

COVER PAGE

2020 4th International Conference on
Green Energy and Applications
(ICGEA 2020)

Singapore | March 7-9, 2020

Co-sponsored By



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WELCOME

Dear distinguished delegates,

It is our great honor and pleasure to welcome you to 2020 4th International Conference on Green Energy and Applications (ICGEA 2020), which is to be held in Singapore on March 7-9, 2020.

Due to the severe impact of the epidemic and the restrictions imposed by European governments and others around the world, many participants will not be able to participate. Most importantly, the health and safety of our participants is our top priority. Considering all those force majeure, the online presentation via video and Skype is acceptable, which will allow the participants to connect and take part in the sessions from your own computer(s).

ICGEA keeps promoting the information exchange on Green Energy and Applications, aiming to accelerate international cooperation and provide an opportunity for researchers around the world to exchange ideas and the latest research results. The evaluation of all the papers was performed based on the reports from anonymous reviewers, who are qualified in the field of Green Energy and Applications. As a result of their hard work, we are pleased to have accepted 39 presentations coming from initially from 89 submissions. The presentations are divided into 1 poster session and 3 oral parallel sessions including video presentations as well as 1 Skype session with the topic on Power Systems and Smart Grids; Electrical Engineering and Automation; Electronics and Energy Engineering as well as Energy and Environmental Engineering.

A word of special welcome is given to our keynote speakers who are pleased to make contributions to our conference and share their new research ideas with us. They are Prof. Changyun Wen, from Nanyang Technological University, Singapore; and Prof. Dennis Leung, from the University of Hong Kong, Hong Kong. Due to the virus effect and restrictions imposed by government, Prof. Udaya and other speakers can't attend the conference to deliver the speech. Meanwhile, Prof. Wen delivered his speech via Skype. And in order to keep authors' safety, we should keep people out of touch and the social program had to be cancelled.

We'd like to express our heartfelt appreciation to our conference chairs, keynote speakers, session chairs, authors, and audiences. Thanks to your support and help, we can hold this conference successfully and always keep making progress. We wish and hope that you will enjoy this conference in a comprehensive experience embracing Green Energy and Electrical Energy as well as culture, friendship, and this famous country. Thank you for your attention!

We look forward to meeting you again next time!

ICGEA2020 organizing committee

AGENDA OVERVIEW

March 7, 2020 (Saturday) | Conference Preparations & Tutorial

10:00-17:00	Registration & Materials Collection	Lobby (Third floor)
14:00-14:50	Tutorial	SR907(Ninth floor)
14:50-15:10	Coffee Break	Outside the meeting room
15:10-16:00	Tutorial	SR907(Ninth floor)
15:00-17:00	Video and Skype test	Lobby (Third floor)

March 8, 2020 (Sunday) Morning | Opening & Keynote Speeches

09:30-09:40	Opening Remarks - Dr. Deepak L. Waikar	LT301(Third floor)
09:40-10:20	Keynote Speech I - Prof. Changyun Wen	LT301(Third floor)
10:20-10:30	Group Photo	
10:30-11:30	Coffee Break & Poster Presentations	
11:30-12:10	Keynote Speech II - Prof. Dennis Leung	LT301(Third floor)
12:10-13:30	Lunch	Outside the meeting room

March 8, 2020 (Sunday) Afternoon | Authors' Parallel Presentations

13:30-15:45	Session1-- Power Systems and Smart Grids	SR706(Seventh floor)
	Session2-- Electrical Engineering and Automation	LT301(Third floor)
15:45-16:00	Coffee Break	
16:00-18:00	Session3-- Electronics and Energy Engineering	SR706(Seventh floor)
	Session4-- Energy and Environmental Engineering	LT301(Third floor)
18:00-20:00	Dinner	Restaurant

March 9, 2020 (Monday) | Social Program

As the health and safety of our participants is our top priority, this social program has to be cancelled.

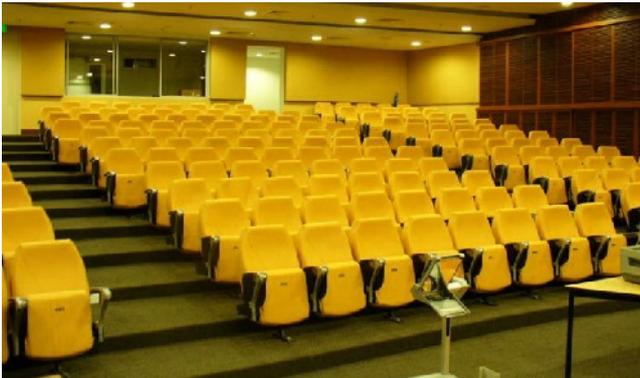
Conference Venue

NTU@one-north

Add: 11 Slim Barracks Rise, (off North Buona Vista Road), NTU@one-north campus,
Executive Centre #09-09, Singapore

Web: <http://www.ntu.edu.sg/odfm/onenorth/Pages/onenorth.aspx>

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 33,000 undergraduate and postgraduate students in the colleges of Engineering, Business, Science, and Humanities, Arts and Social Sciences, and its Graduate College. NTU's Lee Kong Chian School of Medicine was established jointly with Imperial College London.



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How to get to the **NTU@one-north** from **Singapore Changi Airport**?

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➤ **Taxi**

 Taxi----Around 27 minutes (28.7km)

➤ **The affordable way:**

Bus+  Walking---around 70 minutes

Get on **the East West Line at Singapore Changi Airport**

↓(2 Stations)

Get off at **Tanah Merah**



Get on **the East West Line at Tuas Link**

↓(17 Stations)

Get off at **Buona Vista**

↓  (550m)

NTU@one-north campus

Tips:

 **Currency: S\$**

 **Emergency Call: 999**

Detailed Agenda

March 7, 2020 (Saturday) | 10:00-17:00

 **Registration & Materials Collection**

 **Lobby (Third floor)**

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



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



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

! Attention

- ✧ In order to keep everyone's property safe, kindly notice that only the participants wearing the attendance card can be allowed to enter the meeting room. If you have any accompanying person, please do inform our staff in advance when you do the registration. Thanks for your understanding and cooperation.
- ✧ Please always keep your belongings with you. The organizer of the conference does not assume any responsibility for the loss of personal stuff.
- ✧ Don't stay too late in the city, don't be alone in the remote area. Be aware of the strangers who offer you service, signature of charity, etc., at many scenic spots.

March 7, 2020 (Afternoon) | SR907 (Ninth floor)

14:00-14:50	Tutorial	Dr. Deepak L. Waikar
14:50-15:10	Coffee Break	Managing Partner, EduEnergy Consultants LLP Energy Researcher, Educator and Trainer, The Republic of Singapore
15:10-16:00	Tutorial	Speech Title: Synergising Clean Energy & Green Transportation Policy & Technology Innovations for Smart Cities

The tutorial is open access for all the participant for free of charge. Your participation is highly welcome!

Detailed Agenda

Poster Guideline

Please read it carefully:

- ▶ Please bring your own poster.
- ▶ Prepare the Poster
- *Your poster should cover the KEY POINTS of your work.
- *The title of your poster should appear at the top about 25mm (1") high.
- *The author(s) name(s), affiliation(s) and mailbox are put below the title.
- *Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart. Suggested Poster with size of A1 (594mm×840mm width*height), with conference short name and paper ID on right up corner.
- ▶ Carefully prepare your poster well before the conference. All illustrations, charts, etc., to be posted should be prepared in advance as materials for these purposes will not be available at the meeting site.

Oral Presentation Guideline

- ▶ Get your presentation PPT files prepared. Please copy your PPT to the computer 15 minutes before your session on March 8. The size of PPT is 16:9.
- ▶ Regular oral presentation: 15 minutes (including Q&A).
- ▶ Laptop, projector & screen, laser sticks will be provided by the conference organizer.
- ▶ Certificate of Presentation will be awarded after the session by the session chair.
- ▶ One Best Presentation will be selected from each parallel session and the author of best presentation will be announced and awarded after the session by the session chair.

Skype Presentation

- ▶ Get your presentation PPT files prepared. The size of PPT is 16:9. Test your internet connection on March 7, 2020.
- ▶ Each presentation: 15 minutes (including Q&A).
- ▶ Join in conference via the committee Skype account: chenying1119 in advance
- ▶ Certificate of Presentation will be sent to you after your presentation by email.
- ▶ Please keep online for the whole days and join in the session at least 15 minutes' earlier.

Video Presentation

- ▶ Send us the PPT with audio before March 7th.
- ▶ Each video should be with 10 minutes and 5 minutes for questions and answers.
- ▶ Keep online via Skype to reply the questions from audience after your video display.
- ▶ Certificate of Presentation will be sent to you after your presentation by email.

Detailed Agenda

[March 8, 2020 (Sunday)] Morning

📅 Opening & Keynote Speeches

📍 LT301 (Third floor)

09:30-09:40	Opening Remarks	Dr. Deepak L. Waikar Managing Partner, EduEnergy Consultants LLP Energy Researcher, Educator and Trainer The Republic of Singapore
09:40-10:20	Keynote Speech I	Prof. Changyun Wen, IEEE Fellow Nanyang Technological University, Singapore Speech Title: Hierarchical Decentralized Optimization Architecture for Economic Dispatch: A New Approach for Large-Scale Power System
10:20-10:30	Group Photo	
10:30-11:30	Coffee Break & Poster Presentations G1-053, G1-024, G1-022, G1-007, G2-1001, G1-027	
11:30-12:10	Keynote Speech II	Prof. Dennis Leung The University of Hong Kong, Hong Kong Speech Title: Applications of low grade and waste aluminum for powering portable devices and sensors

Lunch @ Outside the meeting room

<12:10-13:30>

Detailed Agenda

[March 8, 2020 (Sunday)] Afternoon

 Authors' Parallel Presentations

 SR706 (Seventh floor)	
13:30-15:30 	Session 1 -- Power Systems and Smart Grids Chaired by Prof. Takeshi Tanaka Hiroshima Institute of Technology, Japan Co-Chair by Assistant Prof. Ahmed Abu Elanien Dhofar University, Oman 8 Presentations G1-050, G1-035, G1-058, G1-011, G1-062, G1-006, G1-016, G1-017
15:30-15:45	 Coffee Break Outside Meeting Room
15:45-17:45 	Session 3 -- Electronics and Energy Engineering Chaired by Prof. Jacek Dach Poznan University of Life Sciences, Poland 8 Presentations G1-049, G1-2002, G1-032, G1-048, G1-055, G1-031, G1-025, G2-002
 LT301 (Third floor)	
13:30-15:45 	Session 2 -- Electrical Engineering and Automation Online Presentation via Skype Chaired by Assoc. Prof. Akhmad Zainal Abidin Bandung Institute of Technology, Indonesia Co-Chair by Assistant Prof-Jakub Pulka Poznan University of Life Sciences, Poland 9 Presentations G1-021, G1-028, G1-009, G1-029, G1-014, G1-034, G1-054, G2-1003, G1-057
15:45-16:00	 Coffee Break Outside Meeting Room
16:00-17:45 	Session 4-- Energy and Environmental Engineering Chaired by Prof. Andreas Ahrens Hochschule Wismar, Germany 8 Presentations G1-005, G1-060, G1-002, G1-033, G1-019, G1-026-A, G1-047, G2-007

Dinner @ Restaurant

<18:00-20:00>

KEYNOTE SPEAKER



Prof. Changyun Wen, IEEE Fellow

Nanyang Technological University, Singapore

Speech Title: Hierarchical Decentralized Optimization Architecture for Economic Dispatch: A New Approach for Large-Scale Power System

Abstract: Conventionally, the economic dispatch problem for a large-scale power system is solved in a centralized way. In contrast to such kind of approach, a hierarchical decentralized optimization architecture is presented in this talk, by decomposing the centralized problem into decentralized local problems. Each local generator only solves its own problem iteratively, based on its own cost function and generation constraint. An extra coordinator agent is employed to coordinate all the local generator agents. Besides, it also takes responsibility to handle the global demand supply constraint based on a newly proposed concept named virtual agent. In this way, the global demand supply constraint and local generation constraints are handled separately, which would greatly reduce the computational complexity. In addition, as only local individual estimate is exchanged between the local agent and the coordinator agent, communication burden is reduced and information privacy is protected. It is theoretically shown that, based on the proposed architecture, each local generator agent can obtain the optimal solution of the economic dispatch problem. Several case studies implemented on the IEEE 30-bus and the IEEE 118-bus also illustrate and validate the proposed method.

Bio: Changyun Wen received his B.Eng from Xi'an Jiaotong University, China in July 1983 and Ph.D from the University of Newcastle, Australia in Feb 1990. From August 1989 to August 1991, he was a Research Associate and then Postdoctoral Fellow at the University of Adelaide, Australia. Then he joined the School of Electrical and Electronic Engineering at Nanyang Technological University (NTU) as a lecturer. He was promoted to Full Professor through the first Promotion and Tenure Review Exercise at NTU in 2008.

He is an Associate Editor of a number of journals including Automatica, IEEE Transactions on Industrial Electronics and IEEE Control Systems Magazine. He is the Executive Editor-in-Chief, Journal of Control and Decision. He also served the IEEE Transactions on Automatic Control as an Associate Editor from January 2000 to December 2002. He has been actively involved in organizing international conferences playing the roles of General Chair, General Co-Chair, Technical Program Committee Chair, Program Committee Member, General Advisor, Publicity Chair and so on. He was awarded the IES Prestigious Engineering Achievement Award 2005 by the Institution of Engineers, Singapore (IES) in 2005. He received the Best Paper Award of IEEE Transactions on Industrial Electronics in 2017.

His main research activities are in the areas of adaptive control, intelligent power management system for more electric aircraft, modelling and control of active chilled beam for HVAC systems, switching and impulsive systems, model based online learning, system identification, control and synchronization of complex systems and networks, smart grids, cyber-physical systems, biomedical signal processing and biomedical control systems.

He is a Fellow of IEEE, was a Member of the IEEE Fellow Committee from Jan 2011 to Dec 2013 and a Distinguished Lecturer of IEEE Control Systems Society from Feb 2010 to Feb 2013.

KEYNOTE SPEAKER



Prof. Dennis Leung

The University of Hong Kong, Hong Kong

Speech Title: Applications of low grade and waste aluminum for powering portable devices and sensors

Abstract: Aluminum-air (Al-air) battery has been invented for more than 50 years, which is well-known for its high energy density and excellent power output. Nevertheless, the application of this technology is still restricted to large-systems with high cost due to its complexity, while its application in portable devices is barely reported. This is because of its requirement of high-purity Al anode and complex electrolyte management, which lead to poor market competitiveness and system redundancy. Inspired by the ever-growing research on paper-based power sources, in this work a novel-type Al-air battery has been developed to bring this conventional technology to the enormous miniwatt market potential. By using cellulose paper as electrolyte channel, the whole system is greatly simplified without the need for bulky liquid storage or active electrolyte delivery. Hydrogen generation is also suppressed. More importantly, the restricted electrolyte transport and ion diffusion inside the porous and tortuous paper enables the direct utilization of low-purity Al (<98%) in alkaline electrolyte with a high specific capacity of 1732 Ma h g⁻¹. Furthermore, the intrinsic flexibility and printability of paper have enabled the fabrication of flexible and printable Al-air batteries, which are more lightweight and versatile. This printable battery design directly employs Al ink and Oxidation Reduction Reaction (ORR) ink for anode and cathode fabrication, respectively. This novel design exhibits a great development potential for a much smarter and more economic battery application prospect for the emerging miniwatt market such as wearable electronics, point-of-care diagnostic assays, biosensors, smart packages, etc. In this talk, the above innovative batteries will be introduced and demonstrated.

Bio: Prof. Dennis Y.C. Leung received his Beng (1982) and PhD (1988) from the Department of Mechanical Engineering at the University of Hong Kong. He had worked with the Hongkong Electric Co., Ltd. For five years heading the air pollution section of the company before joining the University of Hong Kong in 1993. Professor Leung is now a full professor and associate head of the Department of Mechanical Engineering specializing in environmental pollution control and renewable & clean energy development. He has published more than 450 articles in this area including 280+ peer reviewed top SCI journal papers. His current h-index is 65 and total citations are more than 23000 according to Goggle. He is one of the top 1% highly cited scientists in the world in energy field since 2010 (Essential Science Indicators) and named as a Highly Cited Researcher by Clarivate Analytics in 2017 and 2018. Prof. Leung has delivered more than 60 keynote and invited speeches in many international conferences as well as public lectures.

SESSION 1

March 8, 2020

Session 1

Power Systems and Smart Grids

🕒 **13:30-15:30**

📍 **R706 (Seventh floor)**

Chaired by **Prof. Takeshi Tanaka**

Hiroshima Institute of Technology, Japan

Co-Chaired by **Assistant Prof. Ahmed Abu Elanien**

Dhofar University, Oman

8 Presentations—

G1-050, G1-035, G1-058, G1-011

G1-062, G1-006, G1-016, G1-017

***Note:**

- Please arrive 30 minutes ahead of the session to prepare and test your PowerPoint.
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- Please keep all your belongings at any time!

SESSION 1

<p>G1-050 13:30-13:45</p>	<p>Renewable Energy Intermittency Mitigation in Microgrids: State-of-the-art and future prospects Aqsa Naeem, Naveed Ul Hassan and Naveed Arshad Lahore University of Management Sciences (LUMS), Pakistan</p> <p>Abstract—The use of Renewable Energy Sources (RES) in Microgrids (MG) for power generation is a much-proposed countermeasure against the environmental degradation caused by burning of fossil fuels. However, RES are intermittent in nature and the power generated by them fluctuates randomly, due to which, appropriate measures are needed to ensure an efficient and reliable power supply. This paper reviews the state-of-the-art techniques used to mitigate the intermittency of RES in MG. A new classification of intermittency mitigation techniques is presented and a comparison of these techniques is drawn. Based on the reviewed literature, some important research directions to improve the existing intermittency mitigation techniques are proposed. Among these directions, the need to investigate RES complementarity further by characterizing RES, minimization of the cost of energy storage systems (ESS) and development of algorithms for better integration, management and control of ESS and dispatchable generators have been identified as crucial challenges in mitigating the intermittency of RES in MG. In addition, the standardization of communication protocols to ensure interoperability of communicating elements of MG and the use of fast, reliable communication links have been realized as fundamental requirements for a MG to be able to mitigate intermittency through appropriate techniques, such as, energy cooperation between MG and demand response management.</p>
<p>G1-035 13:45-14:00</p>	<p>Energetic and economic aspects of biogas plants feed with agriculture biomass Patrycja Pochwatka, Alina Kowalczyk-Juško, Andrzej Mazur, Damian Janczak, Jakub Pulka, Jacek Dach and Jakub Mazurkiewicz University of Life Sciences in Lublin, Poland</p> <p>Abstract—The aim of this paper was to determine the energetic and economic aspects of a 499 kw power biogas plant powered by substrates in three different scenarios: typical arable crops (maize silage), dedicated energy crops (sorghum silage) and agricultural waste biomass (maize straw). The obtained results show that methane productivity of tested substrates is closely connected with its dry matter content – which was especially significant in case of pig slurry (only 1.30 m³ CH₄/Mg of fresh matter). In consequences methane productivities of tested substrates had strong influence on its masses needed for feeding planned biogas plant (from 11,250 Mg to 20,430 Mg). The research have shown the big differences of the substrates costs in analyzed scenarios: the most costly scenario II was over 180 kEuro more expensive than III scenario. Taking into account 15 years period of guaranteed subsidies in Poland, this difference can reach in total 2.71 mln Euro.</p>
<p>G1-058 14:00-14:15</p>	<p>Project BAGWIS: A Modular, Diffuser Augmented Micro-Wind Turbine System Jeremy C. De Leon, Febus Reidj G. Cruz Mapua University, Philippines</p> <p>Abstract—This paper presents the design and fabrication of a horizontal micro-wind turbine that is capable of lighting and charging low power devices. This wind turbine will be called</p>

SESSION 1

	<p>Bagwis, a Filipino term meaning feather. It features a modular wind diffuser which is capable to connect with other “Bagwis” unit and its accessories. 3D printing will be utilized in all parts concerning the fabrication of design. The case diffuser theoretically increases wind speed up to 41 percent which yields a power increase up to 181.32 percent.</p>
<p>G1-011 14:15-14:30</p>	<p>Design and analysis of diffuser casings of diffuser augmented wind turbines Surya S, Ashwini Anand Gaonkar and Jayakrishnan Radhakrishnan Manipal Institute of Technology, India</p> <p>Abstract—Diffuser Augmented Wind Turbines (DAWTs) are an efficient method of harnessing wind power compared to conventional wind turbines. This article mainly focuses on the design and analysis of diffuser casing of various with various design parameters. Reynolds Averaged Navier Stokes equations in conjunction with k-ω SST turbulence model was used to analyze the flow pattern and properties through the diffuser casing. The m14ehaviorof diffuser was done in CATIA and all CFD analysis was performed on ANSYS FLUENT.</p>
<p>G1-062 14:30-14:45</p>	<p>Cow manure anaerobic digestion or composting – energetic and economic analysis Jacek Dach, Jakub Mazurkiewicz, Damian Janczak, Jakub Pulka, Patrycja Pochwatka and Alina Kowalczyk-Juśko Poznan University of Life Sciences, Poland</p> <p>Abstract—The aim of the work was to compare composting technology and anaerobic digestion in the case of manure from dairy cows. The research was carried on the case study farm in Wielkopolska Region (Western Poland) specialized in milk production (600 cows). The results have shown that both analyzed scenarios can give the additional profits to a studied dairy farm. However, the anaerobic digestion can provide more than twice a higher profit (315.6 kEuro) comparing to the composting scenario (148 kEuro). In composting, the biggest part of the generated heat is lost and only 36% can be recovered, which influences on profit decreasing up to 75.5 kEuro (instead of 201.7 kEuro theoretically). The amounts of energy produced in anaerobic digestion technology by CHP unit is almost equal for electricity (1601 MWh) and for heat (1680 MWh). However, the electric energy has several times higher value than heat because of additional subsidies paid by the state.</p>
<p>Video-G1-006 14:45-15:00</p>	<p>Study Of Shale Gas Storage Mechanism And Gas In Place Calculations: New Sights Asadullah Memon and Aifen Li China University Of Petroleum (East China), China</p> <p>Abstract—For shale gas reservoirs, the combined study of adsorbed and absorbed gases provides a better description of gas storage mechanism and characterizes the original gas-in-place. Two shale samples were taken and a series of isothermal gas sorption, porosity and total organic carbon experiments were conducted. Then, gas sorption and stress equations were combined to evaluate the mechanism of gas storage by analyzing the effective porosity of sorbed gas. Absorbed gas is usually linked with adsorbed gas and about 22% is contributing in connection with total gas storage capacity but previous studies had ignored such gas in calculation of total gas storage capacity. Therefore, present study is considered the sorbed gas which is the combination of adsorbed and absorbed gases and</p>

SESSION 1

	<p>presenting new sights to comprehend the gas storage mechanism and to characterize the shale gas-in-place. Results revealed from this study that sorption model is providing better descriptions than Langmuir model and close matched with experimental data. Analysis of effective porosity is important to depict the shale gas reservoirs. Shale gas-in-place was measured using different methods e.g. previous and new proposed method and observed that when using new proposed method the total gas storages were found higher at low pressure because of absorbed gas input as compare to previous methods. Further, the total gas storages capacity is increases further according to the adsorption and absorption behavior as pressure increases. This study presents sorbed gas mechanism and might be useful for characterizing the shale gas reservoirs.</p>
<p>Video-G1-016 15:00-15:15</p>	<p>Condition Evaluation of Dry-type Transformer Based on High-dimensional Random Matrix Theory Yue Hua, Yuanyuan Sun, Yiru Hu, Lina Zhang, Na Li and Shuo Ma Shandong University, China</p> <p>Abstract—Epoxy dry-type transformer plays a key role in the offshore oil platform power system. The normal operation of dry-type transformers faces many challenges, mainly due to the long maintenance period, high reliability requirements and complex offshore power requirements. At the same time, the offshore power system has formed a big data environment. In this context of power system, big data analysis methods are urgently needed. Based on the high-dimensional random matrix theory, this paper firstly considers various factors which have influence on the state of dry-type transformers to construct a condition evaluation matrix, and then analyzes the eigenvalue distribution of the condition evaluation matrix which was formed by time series data. In order to reflect changes in eigenvalue distribution, the mean spectral radius (MSR) was introduced. Through it, we can find the trend of key performance changes, and detect abnormalities in key performance of equipment in time. Finally, the effectiveness of the proposed method is illustrated by an example.</p>
<p>Video-G1-017 15:15-15:30</p>	<p>A Probabilistic Load Flow Method based on Improved Point Estimate and Maximum Entropy Qingyan Wang, Yuanyuan Sun, Xiangmin Xie, Kaiqiang Cheng, Yahui Li and Peng An Shandong University, China.</p> <p>Abstract—New devices such as wind turbine and photovoltaic connecting to the power grid bring uncertain features to the modern power system. The uncertain factors have a significant impact on the operating state and harmonic level of power system. To analyze the influence of the uncertain factors, a novel probabilistic power flow method combined the improved point estimate and maximum entropy theory is proposed in this paper. To relieve the calculation burden, the estimated points are first calculated in the standard normal distribution space. Through the transformation from standard normal probability distribution space to the original probability distribution space, the raw moments can be easily calculated. Then according to the raw moments of output variables, the probability distribution of output variables can be reconstructed through maximum entropy theory. The proposed method can effectively analyze the fundamental and harmonic state of the power</p>

SESSION 1

	system. The superiority of the proposed method is validated by the simulation with the IEEE 33 bus distribution system.
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SESSION 2

March 8, 2020

Online Presentation via Skype

Session 2

Machine Learning and Intelligent Computing

🕒 **13:30-15:45**

📍 **LT301 (Third floor)**

Chaired by **Assoc. Prof. Akhmad Zainal Abidin**

Bandung Institute of Technology, Indonesia

Co-Chaired by **Assistant Prof-Jakub Pulka**

Poznan University of Life Sciences, Poland

9 Presentations—

G1-021, G1-028, G1-009, G1-029

G1-014, G1-034, G1-054, G2-1003, G1-057

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SESSION 2

<p>G1-021 13:30-13:45</p>	<p>Hydraulic energy generation for RO (reverse osmosis) from PRO (pressure retarded osmosis) Ivonne Tshuma, Ralf Cord-Ruwisch and Wendell Ela Murdoch University, Australia</p> <p>Abstract—Although reverse osmosis (RO) is currently the most energy efficient, widely used, desalination technology, it still requires a great deal of energy to create the high pressure necessary to overcome the osmotic pressure of seawater. Pressure retarded osmosis (PRO), on the other hand, utilizes the salinity gradient between two solutions of different salt content to produce pressure, which can subsequently be used to generate electrical energy. The intended outcome of this study is a PRO-RO desalination system, where the PRO unit is directly hydraulically linked to a RO unit such that the pressure produced by PRO is transferred to RO to produce permeate. By utilizing the pressure produced in PRO to power RO, external energy inputs can be substituted. This is particularly significant in remote, off-grid, decentralized locations that have limited access to fresh water. The main objective of this paper is to introduce an RO driven by PRO technology and present ongoing work on a PRO stand-alone process.</p>
<p>G1-028 13:45-14:00</p>	<p>Optimal Grid Reconfiguration Algorithm for Improving System Resilience under Extreme Weather Events Victor Widiputra and Jaesung Jung Ajou University, South Korea</p> <p>Abstract—Due to global warming, the number of extreme weather events has increased in the last ten years. Consequently, the number of power system blackouts has also increased in this period. The reliability index is incapable of analyzing the power system behavior during these events because it does not account for extreme weather events for its calculation. Therefore, the resilience index is proposed for measuring the system functionality during extreme weather events. To increase the resilience value of the system, its functionality during such events must be increased. One way to achieve this is through the reconfiguration of the power system, to ensure that the parts of the power system which do not experience failure remain operational even during the extreme weather events. This paper proposes an algorithm to determine the optimal reconfiguration of the power system to increase the grid resilience. First, it applies the actual condition of the system during the extreme weather events. Then, the algorithm finds the islanded buses in the power system using bus injection to bus current (BIBC) matrix. Finally, the algorithm utilizes a genetic algorithm to find the optimal reconfiguration for the system. The results show that the reconfiguration strategy can be utilized to increase the system resilience under similar extreme weather events.</p>
<p>G1-009 14:00-14:15</p>	<p>Biodiesel Production From Refined Rice Bran Oil Using Eggshell Waste As Catalyst Impregnated With Silver Nanoparticles Febrian Rizkianto, Vinod K. Jindal, Ranjna Jindal, Romanee Thongdara, Masaki Takaoka and Kazuyuki Oshita Mahidol University, Thailand</p> <p>Abstract—Biodiesel is a promising renewable fuel with many attractive features such as high combustion efficiency, biodegradability, and less toxic exhaust emission. This study</p>

SESSION 2

	<p>investigated an environmentally friendly method for biodiesel production from refined rice bran oil (RRBO) using calcium oxide (CaO) from eggshell waste as a catalyst via transesterification reaction. A two-level three-factor full factorial experimental design was used to determine the effect of the impregnation of silver nanoparticles (AgNPs), calcination temperature and heating rate as independent variables on the biodiesel yield. Results showed that the calcination heating rate and the impregnation of AgNPs had significant effects on the biodiesel yield. An optimum biodiesel yield of about 92% was obtained using AgNPs impregnated CaO catalyst prepared from eggshell waste using a heating rate of 50c/min during calcination at temperatures in 800-1000oc range.</p>
<p>G1-029 14:15-14:30</p>	<p>Operator-oriented Peer-to-peer Energy Trading among Residential Customers in South Korea Kangjoon Heo and Jaesung Jung Ajou University, South Korea</p> <p>Abstract—This paper proposes a peer-to-peer (P2P) energy trade operating methodology in a community that comprises several residential customers. Unlike previous studies on P2P energy trading, this paper suggests an operator-oriented trading scheme to solve a social welfare maximization problem by using the block rate price (BRP). Under this scheme, the operator, rather than each of the participants, decides the trading price and schedules. For this scenario, a price model and a social welfare problem were formulated. The former aims at a fair profit distribution between sellers and buyers, and the latter targets maximizing the community’s total profit. The results are verified using a case study on a community consisting of residential customers in South Korea who adapted the BRP.</p>
<p>G1-014 14:30-14:45</p>	<p>Modeling and Analysis of Compound Aggregation of Household Load Groups Participating in Demand Side Response Jiao Xiaoquan and Xu Qingshan Southeast University, China</p> <p>Abstract—In order to ensure the stable operation of the household power system, a comprehensive aggregation model of the household load group participating in the demand side response is proposed. According to the principle of participating in the demand side response, operation parameters of the household power system are collected and the corresponding values of household load groups are calculated. Based on the calculated composite values, the polymerization process at night is processed. Then the aggregation process is optimized, and a fast aggregation decision tree is established accordingly. The aggregation model based on potential assessment is established according to electricity consumption habits of users and operating characteristics of equipment. The experiment shows that the load response performance of the research method can be better. The user satisfaction is over 90%, the load scheduling time is less than 1.8s, and the daily power consumption of the family can be reduced. This proves that the comprehensive performance of the method can be better and the application effect can be more ideal.</p>
<p>G1-034 14:45-15:00</p>	<p>Achieving Robust and Accurate Power Distribution Grid Damage Forecasting via a Two-Stage Forecasting Method Seongmun Oh, Yejin Yang, Jaesung Jung and Min-Hee Choi</p>

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	<p>Ajou University, R.O. Korea</p> <p>Abstract—This paper presents a method to forecast storm-induced power distribution grid damage. Three sets of historical data are used: storm data, local weather data, and power distribution grid damage data from January 2008 to March 2018. Before developing the damage forecasting method, the key explanatory variables are identified by using stepwise regression analysis to develop a simpler and robust forecasting model. Thereafter, this paper proposes a two-stage damage forecasting method. Random Forest (RF) and feed-forward neural network (FFNN) model are used for forecasting grid damages. RF is used to classify the no damage and damage cases before the damage forecasting and then FFNN is used to forecast the number of grid damages only for the damage cases. The actual storm event data is used to verify the proposed method by using Mean Absolute Error (MAE).</p>
<p>G1-054 15:00-15:15</p>	<p>A Novel Fuzzy based Intelligent Demand Side Management for Automated Load Scheduling Dhairya Karna, Aditya Vikram, Astitva Kumar and Mohammad Rizwan Delhi Technological University, India</p> <p>Abstract—Developments in smart-grid technologies can be associated with rising awareness among general populace of renewable energy as well as the need of distributed generation via these sources. Improvement in efficiency of electrical energy from Renewable Sources (RS) can be achieved by collaborating advanced structures with intelligent metering technology. The smart meters along with the distributed generation sources are being widely used in smart grid applications. An intelligent energy management system is key to monitor and control the processes at consumer and supplier end. Thus, an intelligent system for various computation and procurements can be considered a part of smart-grid. It is within consideration that a part of the energy demand by the building is covered by this Intelligent Demand Management Structure (IDMS). The IDMS is an indispensable tool in order to guarantee greatest added value to the smart meter. The practical and theoretical integration and application of IDMS with the smart meter is presented in this article. The article proposes a novel algorithm based on fuzzy optimization logic employed to the intended system. Fuzzy Controller Logic (FCL) language was used to create the fuzzy rules while the execution was carried out in Python. The designed algorithm is tested in the real time with the load profile of a practical setup. The proposed FCL based algorithm saved a maximum of 17.12% energy in best cased scenarios.</p>
<p>G2-1003 15:15-15:30</p>	<p>Evaluation and Visualization of kw / kWh Cost of a District Heating and Cooling System for Electricity Adjustment Kohei Tomita, Yasuhiro Hayashi, Yutaka Iino, Yuto Yamamoto and Kosuke Kobayashi Waseda University, Japan</p> <p>Abstract—A District Heating and Cooling system (DHC) with Combined Heat and Power (CHP) is able to not only satisfy regional heat and cold demand but also generate and control electricity by CHP. Therefore, a DHC with CHP has potential as control reserve for electricity adjustment (EA). In Japan, an EA auction was established to secure control reserve efficiently. In our previous research, potential of EA by a DHC for this auction has already evaluated. Furthermore, it was found that kw and kWh costs of a DHC for EA mainly depend on the heat and cold demand. Operators of DHCs need to comprehend the exact costs for EA</p>

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	<p>when they bid on the auction. Therefore, fluctuations in costs for EA due to changes in heat and cold demand have been a critical issue for operators in decision making for the bid. However, costs for EA of a DHC with comprehensive assumption of various heat and cold demands has not been evaluated. Therefore, in this paper, the kw and kWh costs of an existing DHC are quantified and visualized as a multidimensional function based on the conditions of heat and cold demands. In addition, the factors behind those results are discussed. As a result, this research made it possible to predict the costs for EA of the DHC with heat and cold demand forecasts, and the operator could use it as auxiliary information in decision making for the bid.</p>
G1-057 15:30-15:45	<p>Identification of power demand characteristics for each area and energy saving control selection method Toshihiro Mega, Yusuke Fujiwara, Masatada Kawatsu and Noriyuki Kushiro Kyushu Institute of Technology, Japan</p> <p>Abstract—Demand response (DR), which aims to stabilize power supply and cost of electricity, has garnered considerable research interest in recent years. It is expected to be particularly useful in small and medium-sized office buildings, which are responsible for a large share of the total electricity consumption of an area. In this paper, we propose a method for identification of power demand characteristics for each unit, floor, and area based on a power consumption prediction model developed using heterogeneous mixture learning technology. With experimental data obtained from an eight-story office building, we develop an energy-saving control selection method for DR based on the identified power demand characteristics and our evaluation results are reported herein.</p>

SESSION 3

March 8, 2020

Session 3

Electronics and Energy Engineering

🕒 **15:45-17:45**

📍 **SR706 (Seventh floor)**

Chaired by **Prof. Jacek Dach**

Poznan University of Life Sciences, Poland

8Presentations—

G1-049, G1-2002, G1-032, G1-048

G1-055, G1-031, G1-025, G2-002

***Note:**

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<p>G1-049 15:45-16:00</p>	<p>Design of Solar-Wind Hybrid Power System by using Solar-Wind Complementarity Aqsa Naeem, Naveed Ul Hassan and Naveed Arshad Lahore University of Management Sciences (LUMS), Pakistan</p> <p>Abstract—Environmental degradation is a rapidly growing concern across the globe, which is primarily caused by conventional fossil fuels-based power generation. This study examines the feasibility of generating electricity by using renewable energy sources (RESs) based hybrid power system (HPS). A general planning framework for integrating solar and wind energies in a HPS is proposed, that exploits the solar-wind complementarity to stabilize the combined power output. Specifically, it evaluates the solar-wind complementarity by using Pearson’ correlation coefficient, and determines the optimal shares of solar-wind energies in power generation by minimizing the standard deviation of HPS power output. The proposed framework is evaluated on a case study in Pakistan, where sufficient solar-wind synergy potential exists. Our results show that values of solar-wind complementarity vary considerably from -0.351 (high complementarity) to 0.411 (low complementarity). It is observed that by using optimized shares, HPS power outputs exhibit less variations than the outputs generated by standalone solar or wind energy-based power systems. Best location for deployment of solar-wind HPS is identified as the one that maximizes the solar-wind complementarity benefits.</p>
<p>G1-2002 16:00-16:15</p>	<p>Energetic and economical assessment of waste fermentation process Jakub Pulka, Damian Janczak, Andrzej Lewicki, Jakub Mazurkiewicz, Jacek Dach, Marta Cieřlik, Alina Kowalczyk-Juřko and Patrycja Pochwatka Poznan University of Life Sciences, Poland</p> <p>Abstract—Maize silage, in spite of its rising prize and technological problems of monoculture in Eastern Germany, is still the most popular substrate for biogas plants. However waste materials often generate income, because of the potential technological or ecological problems they cause. Such an approach seems to be more profitable even considering lower biogas yield of dose waste substrates. To compare these different scenarios energetic and economical assessment of waste fermentation processes such be conducted. In this paper, three different substrates will be evaluated to determine their suitability for agricultural biogas plant feedstock.</p> <p>The study was conducted in the Laboratory of Ecotechnologies (Poznan University of Life Sciences). The research was based on the modified German standard DIN 38 414/S8 and VDI 4630, while chemical and physical analytical methods were based on the Polish Standard System. Economic analysis was performed using standard prices in the polish biogas market. The calculation was conducted for 500 kw installation.</p> <p>Based on the obtained results, it was proven that refood was characterized by the highest methane and biogas yield from the analyzed substrate group. Maize silage fermentation in the Polish condition is least profitable due to the approximately 50 % income reduction by the costs of obtaining silage. However due to the price received for treating waste materials, refood fermentation is the most economically feasible option.</p>

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<p>G1-032 16:15-16:30</p>	<p>Construction of a Preliminary Educational System for Fuel Cell using Hydrogen Nobuharu Okamitsu, Kenshi Nishino, Faye Duncan and Takeshi Tanaka Hiroshima Institute of Technology, Japan</p> <p>Abstract—Global warming problems, local energy problems, etc. are expected to become serious problems as the aging society in Japan progresses. In addition, the introduction of renewable energy is important not only for measures against global warming, but also from the viewpoints of securing energy security, building independent and distributed energy systems, creating new industries and jobs. In this research, we constructed a preliminary educational system that can confirm the operation of hydrogen sensor, water electrolysis, LED lighting using fuel cell and so on. In addition, examples of fuel cells, microgrids, and Rankine cycles provided by Mathworks were introduced, and future hydrogen-related facilities were introduced.</p>
<p>G1-048 16:30-16:45</p>	<p>A New Six-Phase FSCW Layout for Permanent Magnet Synchronous Wind Generators Ayman Abdel-Khalik, Ahmed Abu Elanien, Ahmed Massoud, and Shehab Ahmed Dhofar University, Oman</p> <p>Abstract—This paper proposes a new non-overlapped six-phase Fractional Slot Concentrated Winding (FSCW) layout for a Permanent Magnet (PM) synchronous wind generator with an outer rotor and surface mounted magnets. The proposed FSCW layout is originally an asymmetrical nine-phase winding where the nine phases are connected with a special connection as to provide an equivalent stator winding with six terminals only. The proposed winding successfully offers a high torque and voltage qualities with a low cogging torque. Besides, the stator and rotor core losses are reduced when compared with a three-phase counterpart. Finally, the high phase order of the proposed generator provides a better fault tolerant generator design. A 100kw PM generator with an outer rotor based on the proposed winding layout is designed and simulated using 2D Finite Element Analysis (FEA).</p>
<p>G1-055 16:45-17:00</p>	<p>Experimental Study on the Thermal Performance of a Porous Medium Solar Pond Hongsheng Liu, Wu Dan, Xie MaoZhao and Sun Wence Dalian University of Technology, China</p> <p>Abstract—Thermal performance of a porous medium solar pond is studied by the laboratory and outdoor experiments. The laboratory experiments are carried out to test the heat storage ability of varies porous materials. The outdoor contrast experiment between two mini solar ponds with a surface area of 2.4m×2.4m, bottom area of 1m×1m are conducted to analyze the thermal performance of the porous medium solar pond. Influences of the porous medium as well as a cover on the temperature distribution are discussed. Results show that the maximum temperature of solar pond increase by about 6°C due to the introduction of porous medium. Inspired by the principle of the porous medium solar pond, a tide-driven reservoir with heat collection pond and circulating storage pond is proposed to provide fresh seawater with moderate temperature for seaside marine park in winter.</p>

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<p>Video-G1-031 17:00-17:15</p>	<p>Optimal Planning of Distributed Generators and Loads in Active Distribution Network: A Review Shichuan Wang, Yuanyuan Sun, Kejun Li, Lisheng Li, Yang Liu and Linli Zhang. Shandong University, China</p> <p>Abstract—The integration of distributed generation and loads (DGL), which are composed of distributed generation (DG), energy storage system (ESS) and electric vehicles (EVs) in power distribution networks (DN), has become increasingly important in recent years. In this paper, the optimal allocation of DGL under the background of active distribution network (ADN) is summarized. Firstly, this paper presents an overview of this research field and the main research methods. Then, the optimal planning problem and the modeling of DGL are stated. After that, the most innovative contributions in reviewed works are analyzed and classified. And finally, the future research directions are prospected.</p>
<p>Video-G1-025 17:15-17:30</p>	<p>Stochastic Distribution Expansion Planning with Wind Power Generation and Electric Vehicles Considering Carbon Emissions Vivienne Hui Fan, Ke Meng, Jing Qiu and Zhaoyang Dong University of New South Wales, Australia</p> <p>Abstract—Conventional power distribution system is evolving with the growth of distributed generation and electric vehicle integration. The methods of this multidisciplinary integration under uncertainty have not yet been closely examined. In this work, we propose a framework for distribution network expansion planning considering the stochastic nature of DGs, charging stations and the associated carbon impact. The proposed model aims to minimize the overall investment cost, the operation and maintenance cost, energy losses and carbon emissions by optimizing the location and sizes of alternative feeders, the reinforcement of existing substations and new constructions, and the deployment of DGs and charging stations. A multiobjective mixed-integer nonlinear programme is formulated and recast as a two-stage stochastic problem based on analytical probabilistic approach. The model is solved with Tchebycheff decomposition method based evolutionary algorithm. The proposed approach is examined against a modified case 54 distribution and node 25 transportation system. Sensitivity analysis proves the overall investment cost could be substantially affected by carbon emissions by 21%. System cost and energy loss can be reduced by 1.5% by integrating wind generators. Numerical results obtained effectively demonstrate the capability and feasibility of proposed method.</p>
<p>Video-G2-002 17:30-17:45</p>	<p>Experimental Study on External Short Circuit and Overcharge of Lithium-ion Battery Packs for Electric Vehicles Weixiang Shen, Ruixin Yang and Rui Xiong Swinburne university of technology, Australia</p> <p>Abstract—External short circuit (ESC) and overcharge are two types of electrical failures in lithium-ion batteries for electric vehicles. Experimental study has been conducted to quickly and accurately diagnose these faults, which is critical to ensure battery safety. In this study, three contributions are made: (1) Battery cells with ten different SOCs (10%, 20%... 100%) are short-circuited at three ambient temperatures of 20°C, 30°C, and 45°C to investigate</p>

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	<p>the effect of SOCs and temperatures on the ESC fault characteristics. (2) The ESC experiments are performed in 4-series and 2-parallel connected battery packs. In these experiments, one cell is short-circuited while the whole battery pack is being charged or discharged. It can be found that the ESC fault triggers different degrees of overcharge faults in a battery pack, and these overcharge faults are also influenced by charging/discharging strategies on the whole pack. (3) Based on experimental data, an equivalent circuit model is employed to simulate electrical behaviors of battery cells under ESC and overcharge conditions. It is found that both ESC model and overcharge model are capable to capture electrical performances under abusing tests.</p>
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SESSION 4

March 8, 2020

Session 4

Energy and Environmental Engineering

🕒 **16:00-18:00**

📍 **LT301 (Third floor)**

Chaired by **Prof. Andreas Ahrens**

Hochschule Wismar, Germany

8 Presentations—

G1-005, G1-060, G1-002, G1-033,

G1-019, G1-026-A, G1-047, G2-007

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<p>G1-005 16:00-16:15</p>	<p>Energy Savings by Using Traffic Estimation for Dynamic Capacity Adaptation in Communication Network Operations Andreas Ahrens, Christoph Lange and Jelena Zašcerinska Hochschule Wismar, Germany</p> <p>Abstract—Energy efficiency of telecommunication networks plays an essential role in the context of sustainability and climate change. Furthermore, an economical network operation calls for low energy demand. A challenging and crucial task for energy-efficient and sustainable network operation is the load-adaptive operation of network elements such as routers, switches and access multiplexers. Since the traffic is temporally fluctuating and load-adaptive control of the network requires a robust traffic demand estimation. This is also of overwhelming importance, as a stable network operation is a central task of network operators – since it is expected by their customers as service they pay for. Here, Wiener filtering has been identified as a robust solution for reliable traffic demand forecasting on relevant time scales. The results presented in this paper show that the capacity dimensioning based on the proposed Wiener filtering traffic forecasting leads to reliable outcomes in terms of predicted traffic enabling sustainable and efficient network operation.</p>
<p>G1-060 16:15-16:30</p>	<p>Study on Environmental Health Aspect of Plastic Refinery in MASARO Cirebon Unit in Indonesia Akhmad Zainal Abidin, Najwa Shufia Choliq, Elsy Veradika Yemensia and Rizki Hastuti Bandung Institute of Technology, Indonesia</p> <p>Abstract—The main problems regarding waste management issue in Indonesia is the increasing volume and the rate of waste produced along with the increasing cost of handling, as well as the lack of attitude and behavior of the people in managing waste. MASARO or Management Sampah Zero is a zero waste management system that offers the handling of waste until it is fully reduced to zero. One of the units in MASARO is plastic refinery, which handles plastic film waste and turns it into fuel. This refinery unit produce smoke and water as waste. A study is done in the aspect of environmental safety and health, focusing on the analysis of the smoke and the waste water. The analysis showed that all aspects from gas meet the environmental standar, but the height of the chimney need to be made higher for about 5 m. All aspects from waste water meet the environmental standard, except nitrate, phenol, and COD by potassium dichromate, which need to be treated afterwards using waste water treatment.</p>
<p>G1-002 16:30-16:45</p>	<p>A Comparative Analysis of Processes of Conceptual Change for the Enhancement of Implementation of Green Energy Education and Training Andreas Ahrens, Christoph Lange, Jelena Zašcerinska and Ludmila Aleksejeva Hochschule Wismar, Germany</p> <p>Abstract—Green energy is promoted via education and training. In education, concepts are the cornerstone in knowledge creation. Comparative analysis in the present paper assists in the discovery of patterns of processes of conceptual change. The aim of this</p>

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	<p>paper is to compare processes of conceptual change underpinning the enhancement of implementation of green energy education and training. Our motivation here is to identify an efficient process of conceptual change for the enhancement of implementation of green energy education and training. The novelty of the research presented in this paper lies in the formulated implications for research and practice devoted to the efficient implementation of green energy education and training.</p>
<p>G1-033 16:45-17:00</p>	<p>Techno-Economic Assessment of Net Energy Metering Implementation for Rooftop Solar PV in a Commercial Building in Bangladesh Muhammad Ahad Rahman Miah, Shaikh Rashedur Rahman and Runa Kabir University Of Asia Pacific (Uap), Bangladesh</p> <p>Abstract—Net Energy Metering (NEM) involves to a mechanism that permits consumers to interconnect their distributed generation systems to the power grid network. NEM allows utility and consumer to mount a bi-directional meter to measure power flow in two directions- one from utility to consumer (import) and another from consumer to utility (export). The consumer’s monthly consumption bill will be calculated based on the net energy measured by the meter i.e. energy drawn from the distribution grid minus the energy delivered to the distribution grid over the stated billing cycle. This study assesses the technical and economic potential and feasibility of net metering system implementation for a rooftop Solar Photovoltaic (PV) in a commercial building. It also analyzes the environmental impact reduction by implementing such renewable energy utilization project.</p>
<p>Video-G1-019 17:00-17:15</p>	<p>Comparison of Energy Efficiency and Carbon Dioxide Emissions of Gas Turbine Cogeneration with Steam Absorption Chillers versus Conventional Chilled Water Generation Adzuien Nordin, Didi Asmara Salim, Shahrul Nahar Omar Kamal, Danny Tam and Mohd Kamarul Yusri Yusof Politeknik Ungku Omar, Malaysia</p> <p>Abstract—Malaysia government committed to reduce greenhouse gas emission by 45% by 2030. This target was set with 35% on unconditional basis and 10% on conditional basis upon receipt of climate finance funding, technology transfer and capacity building developed countries. This paper demonstrate how cogeneration district cooling power plant helped to mitigate greenhouse gas emission by comparing fuel efficiency and carbon dioxide emissions of the cogeneration district cooling plant and a conventional electrical chiller plant which electricity was imported from the power grid. The GT Pro simulation is used to estimate the efficiency and the carbon dioxide emissions from the power plant. Results and analyses indicate that the cogeneration district cooling plant consumed 30.47% less primary energy and emit 44.43% less of carbon dioxide as compared to the conventional power plant. Hence, the adoption of cogeneration district cooling plant will definitely help the nation goal to reduce greenhouse emission intensity by 35% to 45% by 2030.</p>

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<p>Video-G1-026-A 17:15-17:30</p>	<p>Generation of Eleven-Level Output Voltage from Cascaded Multilevel Inverter Consisting of Three H-Bridge Units Connected to Unequal dc Sources Tapan Kumar Chakraborty, Ashique Anan Abir and Md. Imran Prodhan University of Asia Pacific, Bangladesh</p> <p>Abstract—Recently, different topologies of cascaded multilevel inverters are being widely investigated due to their industrial applications in many fields. A cascaded multilevel inverter circuit is implemented by connecting several H-bridge units in series to obtain a desired output voltage consisting of several voltage steps. In most of the cascaded multilevel inverters, dc sources with different values are connected to individual H-bridge unit. However, in few cases of the cascaded multilevel inverters, equal independent dc sources are connected to individual H-bridge unit. This paper introduces an implementation of single-phase multilevel inverter to generate eleven-level output voltage using cascaded three H-bridge units. Four power semiconductor MOSFET switches have been used for each H-bridge unit. Three unequal independent dc sources have been connected to three H-bridge unit. The gate drive signals for twelve MOSFETs of the three H-bridge units connected in series to control the switching states have been generated using ATmega 2560 microcontroller-based Arduino board. The complication of generating gate drive signals for MOSFETs has been simplified for multilevel inverter by writing simple programming codes for the microcontroller. Twelve pins of the Arduino board have been programmed in output mode for generating gate drive signals using simple algorithm. It is observed that less number of power semiconductor devices are used to obtain eleven levels on the output voltage of the proposed system. This study also shows that total harmonic distortion of the output voltage of the proposed inverter has been reduced with increasing number of voltage levels. The proposed system was experimentally tested in the laboratory. It is found that the proposed system accurately generates the gate signals for controlling the switching on/off state of semiconductor switches and there is an improvement in the total harmonic distortion of the output voltage across the load. However, the output voltage of the multilevel inverter consists of switching spikes which may be reduced by selecting proper power switching devices with low turn-off and turn-on times.</p>
<p>Video-G1-047 17:30-17:45</p>	<p>Tool Wear of (Al,Cr,W)/(Al,Cr,W,Si)-based-coated Cemented Carbide Tools in Cutting of Hardened Steel Tadahiro Wada, Akiyoshi Nitta and Junsuke Fujiwara National Institute of Technology, Japan</p> <p>Abstract—In this study, a carbonitride coating film was deposited on a cemented carbide ISO K10 using three different Al-Cr-W-Si targets. The coating film structure consists of mono-layer film and multi-layer films. The hardened steel ASTM D2 was cut with five types of coated cemented carbide tools. The tool wear of the coated tools was experimentally investigated. The following results were obtained: (1) Comparing the wear progress of the (Al53,Cr23,W14,Si10) (C,N)-and (Al58,Cr25,W7,Si10) (C,N)-coated tool, the wear progress of the (Al58,Cr25,W7,Si10) (C,N)-coated tool is slightly slower than that of the (Al53,Cr23,W14,Si10) (C,N)-coated tool. (2) Comparing</p>

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	<p>the wear progress of the (Al60,Cr25,W15) (C,N)/(Al53,Cr23,W14,Si10) (C,N)-and the (Al53,Cr23,W14,Si10) (C,N)/(Al58,Cr25,W7,Si10) (C,N)-coated tool, the wear progress of the (Al53,Cr23,W14,Si10) (C,N)/(Al58,Cr25,W7,Si10) (C,N)-coated tool is slightly slower than that of the (Al60,Cr25,W15) (C,N)/(Al53,Cr23,W14,Si10) (C,N)-coated tool.</p>
<p>Video-G2-007 17:45-18:00</p>	<p>Modelling a Solar Module and Tracing Maximum Power Point Under Variant Ambient Conditions Anup Shukla and Jasdeep Kour Indian Institute of Technology Jammu, India</p> <p>Abstract—This paper proposes the mathematical behavior of a photovoltaic module and works out on techniques for tracking and identifying the Maximum Power Point (MPP) related to a voltage value. The MPP is worked out by using a Perturb and Observe algorithm and then by Ant Colony Optimization technique. The simulation is done on MATLAB platform. The simulation outcomes prove better behavior results with lesser error to the values specified on the datasheet and to the results already reported in literature. Ant Colony Optimization algorithm discussed in the paper is quite consistent with the metaheuristic techniques and lesser modification is done to the algorithm to suit the current situation as already reported. This algorithm provides faster convergence and a steady output even under adverse situations like change in ambient temperature, change in solar insolation levels and even under partial shading conditions caused due to passing clouds or falling tree branches</p>

March 8, 2020

Poster Presentations

🕒 10:30-11:30

📍 LT301 (Third floor)

6 Presentations—

G1-053, G1-024, G1-022, G1-007, G2-1001, G1-027

G1-053	<p>Research on the influence of different types distributed power supply on distribution network voltage Xiao Ying, Chang Xiao, Zhang Shifeng, Shi Yuxin, Zhao Jun and Liu Liquan State Grid Shanxi Electric Power Company, China</p> <p>Abstract—High-permeability distributed power (DG) access to the distribution network has become the latest trend in the development of renewable energy, which has led to some questions, such as the changes in distribution network voltage, complex power flow calculation, difficult protection, and increased harmonics, which are more complex and random as compare with the conventional distribution networks, and affect the reliability of the distribution networks. This article starts from the perspective of the impact of different types of DG access to the distribution network on the node voltage. Based on the standard IEEE33 node distribution network, specific examples are used to compare the effects of different types on the distribution network. The simulation results show that the role of the node voltage of different types' DG in the distribution network is very different. When protecting the DG access to the distribution network, it is necessary to consider the type of DG.</p>
G1-024	<p>A Novel DC Voltage Control Strategy for DC Distribution Based on Adaptive Droop Control Xianxu Huo, Xingfeng Xie, Zaijun Wu and Xiaoyong Cao Southeast University, China</p> <p>Abstract—The stability of the DC voltage is one of the key technologies needed to be solved in the medium voltage DC distribution system (MVDCDS). Therefore, this paper proposes a</p>

	<p>novel master-slave control strategy based on the proposed adaptive droop control of the voltage source converter (VSC). According to this strategy, the master station operates in constant DC voltage mode as a reference of voltage and other slave stations adopt adaptive droop control with the dead band. When MVDCDS operates in steady-state, the slave stations output constant power to track the setting values, but if MVDCDS suffers from the larger disturbance, the slave stations can automatically switch to the adaptive droop control to rapidly regulate the DC voltage, so that the DC voltage does not overstep its limits. A two-terminal DC distribution system model is established by MATLAB/Simulink to verify the effectiveness of the proposed control strategy.</p>
G1-022	<p>The three-port three-phase 3L-NPC isolated bidirectional DC-DC converter Chongwu Wang, Sheng Cao, Wenlun Cao and Junfeng Chen The Northern Polytechnical University, China</p> <p>Abstract—The multiport 3 level neutral point clamped (3L-NPC) isolated bidirectional DC-DC converter (IBDC) can double the voltage level using the standard switching devices and connects different type sources together to meet the high-power application such as the ROV systems. A kind transformer coupled three-phase three-port 3L-NPC IBDC was put forward in this paper, and two operation modes were analyzed in detail according to the phase shift ratio and the duty cycle relationship. The regulating strategy of power flow for the three-port 3L-NPC IBDC was to get the minimum loss, hence the zero averaged power in the storage port and/or the zero-power flow between the storage port and load port were applied. The control was the multi-loop negative feedback of output voltage and current at the load port and a single-loop feedback of output current at the storage port. The linearization small signal mode was set up to analyze the control property and to determine the parameters. The three-port 3L-NPC IBDC can improve the electromagnetic compatibility obviously for high-power high-voltage application.</p>
G1-007	<p>A PHET Dispatching Method Considering Customer Demand and Charging Resources Xushan Qing, Xiangzhou Luo and Huimiao Chen University of Electronic Science and Technology of China, China</p> <p>Abstract—Plug-in electrical vehicles (PEVs) play a significant role in environment protection and attract global attentions. However, with the popularization of PEVs, low-efficiency supporting facilities such as the charging system impede its future development. To improve the charging system, we focus on plug-in hybrid electric taxis (PHETs) as they are the main users of public charging system. In this paper, we first predict the order numbers and mileage consumption of orders with the help of convolutional neural networks (CNNs). We then divide the area in 30 groups using K-means method and plan the charging capacity of station in each area. Two coordinated dispatching and charging strategies are proposed considering the states of charge (SOCs) at vehicle level and considering the real-time effect at region level, respectively. Finally, we test the dispatching effect using order car ratio (OCR) models at region level. The results show that it works quite well when testing on the real dataset. This method provides optimal instructions for PHETs to pick orders, satisfy their charging demand and also meet the order demands for taxis.</p>

G2-1001	<p>Identifying inrush currents based on Bayesian recursive algorithm for a numerical overcurrent protection relay Anh V Nguyen and Lien B Nguyen Hanoi University of Science and Technology, Vietnam</p> <p>Abstract—The overcurrent relays are one of the most important devices on the electrical power system because they help to eliminate the abnormal currents. However, the relays sometimes cause nuisance trips when the circuit is starting because they fail to discriminate between the short-circuit current and the inrush current. This paper introduces a new principle of discrimination between inrush currents and short-circuit currents based on Bayesian recursive algorithm. Information about the abnormal current patterns as well as the instance of the event can be represented in terms of probability density functions, Bayesian rules help combine the probability information to find the most probable prediction about the current states. Experiment results demonstrate that this method is effective and helps the relay avoid nuisance tripping of short-circuit protection.</p>
G1-027	<p>A Control Strategy for Suppressing the DC Overvoltage under the Fault of DC Power Grid Shanshan Wang, Yuetong Zhao, Bing Zhao, Tiezhu Wang, Guanglu Wu, Yingbiao Li, Xiao Yu, Yuanyuan Sun, Rui Yin, Shanmeng Qin and Yue Hua Shandong University, China</p> <p>Abstract—Unbalanced power in DC power grid causes DC overvoltage, which damages the capacitors, IGBT and other devices, so it is essentially important to suppress the DC overvoltage. Aiming at the problem of DC overvoltage suppression, this paper proposes a new control strategy to suppress the rise of DC voltage by adding DC voltage signal to traditional constant AC voltage controller. Firstly, the mechanism of DC overvoltage is studied, and the relationship between the DC voltage and the unbalanced power in DC power grid is qualitatively and quantitatively analyzed according to the law of energy conservation. Then the relationship between the DC voltage and AC voltage is obtained, and an additional DC voltage control strategy is proposed for constant AC voltage control to suppress the rise of DC voltage. Based on the PSCAD/EMTDC, the simulation model of four terminal VSC-HVDC is built. In the case of blocking fault at the receiving end, the effectiveness of the proposed control strategy is verified.</p>