process of electric energy production cannot be ignored;(2) Lithium ion battery use, the production process is contaminated; However, electric vehicles are also electrified, which is an inevitable requirement for the progress of human society Electricity come from more sources, such as solar energy, wind energy, water energy. However, the thermal power is still the main source of electricity in China. Primary energy (coal) production (conversion) into "electricity" technology is also more and more advanced, its pollution will be less and less. Electric vehicles are more environmentally friendly than internal combustion engines. Electric vehicles are also electrified, but it needs a process of development and improvement. Last, Electric vehicles are environmentally friendly, but the power batteries are not.Compared with the conventional IC engine, the electric vehicles are more environmentally friendly. in fact, the production process of "electricity" is not total environmentally friendly, so they conclude that "one of the culprits of Environmental pollution in China". Simply increasing the amount of reserves cannot really improve air quality.
KM2-1001-A	Impacts of driverless cars on energy and publicsafety Ruochen Li and Sijia Lin International Department, Beijing National Day School, China;

	Abstract—In order to understand the impacts of driverlesscars on energy and public safety and provide possible solutions for relatedissues, we have presented information analysis and literature reviews on thistopic. First of all, the 6 automation levels (Levels 0~5) of the autonomouscars are introduced, ranging from zero automation to full automation. Subsequently, advanced techniques from leading companies have beendemonstrated, e.g., autonomous lane-changing. Since none of the state-of-arttechniques reaches full automation, there are no energy reports that canaccurately predict the change in energy consumption due to the use of fullyautonomous cars. According to previous research, we evaluate such uncertaintiesin energy impacts from factors including fuel choice, weight of cars, roadconditions, etc. Moreover, case studies with modelled Autonomous Mobility onDemand system are discussed, which might both save energy usage and reduce airpollution due to the realization of performing car-sharing with electricvehicles. Finally, three major safety issues of driverless cars are discussed: sensors, determination of OS, and the controlling. Our results suggest the ways toprevent or alleviate some serious safety issues. On this basis, we concludethat there are feasible solutions for energy and safety related issues ofautonomous cars, which may make a massive positive impact on the society in thefuture, accompanied with the development in car automation technology.
KM2-1002-A	Recent Development and Installation of Photovoltaic Yicen Zhao, CanLi and Shengbo Zhao Newcastle University, UK *Abstract*—Contemporarily, governments have increased the investment on solar power to reduce the usage proportion of fossil fuels, both for technology development and installation bonus. The recent developments, applications and the challenge are discussed in detail here. First of all, we summarized the recent developments of photovoltaic panels. The application of different material and development of novel technologies (e.g., improve the efficiency, reduce cost) are introduced. In the meantime, we evaluated the commercial value of these material and got rid of scarce and harmful materials. Subsequently, three main application of photovoltaic panels are described: home roof, local shared, and central generation system. Then, the challenges facing by the solar power industry are analysed including damage to the electric grid due to unstable voltage and electricity supply stability. Finally, predictions of future development tendency are demonstrated. The supply security will be supported by incremental investment on energy storage technologies and hybrid station constructions. Besides, to minimize land occupation as well as augment the economic value, it is convincing that photovoltaic will walk into daily life and integrate with local industry gradually, thus fight against the potential government subsidy decline.
KM2-1003-A	The impact of renewable energy on China’s economic growth Zijun Pei, Tingrui Zhang and Tianyan Jiang

	Shanghai University of Engineering and Science, China; *Abstract*—Most past studies have focused on the impact of energy on economic growth without making any distinction between energy sources. In order to analyze and compare the influence of different types of energy on economic growth in more detail, we divide energy into renewable and non-renewable. Based on the Cobb-Douglas production function model, the empirical analysis is carried out by econometric means of Augmented Dickey-Fuller test, Johansen test and Granger causality test with the time series data deriving from National Bureau of Statistics of China from 1990 to 2019. The results show that non-renewable energy consumption and renewable energy consumption have different effects on China's GDP. Non-renewable energy consumption affects positively on China's economic growth, while renewable energy consumption has negative influence on GDP growth. It means that China's renewable energy development is at a relatively primary stage. Therefore, governments should combine the particular situation of China and formulate complementary policies to improve its development, providing state subsidies for the development and utilization of renewable energy source. Furthermore, governments should upgrade the renewable energy industry and establish a reasonable price system, which is an effective measure to stabilize the renewable energy consumption market and improve its utilization efficiency.
KM2-1004-A	The efficient production of perovskite solar cells will be achieved by perfecting deposition techniques Weizhao Ou, Ruochen Bai and Qi Li North China Electric Power University, China; *Abstract*—Perovskite solar cells have great potential in the field of solar power supply in the future due to their efficient energy conversion rate, while to increase production speed and realize industrialization requires advanced deposition technology. This paper is based on the frontier research of the theory of a slot die coating method to produce perovskite cells. The organic solvents DMF and N-Methyl-2-pyrrolidone (NMP) were replaced by a composite using low boiling and highly volatile acetonitrile (ACN) and methylamine gas to realize the high-speed crystallization of perovskite film. It was shown that the production speed is greatly improved. Over 98% of the uniaxial perovskite film crystallization was produced in only 110s at room temperature. Moreover, a lower viscosity was achieved compared with the traditional solvent treatment, which means that a more high speed of slot-die coating can be realized. Overall, the new solvent system based on the slot die coating method can not only improve the speed of perovskite film crystallization, but also improve the quality of perovskite film crystallization, which is conducive to the realization of the industry of perovskite-producing cells, but the problem of solvent inflammability still needs to be solved.

KM2-1005-A	Use Of New Materials to Enhance Energy Reduction And Solar Utilization Xiaotong Zhao, Zhengtao Li, Guanye He 1Qibao Dwight High School, Shanghai, Shanghai, 201100, China; 2Nanjing Foreign Language School, Nanjing, Jiangsu, 210008, China; 3Hubei experimental high school, Wuhan, Hubei, 430060, China *Abstract*—The energy reduction and solar utilization in the building through energy-efficient materials remain a fundamental challenge in the field of architecture. By analyzing the chemical and physical properties of materials for buildings, we first raised the essential structures that new applications need to have. To make energy use more efficient and overcome the high thermal insulation, we discovered the airtightness and ventilation system through thirteen of paper works. Here we focused on the case of Trombe Wall, since it shows an excellent performance when effectively utilizing solar energy. The analysis of economic and political support was introduced next. Different factors influencing the new building materials was studied. Generally speaking, this paper focuses on the modern application for buildings, bringing the theoretical guidance for related businesses to conserve energy use when designing the new materials and constructions regarding current political and economic regulations and support.
KM2-1006	Research on the Diversified Development of Energy System in China YIMING ZHANG University of California, College of Engineering, US, *Abstract*—With faster industrial development, the demand for energy increases dramatically. As demand rises, the supply of energy grows a lot. Although with new technologies, traditional energy, such as burning coal, is still the main way of producing energy. The traditional production has a huge and irreversible hurt to the environment, which should be substituted by new clean energy. Finding out the new resources and making it work to the real energy market is the primary goal of energy development. This article mainly describes the current status of China's natural clean energy, and then combines the advantages and disadvantages of many aspects and proposes several methods suitable for the multiple development of energy. Comprehensively considering the clean and high-efficiency characteristics of future energy development, a circular model of energy consumption and production capacity has been formed in all aspects, reducing energy waste and increasing energy consumption restrictions due to instability. In view of the development characteristics of China's existing vast land and resources, and the huge energy demand groups, small-quantity, multi-site and diverse energy development is the future trend of China's energy development. However, the existing utilization and utilization rate of these natural resources are very low, and although a large number of traditional production capacity

	industries can meet the energy supply demand, they have a great impact on the environment. President Xi once said that green waters and green mountains are our golden and silver mountains. Such environmentally friendly energy development is the ultimate goal we want to achieve.