FRONT PAGE

2018 3rd International Conference on Power and Renewable Energy (ICPRE 2018)

Berlin, Germany | September 21-24, 2018.

Sponsored by

Technically Assisted by

Published by

CONTENTS

VENUE

Novotel Berlin Am Tiergarten Hotel

Address: Strasse des 17 Juni 106-108, 10623, Berlin, Germany
Tel: +49 (0) 30 600 35 157 E-mail: sophia.ringel@accor.com

Mass transport

From Tegel Airport-TXL (Airport Tegel Berlin Bus Station):

X9- Bahnhof Berlin Zoologischer Garten (Berlin Zoologischer Garten Station)-**S3**-Tiergarten (32 min)
TXL-Berlin Hauptbahnhof (Berlin Central Station)-**S9**- Tiergarten (31 min)

From Schönefeld Airport-SXF:

S9-Tiergarten (54 min)
RB14-Berlin Friedrichstraße Station-**S9**-Tiergarten (48min)

***Local Temperature: 11/20℃** ***Police: 110 Ambulance:112**

AGENDA

[September 21, 2018]

10:00-17:00

Lobby/ Ground Floor

Novotel Berlin Am Tiergarten Hotel

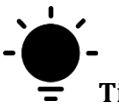
Registration & Materials Collection

Give your **Paper ID** to the staff

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

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

---



Tips for Participants

- ✧ Your punctual arrival and active involvement in each session will be highly appreciated.
- ✧ The listeners are welcome to register at any working time during the conference.
- ✧ Get your presentation PPT or PDF files prepared.
- ✧ Regular oral presentation: 15 minutes (including Q&A).
- ✧ Laptop (with MS-Office & Adobe Reader), projector & screen, laser pointer will be provided by the conference organizer.
- ✧ Please keep all your belongings (laptop and camera etc.) with you in the public places, buses, metro.

AGENDA

[September 22, 2018]

Morning

Novotel Berlin Am Tiergarten Hotel

Kurland 2@ Ground Floor

Speeches	
Chaired by Prof. Dr. Mohan Kolhe, University of Agder, Norway	
09:00-09:10	**[Opening Remarks]** by Prof. Dr. Mohan Kolhe, University of Agder, Norway
09:10-09:50	**Keynote Speech** **[**Emerging Sustainable Energy Systems: European Innovations for Power Transmission and Distribution**]** **By Prof. Dr.-Ing. Kai Strunz, Technical University of Berlin, Germany**
09:50-10:30	**Coffee Break & Group Photo & Poster Display**
	Posters-ICP102, ICP051, ICP080, ICP097, ICP082, ICP099, ICP084, ICP101, ICP100, ICP072
10:30-11:10	**Keynote Speech** **[**Grid Interaction of Zero Energy Buildings (ZEBs): A Case Study of Southern Norway ZEBs**]** **By Prof. Dr. Mohan Kolhe, University of Agder, Norway**
11:10-11:40	**Invited Speech** **[**Contactless Power Transmission in Seawater**]** **By Prof. Masayuki Morimoto, Tokai University, Japan**

Lunch @ Hotel Restaurant @ Ground Floor
<11:40-13:00>

AGENDA

[September 22, 2018]

Afternoon

Kurland 2 @ Ground floor@ Novotel Berlin Am Tiergarten Hotel	
13:00-15:15	**Session I-Renewable Energy and Clean Energy** Chaired by Prof. Mauricio Escalante Soberanis Universidad Autónoma de Yucatán/ Facultad de Ingeniería, Mexico
	9 Presentations—ICP015, ICP026, ICP033, ICP058, ICP1013, ICP1014, ICP111, ICP065, ICP021
15:30-15:45	**Coffee Break & Poster Display**
15:45-18:00	**Session II- Solar Energy Development and Utilization** Chaired by Prof. Silvia Brunoro University of Ferrara, Italy
	9 Presentations—ICP1003, ICP018, ICP031, ICP032, ICP042, ICP053, ICP070, ICP071, ICP108

Neuosier @ 1st floor@ Novotel Berlin Am Tiergarten Hotel	
13:00-15:30	**Session III-Photovoltaic Systems and Power Generation Technologies** Chaired by Prof. Ryuji Matsuhashi Graduate School of the University of Tokyo, 113-8656 Tokyo, Japan Co-chaired by Prof. Wei Yu, Shanghai Polytechnic University, Shanghai, China
	10 Presentations—ICP034, ICP054, ICP091, ICP1018, ICP086, ICP1005, ICP062, ICP005, ICP073, ICP1019
15:30-15:45	**Coffee Break & Poster Display**
15:45-17:30	**Session IV-Energy Storage Technology and Energy Engineering** Chaired by Prof. Ashmore Mawire, North West University, South Africa
	7 Presentations—ICP019, ICP025, ICP1004, ICP061, ICP088, ICP064, ICP048

Dinner @ Hotel Restaurant @ Ground Floor
<18:00-19:30>

AGENDA

[September 23, 2018]

Morning

Berlin-Ceres @ Ground floor @ Novotel Berlin Am Tiergarten Hotel	
09:30-12:00	**Session V-Electrical Engineering and Mechatronics** Chaired by Assoc. Prof. Yueh-Ru Yang Ming Chi University of Technology, Taiwan
	9 Presentations—ICP027, ICP105, ICP040, ICP041, ICP023, ICP107, ICP014, ICP049, ICP112

Lunch @ Hotel Restaurant @ Ground Floor
<12:00-13:30>

[September 23, 2018]

Afternoon

Berlin-Ceres @ Ground floor @ Novotel Berlin Am Tiergarten Hotel	
13:30-15:45	**Session VI-Power System and Energy** Chaired by Assoc. Prof. Giedrė Streckienė Vilnius Gediminas Technical University, Vilnius, Lithuania
	9 Presentations—ICP035, ICP028, ICP1009, ICP069, ICP029, ICP092, ICP037, ICP010, ICP038
15:45-16:15	**Coffee Break & Poster Display**
	Posters-ICP085, ICP1016, ICP081, ICP1012, ICP083, ICP1011, ICP104, ICP1017, ICP103, ICP113, ICP106

AGENDA

[September 24, 2018]

Excursion

Gathering Time: 10:00 AM **Gathering Place: Schlossbrücke, Charlottenburg** **Duration:** 3.5 hours (approx.)	
	**Departure Point** - Schlossbrücke, Charlottenburger
	**Itinerary:** Schlossbruecke, Charlottenburger Ufer - Hansaviertel - Spreebogencenter - Bellevue Palace - House of the Cultures of the World - German Chancellery - Central Train Station Haupbhanhof - Reichstag - Museum Island - Berlin Cathedral - Berlin City Palace - TV Tower - Berlin's Red Town Hall - Nikolai Quarter - Muehlendammschleuse - East-Side-Gallery - Mercedes Benz Arena - Oberbaum Bridge - TrepTowers (Molekulemen)
	**Highlights** • 3-hour boat cruise down the Spree River in Berlin • Learn about the history of the city from the ongoing narrative while the boat cruises down the river • Relax on the boat while eating a delicious two-course lunch and a beverage • See most of Berlin's top sites and attractions from the river
	**Return details -** Schlossbrücke, Charlottenburg

Inclusions:

✧ 2-course lunch + 1 drink per person (either 0.5l beer or 0.5l soft drink or 0.2l wine)
✧ For children: a small portion lunch + 1 small drink per person
✧ 3-hour river cruise
✧ English commentary from the speakers on board

Exclusions:

✧ Further drinks and meals
✧ Gratuities (recommended)
✧ Hotel pickup and drop-off

Attention:

✧ Gathering Place is Schlossbrücke, Charlottenburger
✧ The cost of One day Excursion is 80USD per person.
✧ Please keep your belongings with you.
✧ If you are interested, please give your feedback before or on September 10th. If you miss this date, we can't accept your request anymore.
✧ Please arrive the assembly point 10 minutes earlier. Thanks for your kind understanding!

AGENDA

Excursion Gathering Place

[Schlossbrücke, Charlottenburg]
September 24, 2018
Time: 10:00 AM

Route

From Novotel Berlin Am Tiergarten Hotel:

[21 min] Tiergarten-**S5**-Berlin-Charlottenburg--Walk to S Charlottenburg/Gervinusstr.-**Bus 109**- Schlossbrücke (Berlin)

[19 min] Tiergarten-**S5**-Zoologischer Garten Berlin-**Bus X9**-Quedlinburger Str. (Berlin)--Walk to Schloßbrücke

[21 min] Walk to Marchstr. (Berlin)-**Bus M45**-Luisenplatz/Schloss Charlottenburg-- Walk to Schloßbrücke

Attention

The pier at Schlossbrücke near Charlottenburg Palace is the point of departure for river cruises. A staircase leads from the street Charlottenburger Ufer down to the water. Visitors coming from the palace gardens can reach the pier on a path under the bridge.

When you arrive at the dock, please present your voucher at the counter (a small house with a sign "Reederei Winkler"). You will then receive a ticket for the cruise with a indication of your seat as well as a voucher for your 2-course lunch and 1 drink. The ticket will have to be presented whilst entering the boat and the voucher will have to be given to our staff on board of the boat.

WELCOME

Dear professors and distinguished delegates,

It is our great honor and pleasure to welcome you to the 3rd International Conference on Power and Renewable Energy held in Berlin, Germany on September 21-24, 2018.

The theme of ICPRE is to proclaim knowledge and share new thoughts among the professionals, industrialists and students from research areas of Clean and Renewable Energy, Power and Energy Engineering.

The evaluation of all the papers was performed based on the reports from anonymous reviewers, who are qualified in the related field.

We are pleased to have accepted 116 papers and 74 presentations from 30 countries and regions such as Canada, Mexico, Egypt, Turkey, China, Taiwan, Japan, South Korea, India, Iran, Saudi Arabia, Germany, Australia, United Kimdom, South Africa, France, Brazil, Portugal, Lithuania, Ecuador, Romania, Poland, Algeria, Denmark, Morocco, Colombia, Italy, Indonesia, Latvia, Indonesia in this program, which provide a wide spectrum of researches in various areas such as Solar Energy Development and Utilization, Renewable Energy and Clean Energy, Energy Storage Technology and Energy Engineering, Photovoltaic Systems and Power Generation Technologies, Electrical Engineering and Mechatronics, Power System and Energy, etc. All the presentations are peer-reviewed, and it has really been a difficult task to select the most representative papers.

Apart from this, the conference program is highlighted by the keynote and invited speakers: Prof. Dr.-Ing Kai Strunz from Technical University of Berlin, Germany; Prof. Dr. Mohan Kolhe from University of Agder, Norway and Prof. Masayuki Morimoto from Tokai University, Japan

Berlin, where the conference is held is best known for its historical associations as the German capital, internationalism and tolerance, lively nightlife, its many cafés, clubs, bars, street art, and numerous museums, palaces, and other sites of historic interest. Berlin's architecture is quite varied. Although badly damaged in the final years of World War II and broken apart during the Cold War, Berlin has reconstructed itself greatly, especially with the reunification push after the fall of the Berlin Wall in 1989.

It is now possible to see representatives of many different historic periods in a short time within the city centre, from a few surviving medieval buildings near Alexanderplatz, to the ultra modern glass and steel structures at Potsdamer Platz. Because of its tumultuous history, Berlin remains a city with many distinctive neighbourhoods. Brandenburger Tor is a symbol of division during the world war, which now shows German reunification. It was built after the Acropolis in Athens and was completed in 1799 as the royal city-gate.

To offer an opportunity to discover Berlin, the one day tour guided by trained guide is arrange on September 24th. We hope you will enjoy your stay in the conference as well as in Berlin.

Yours sincerely,

Conference Organizing Committee

SPEAKERS

Prof. Dr.-Ing. Kai Strunz

Technical University of Berlin, Germany

Professor Kai Strunz graduated with the Dr.-Ing. degree with summa cum laude from Saarland University, Germany, in 2001. From 1995 to 1997, he pursued research at Brunel University in London. From 1997 to 2002, Dr. Strunz worked at the Division Recherche et Développement of Electricité de France (EDF) in the Paris area. From 2002 to 2007, he was tenure-track Assistant Professor of Electrical Engineering at the University of Washington in Seattle. Since September 2007, he has been Professor and holder of the chair of Sustainable Electric Networks and Sources of Energy (SENSE) at Technische Universität Berlin.

Dr. Strunz is recipient of the IEEE PES Prize Paper Award 2015 and the IEEE Journal of Emerging and Selected Topics in Power Electronics First Prize Paper Award 2015. He received the National Science Foundation (NSF) CAREER Award of the USA in 2003. Kai Strunz received the Outstanding Teaching Award of the Department of Electrical Engineering at the University of Washington in 2004.

Professor Strunz was General and Technical Program Chair of the conference IEEE PES Innovative Smart Grid Technologies (ISGT) Europe 2012. He is Chairman of the IEEE PES (Power & Energy Society) Subcommittee on Distributed Energy Resources and Past Chairman of the IEEE Subcommittee on Research in Power & Energy Education. Dr. Strunz is editor of the open access IET Engineering Journal launched in 2013. He co-manages the operation of the Power-Globe email forum. He acted as a Review Editor for the IPCC (Intergovernmental Panel on Climate Change) from 2009 to 2011.

Title---Emerging Sustainable Energy Systems: European Innovations for Power Transmission and Distribution

Abstract---For the year 2050, the European Union (EU) aims to cut CO2 emissions by 80 % to 95 % compared with 1990 levels. Several research initiatives of the EU support these objectives by the system integration of renewable energy. Through the project eHighway2050, the foundation for a pan-European transmission grid have been laid. As a further prominent example given in the presentation, a new operation paradigm to manage distribution systems in a more efficient and cost-effective way were developed and demonstrated in project SuSTAINABLE. An important functionality of the Sustainable concept is the Virtual Power Plant (VPP). The VPP is a novel market player that aggregates and schedules distributed energy resources according to contracts established with them. The VPP's aggregation function is an important service to allow for the participation of small-scale wind, photovoltaics, and storage resources in the electricity market. A further valuable and novel service function of the VPP is the support of congestion management in the distribution network. Details of this services are explained in the presentation.

SPEAKERS

Prof. Dr. Mohan Kolhe
University of Agder, Norway

Professor (Dr) Mohan Kolhe is with the University of Agder (Norway) as full professor in electrical power engineering with focus in smart grid and renewable energy in the Faculty of Engineering and Science. He has also received the offer of full professorship in smart grid from the Norwegian University of Science and Technology (NTNU). He has more than twenty-five years' academic experience at international level on electrical and renewable energy systems. He is a leading renewable energy technologist and has previously held academic positions at the world's prestigious universities e.g. University College London (UK / Australia), University of Dundee (UK); University of Jyvaskyla (Finland); Hydrogen Research Institute, QC (Canada); etc.

He was also a member of the Government of South Australia's Renewable Energy Board (2009-2011) and worked on developing renewable energy policies.

Presently he is also leading the EU FP7 Smart Grid-ICT project 'Scalable Energy Management Infrastructure for Household' as Technical Manager. This project is in collaboration with 12 EU partners from 4 EU countries.

His academic work ranges from the smart grid, grid integration of renewable energy systems, home energy management system, integrated renewable energy systems for hydrogen production, techno-economics of energy systems, solar and wind energy engineering, development of business models for distributed generation etc. He also did extensive teaching in renewable and electrical energy systems engineering as well as in energy economics.

He has been successful in winning competitive research funding from the prestigious research councils (e.g. EU, EPSRC, BBSRC, NRP, etc.) for his work on sustainable energy systems. He has published extensively in the energy systems engineering. He has been invited by many international organizations for delivering expert lectures / courses / key note addresses / workshops. He has also been member of many academic promotional committees.

Title---Grid Interaction of Zero Energy Buildings (ZEBs): A Case Study of Southern Norway ZEBs

Abstract---These ZEBs have Building Integrated Photovoltaic (BIPV) system. The energy efficient housing development should consider that a building should produce the same amount of electrical energy as its annual requirements (i.e. ZEB). In future, ZEBs are going to play a significant role in the upcoming smart grid development due to their contribution on the on-site electrical generation, energy storage, demand side management etc. In Southern Norway, a smart village Skarpnes is developed for ZEBs. In this work, the usefulness of ZEBs for load matching with BIPV generation profiles and grid interaction have been analyzed. Impact of building integrated photovoltaic (BIPV) system has been investigated on the distributed network power flow as well as on protection and protective relays analysis. This work will provide to the participants on understanding of various grid interaction parameters suitable to describe energy performance of the BIPV.

SPEAKERS

Prof. Masayuki Morimoto
Tokai University, Japan

Masayuki Morimoto was born in Tokyo, Japan in 1952. He received his BSc, MSc and PhD degree in electrical engineering from Keio University, Japan in 1975, 1977 and 1990 respectively. He worked at Mitsubishi Heavy Industries, Ltd. from 1977 to 2005. Since 2005, He has been a Professor at the Department of electrical and electronics engineering, Tokai University. His research interests are in the areas of power electronics and its applications, electric machines and drives, and vehicle application. He is a Fellow of IEEJ, member of IEEE and several academic societies. He is the single author of 10 technical books in Japanese and the coauthor/editor of more than 10 technical books in Japanese.

Title---Contactless Power Transmission in Seawater

Abstract---Contactless Power Transmission (CPT) is becoming popular for charging small equipment such as mobile phones, electric toothbrushes, electric shavers, etc. This technology is also planned for applied to products with large power equipment such as electric vehicles and tram. By using CPT technology, we can charge battery at stand still and also we can continuously supply power to the moving object. The CPT is electrically safe because it has no exposure of high-voltage hot parts. From this point of view, CPT can be used in the water. This application has been discussed for very long time, however, the technology is not used in actual applications. There are several reports about CPT in the water. Capacitive coupling power transfer and inductive power transfer in the water has been discussed, however, these method can transfer power in the limited distance within several millimeters.

The magnetic resonant coupling method can transfer the power rather long distance such as several tenth centimeters or more. This method is actually applicable to the submerged application in seawater because the accuracy of docking or coupling from sender to receiver is not necessary.

In this presentation, the electrical affection of seawater to the contactless power transmission system will be discussed. And I will show some experimental results.

SESSIONS

September 22nd, 2018

Session I

[Renewable Energy and Clean Energy]

13:00-15:15
Kurland 2 @ Ground floor

Chaired by Prof. Mauricio Escalante Soberanis

Universidad Autónoma de Yucatán/ Facultad de Ingeniería, Mexico

9 presentations—
ICP015, ICP026, ICP033, ICP058, ICP1013, ICP1014, ICP111, ICP065, ICP021

***Note**:

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

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

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

SESSIONS

ICP015 13:00-13:15	Turkey’s Energy Strategy for 2023 Targets after 2000 MW Giant Renewable Energy Contract **Haci Sogukpinar**, Ismail Bozkurt and Serkan Cag University of Adiyaman,Adiyaman, Turkey Abstract— Turkey wants to become the world's 10th largest economy in the 100th anniversary of the foundation of the republic of Turkey. In order to achieve this goal, there are many breakthroughs in the political, economic and in energy fields. Turkey's installed power capacity was 85000 MW in 2017 but installed power of 125.000MW is targeted to achieve the objective of 2023 targets. The government is aiming to increase the total production of renewable energy share by 30% in 2023, while foreseeing the increase in capacity due to nuclear and fossil fuel consumption. Targets for different technologies are 34000 MW hydroelectric, 20000 MW wind energy, 5000 MW solar energy (photovoltaic and condensed solar energy), 1000 MW geothermal energy and 1000 MW biomass. Capacity utilization in hydroelectricity is 62%, wind power is 14%, and geothermal power is 33%. The total installed capacity of Biogas, Biomass, Waste Heat and Pyrolytic Oil Power Plants is 530 MW. Theoretical total power capacity of the solar energy for Turkey as 300 TWh/year and reached 45% of the 2023 target in 2017 in the last three years. However, it is estimated that the targets of 2023 in solar energy can be exceeded. Government offers attractive incentive packages for renewable and other energy sector to achieve 2023 goals. In order to encourage domestic production, a total of 2000 MW wind and solar energy installation bid was carried out in 2017.This contract is expected to make Turkey as energy hub both in terms of installation and technology. In this study, Turkey's renewable energy potential, and energy strategies and breakthroughs for this were investigated and discussed.
ICP026 13:15-13:30	Mitigating Risks of Intermittent Renewable Energy Generation with Electric Energy Storage **Friedrich Walcher** and Dennis Veit Technical University of Munich, Germany Abstract—A paradigm shift in the design of renewable energy support is taking place. Focus is shifting from fixed feed-in tariffs towards obligatory direct marketing supported by market premiums. This leads to challenges for wind park operators since power generation from wind is inherently intermittent and electricity market prices are highly volatile. Consequently, revenues are random and operators are opposed to volume and price risks. Risk management therefore gains strategic importance for wind park operators under market based support mechanisms. We propose to pool intermittent renewable energy generation technologies with electric energy storage in order to reduce short-term volume and price risks. In particular, we analyze how the integration of electric energy storage influences the risk-return profile of risk-averse wind park operators. Furthermore, we show how the optimal combination of wind and storage is characterized. For this purpose, we apply a mean

SESSIONS

	risk approach using the conditional value at risk (CVaR) in combination with a 2-stage stochastic model. We contribute to the literature in three ways. Firstly, we thematically expand the literature by incorporating the risk patterns into the valuation procedure and sizing of energy storage in combination with wind. Secondly, we adapt the concepts of utility functions, CVaR and marginal value of storage capacity to a linear stochastic optimization program for wind-battery-systems. Thirdly, we add to the current debate on the benefits of electric energy storage for integrating renewable energies into internal electricity systems. We demonstrate that risk-averse wind park operators can improve their risk-return profile by pooling wind generation and electric energy storage. This is true for the case with declining storage costs as well as for today's storage cost level. Our results indicate that electric energy storage can be a viable option to handle increasing market risks for renewable energy operators
ICP033 13:30-13:45	Evaluation of the Black Sea Wind Energy Potential for a Renewable Energy Perspective **Florin Onea** and Liliana Rusu "Dunărea de Jos" University of Galati,Galati, Romania Abstract—The objective of the present work is to assess the potential of the Black Sea wind conditions in the vicinity of the coastal areas, and also to estimate the configuration of a wind farm which may be implemented in this environment. The wind conditions were evaluated by using the reanalysis data coming from the ERA-Interim project for the interval 1998-2017. The datasets with a spatial resolution of 0.75o x 0.75o (≈ 82.5 km x 82.5 km) were processed. Several sites deployed along the center and western coastlines (from Sinop to Novorossiysk) were taken into account, being associated to a water depth which does not exceed 40 m, while the distance between each reference site was set to 100 km. The sites were chosen considering also the spatial distribution of the wind resources established in previous studies, when other wind fields were considered. In those studies was noticed that the center and western part of this basin seems to present a higher potential for a renewable energy project. In the final part of this work, a direct comparison between the wind conditions reported by some European wind projects and the ones from the Black Sea sites was carried out in order to highlight any similarities. In the same time, from this analysis was possible to estimate some potential wind farm configuration which may be taken into account for this target area. Based on these results, we need to mention that the Black Sea is a dynamical environment with relevant wind resources for a wind project, especially in the western part of this basin which is also defined by a shelf area characterized by a lower water depth (<50 m).
ICP058 13:45-14:00	Micro-Grid Simulation of Hybrid Renewable Energy Systems for Off-Grid Mexican Communities **Mauricio Escalante Soberanis**, Liliana San Pedro Cedillo, Mauricio Gamboa Marrufo and Manuel Flota Banuelos

SESSIONS

	Universidad Autónoma de Yucatán/Facultad de Ingeniería, Mexico Abstract—According to the World Bank, 28.3 % of the global population does not have access to electricity in their household. Near 500,00 households in Mexico did not have access to electricity during year 2016, which is equivalent to nearly 2% of the population. On the other hand, there is a significant amount of remote communities running on hydrocarbon-based power generators. An economical and technical feasibility study was developed to determine the best implementation opportunities for a remote hybrid power production system. This computational study represents the first stage of an implementation research study. Hydrocarbon-based power generators, photovoltaic and wind energy are connected to energy storage systems. The main objective is to propose a general framework for economic optimality of remote systems compared to the conventional connection to the electric grid. Three Mexican remote communities were considered in this study with different energy consumption levels (1,000 to 30,000 kWh per day). The main results indicate that the renewable penetration varies according to the community's energy needs and the solar and wind resources. According to our computer simulations, remote communities with a daily energy consumption shorter than approximately 25,000 kWh are economically feasible to install a renewable energy system, rather than connecting their electric system to the grid.
ICP1013 14:00-14:15	Preliminary Study of Jogging Activities Potential on Treadmill as a New and Renewable Electric Energy Source for Small-Scale Lighting in Household **Andi Faharuddin**, Muhammad Tola, Abdul Hafid, Ansar Suyuti, Mutmainnah and Syafaruddin University of Muhammadiyah Makassar, Indonesia Abstract—This research aims to experimentally demonstrate, a new and renewable electric energy source, derived from jogging activities on a treadmill used for a small-scale (household-scale) lighting. This experimental research setup consists of a minor modified manual treadmill (MMMT), a linear to rotary motion converter (LRMC) of 7.1 total ratio, a permanent magnet DC generator (PMDCG) of 30 Volt DC 2 Ampere, a lead acid maintenance free battery of 5 Ah 12 Volt and a LED DC lamp of 5 Watt 12 Volt as the main components. The LED lamp powered by electric energy in the battery that has been charged by PMDCG. Meanwhile, the electric energy was converted from the rotational motion of LRMC that derived from the MMMT, by the PMDCG. The experimental was done around 20 minutes a day as long as for one week, and the measured parameters were the output voltages of the generator, charging voltages of the battery and the charging currents into battery. Jogging activities on the treadmill for 20 minutes with speed ranging from approximately 1.62 to 1.68 kmph could produce the generator voltages and the battery charging voltages of 14.22 to 15.11 Volt and 12.39 to 12.99 Volt, respectively. at the charging currents of 0.46 to 0.56 Ampere. Hence, the charging powers of the system is about 5.93 to 7.21 Watt. This corresponds to the energy stored in the battery of averagely about

SESSIONS

	2.15 Watthour, a day. Therefore, the LED DC lamp of 5 Watt, 12 Volt, could be powered by that amount of energy for about 26 minutes, a day. Finally, the jogging activities on treadmill could be a new energy and also has some potential as a renewable energy source, for small-scale lighting in terms of emergency light in household.
ICP1014 14:15-14:30	Energy Efficient Industrial Parks Cooperation: The Case Study of Fabbrico and Rolo in Reggio Emilia, Italy **Silvia Brunoro**, Giacomo Bizzarri and Laura Ferrari University of Ferrara, Italy Abstract—This paper illustrates techniques and procedures for integrating common energy efficient services at Industrial Park level, in the way of having larger equipment with higher performance for covering the required energy demand by more effective services. Energy parks are responsible for big energy consumption, for this reason it is necessary to find smart solutions for managing energy outputs. A case of best-practice in Italy is presented, in which the synergy between the SMEs (Small Medium Enterprises) leads to a sustainable development.
ICP111 14:30-14:45	Vietnam Renewable Energy Development: Potential, Reality and Solutions **Khanh Viet Dung Tran** and Viet Trung Le PetroVietnam, Viet Nam Abstract—Annual GDP growth in Vietnam is about 7% in the period of 2016-2030. In order to meet this growth, Vietnam power system needs a corresponding development of power plant, power distribution and transmission networks. The total installed power capacity of Vietnam reached approximately 40 GW at the end of 2016, expected to increase to around 80GW in 2025 and 100GW in 2030. Currently, Vietnam power sources are based primarily on coal-fired power plant (35%), hydro power plant (32%), gas-fired power plant (25%) and a negligible proportion of other power sources including renewable energy. However, fossil fuels are being depleted, large scale hydro power plants with controversial environment impacts will not be prioritized for development. Besides, Vietnam has great potential for the development of renewable energy (wind power, solar energy). Therefore, the Vietnamese government target to promote the development of power sources from renewable energy, gradually increasing the proportion of electricity produced from renewable energy sources in the generation mix, to increase the total wind power generation capacity from 140 MW to 2,000 MW in 2025, reaching 6,000 MW in 2030; and aim to reach 850 MW solar power in 2020, 4,000 MW in 2025, 12,000 MW in 2030. To achieve this goal, the Vietnamese government will have more synchronous solutions related to energy policies, electricity pricing mechanisms, tax priorities, support for transmission and distribution, etc. This paper introduces an overview of Vietnam's power system, power source structure, power distribution & transmission systems and development trends; analysis of the potential development of wind energy, solar energy, causes and

SESSIONS

	limitations (economic, technical, policy ...) of the development of renewable energy in Vietnam and successful experiences of countries in the world. From an investor's perspective, this paper proposes appropriate policy solutions to the government to achieve the goal of renewable energy development.
ICP065 14:45-15:00	Investigation of Optimum Hydraulic Retention Time (HRT) of Semi-Batch Photofermentation Process in a Three-Stage System **Akman Melih Can**, Erguder Tuba H., Gündüz Ufuk and Eroğlu İnci Middle East Technical University, Turkey Abstract--This photofermentation research study investigates the third-stage of an integrated three-stage system, which consists of dark fermentation, methanogenesis and photofermentation, to improve the total energy of the integrated system. To that purpose, a set of semi-batch photofermentation reactors was operated. It was aimed to determine the optimum hydraulic retention time (HRT) of photofermentation stage leading to the optimization of energy production in three-stage system. In this direction, three different HRT values of 2, 4 and 6 days were studied. It was planned to investigate hydrogen production rate and hydrogen yield of semi-batch photofermentation reactors. The photofermentation process was followed by using pure strain of purple non-sulfur (PNS) bacteria, Rhodobacter capsulatus DSM1710. Results indicated that, under the studied conditions, HRT value which provided the highest hydrogen production rate was 4 days. The highest production rate was observed as 0.041 mmol/L.h at that condition. When hydrogen yields were examined, HRT value of 6 days provided the highest hydrogen yield of 0.622 mol H2/mol HAc. The highest hydrogen production rate obtained in this study (0.041 mmol H2/L.h) was quite low compared to those given in literature studies using R. capsulatus (0.14-1.01 mmol H2/L.h). On the other hand, the highest hydrogen yield of 0.62 mol H2/mol HAc obtained in this study was found to be higher than those obtained so far in the literature studies using R. capsulatus (0.218-0.569 mol H2/mol HAc). Thus, photofermentative hydrogen production in three-stage systems is promising and can be further improved/optimized. Higher hydrogen production yield is expected to provide higher gross heating value in three-stage integrated system. Therefore, the optimum HRT value for photofermentation stage operated in semi-batch mode was determined as 6 days.
ICP021 15:00-15:15	Supercritical Water Gasification of Eucalyptus Wood Chips Using NiFe2O4 as a Catalyst Ane Caroline Pereira Borges, Jude A. Onwuidili, **Carine Tondo Alves**, Andrew Ingram, Heloysa Martins Carvalho Andrade, Ednildo Andrade Torres and Silvio Alexandre Beisl Vieira de Melo Federal University of Reconcavo of Bahia (UFRB), Feira de Santana, Brazil Abstract—In this work, the supercritical water gasification of eucalyptus wood chips has been investigated in relation to reaction temperature and presence of catalyst. Experiments were performed in a batch reactor at 450 ºC and 500 ºC with two

	different feed concentrations. This work wanted to evaluate mainly the gases were formed during the reactions. The gas products were analysed by gas chromatography. According to the results, it was found that eucalyptus wood chips reacted to form mainly H2, CH4 gases with little yield of CO2. Increasing the reaction temperature beyond 500 ºC led to the increasing production of both CH4 (around 31.1 mol%) and H2 (up to 38 mol%) gases and the liquid sample and solid residue have decreased. Generally, this work suggests that the SCWG has improved significantly the production of H2 but more experiments still necessary to verify the effects of other experimental parameters and to characterise the liquid sample and solid residue.

Coffee Break
<15:30-15:45>

SESSIONS

September 22nd, 2018

Session II

[Solar Energy Development and Utilization]

15:45-18:00

Kurland 2 @ Ground floor

Chaired by Prof. Silvia Brunoro

University of Ferrara, Italy

9 presentations—

ICP1003, ICP018, ICP031, ICP032, ICP042, ICP053, ICP070, ICP071, ICP108

***Note**:

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

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

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

SESSIONS

ICP1003 15:45-16:00	The Magnetic Cobalt Nanoparticles Embedded in Nanoporous Carbon for Good Reusability in Solar Energy Absorption Properties **Lingling Wang**, Dandan Yang and Wei Yu Shanghai Polytechnic University, Shanghai, China Abstract—Solar thermal collector and heat exchanger are two indispensable components in the practical application of nanofluids in the photothermal technology. There is inevitable heat loss produced by the heat exchanger. Here, we propose a new concept "magnetic photothermal nanofluilds", which not only can avoid the heat transfer process of heat exchanger, but also can direct use the base liquid of nanofluids. The magnetic cobalt nanoparticles (NPs) embedded in nanoporous carbon (Co@NC) are prepared via carbonization of zeolitic imidazolate framework-67 (ZIF-67). The obtained Co@NC retains the morphology of original ZIF-67 and the magnetic Co nanoparticles distribute evenly in the nanoporous carbon. Co@NC has an excellent magnetic property and broad absorption spectrum in the visible and infrared region. The maximum photothermal conversion efficiency has been achieved by 100ppm Co@NC/EG nanofluids at carbonization temperature of 900℃, which is 99.6% at 60s. This magnetic photothermal nanofluilds can be reused at least 60 successive cycles without significant loss of photothermal conversion efficiency. This study paves a new avenue for direct use the base liquid of nanofluids in the solar thermal conversion technique.
ICP018 16:00-16:15	Design Analysis Factors of Solar Desalination Power Plants **A.Z. Hafez**, A.M. Yousef and A.S. Abu-Elhamyel University of Nottingham, UK Abstract--This paper presents a review of the design parameters used in the construction of solar desalination systems, along with a review on their applications on different climate conditions. Recent studies that analyze the deployment of solar desalination systems through two main processes, the first one is the direct process where there are many types of it as humidification, dehumidification, membrane distillation (MD), solar pond, multi stage flash (MSF), multi effect desalination (MED), or vapor Compression (VC). While the second type is indirect process, which consist of two types: active solar still or passive solar still. The design parameters in different countries and the operational solar desalination plants are also presented and discussed. The paper also discusses the different kinds of solar still types and design factors developed since 1968, which are especially required for the manufacturing, analysing, testing and validation of the systems. Furthermore, a feasibility data analyses on economic effects of a desalination system to the developing countries.
ICP031 16:15-16:30	Design Optimization and Demand Side Management of a Solar-assisted Industrial Heating Using Agent-Based Modelling (ABM): Methodology and Case Study **Fitsum Bekele Tilahun**, Ramchandra Bhandari and Menegesha Mamo ITT, TH Köln (Cologne University of Applied Science), Germany Abstract—Heavy dependence on traditional fuels as well as connection to a

SESSIONS

	significantly unreliable and inefficient grid (with about 20% energy loss) characterizes the Ethiopian industry. On the contrary, the country has many solar-suited industries for process heat augmentation in the low-to-medium temperature ranges. Thus, if properly designed and operated, solar thermal could give an opportunity for an efficient and cleaner alternative in these industries. This paper presents agent-based modeling (ABM) for an integrated optimization and demand side management (DSM) framework for solar-assisted industrial heating under varying load and weather condition. To demonstrate the validity and practicality of the proposed solution, a case study was conducted on Ethiopian textile industry. A payback period of 5.3 years and solar fraction of 66.7% was identified for an optimized system. Further with the implementation of DSM to guide the production policy of the industry, a 7.5% and 8.4% improvement in payback and solar fraction was achieved.
ICP032 16:30-16:45	Evaluation of Solar Ponds and Aplication Area **Haci Sogukpinar**, Ismail Bozkurt and Serkan Cag University of Adiyaman, Adiyaman, Turkey Abstract—Solar ponds are heat storage systems where solar energy is collected and stored thermally. Solar ponds were discovered during the temperature variations in the lower regions of existing saltwater pond in the area is found to be higher than their surface. Later, it was constructed artificially and started to be used. These systems have heat storage capacity at moderate temperatures. Solar pons are used in many areas such as electricity generation, heating the environment, meeting the need of hot water, drying food and obtaining fresh water from salty water. In this study, the studies about solar ponds were summarized, the construction of solar pond was explained, and the application areas were examined.
ICP042 16:45-17:00	Solar Energy Technology Choice Development **Mohammed Alsumiri** and Hisham El Khashab Electrical and Electronics Engineering Technology Department, Yanbu Industrial College, Saudi Arabia Abstract—During the last decade with the modern scientific development, different solar energy (SE) technologies were introduced under vast cost variations. The huge need of energy for the use of economic development with the rise of fossil fuel price represents an urgent problem worldwide. The geographical location of Arab countries makes them subject to high average solar irradiance. So that, sustainable energy generation especially solar energy generation can be suitable alternative to conventional energy generation. To implement a solar energy application, the suitable technology choice represents a huge challenge due to high risk against budget cost. In this paper, different solar energy technologies are discussed with the suitable application to obtain the optimal energy conversion system efficiency. Both photovoltaic (PV) and Solar thermal technologies were investigated.

SESSIONS

ICP053 17:00-17:15	Performance Improvements of the Air-based Solar Heating System (Improvement Method of Thermal Performance) **Youngjin Choi** Kyushu University, Platform of Inter/Transdisciplinary Energy Research, Japan Abstract—In this study, it is proposed a heating and hot water system for a house using the air-based solar collection. The performance of existing solar heating system is analysed by annual simulation and the problems and the effect of thermal characteristics of the system are investigated due to change of heat collecting surface, heat storage method, capacity, building insulation performance and so on. Furthermore, it presents an improvement plan that maximizes the effect of the system and the performance of the system.
ICP070 17:15-17:30	Evaluation of the Solar Energy Potential of M'Sila (a province of Algeria) **Nabila Ihaddadene**, Razika Ihaddadene, Feres Hadji and Marwan Mostfaoui Department of mechanical engineering, M'Sila University, Algeria Abstract—A precise Knowledge of the solar energy potential in a particular region is important for the development of any solar energy device and estimation of its performance. This paper deals with the data of temperature and incident solar radiation on a horizontal surface recorded by M'Sila meteorological station for 365 days per interval of 5 minutes. M'Sila is sunny during 4388 hours per year. The curves describing the daily evolution of the air temperature at M'Sila region present the same gait, they admit two extremums (limit values), a peak (Tmax) which occurs on the day on average around 14h 21min and a minimum (Tmin) taking place at night on average at 5h 11min. For the five months of May, June, July, August and September, the average monthly temperature is above the annual mean temperature (20.12 °C). There is a discard of three weeks and three days between the longest day (June 18) and the day when the temperature is highest (July 13) due to the heat capacity of the air. The peak of daily insolation occurs between 9h 14min and 13h 59min. M'Sila receives a total of 6316.42 MJ / m2 during the year of study.
ICP071 17:30-17:45	Cabron-Nanotube Based Thermoelectrical Paste for Enhancing Solar Cell Effciency **Mohamed Fathi Sanad**, Ahmed Shaker, Sameh O. Abdellatif, Iman Elmahallawi, Hani A. Ghali and Khaled Kirah Centre for Emerging Learning Technologies (CELT), The British University in Egypt,Cairo, Egypt Abstract—A super-passive cooling technique based on a thermal paste is proposed for PV efficiency enhancement in elevated temperature conditions. A mixture between carbon nanotubes and graphene having a promising Seebeck coefficient is chosen. An overall enhancement in efficiency by around 58% was reached while thermoelectrically supplying hundreds of micro-Watt per PV Watt.

SESSIONS

ICP108 17:45-18:00	Design and Fabrication of a Prototype Solar Tapping Device **Anirudh N. Kulkarni**, B. Arjun Bhat, Chinmay D. Sastry and Dr. K. S. Sridhar PES University, Bangalore, India Abstract—Fossil fuel based energy sources are most commonly used because of the ease of availability and affordability, but have many long lasting negative effects, due to which a shift must be made to renewable and clean energy sources such as solar energy. Efficiency of the photovoltaic cells have increased by 1% [1] every ten months, resulting in reduced costs and increased number of users. The project will explore the design and fabrication of an improved and efficient solar tapping device. An effort will be made to incorporate an architectural concept called “barrel vault” that is primarily used for natural lighting, over a Fresnel lens plate setup to act as a collector. The tracking mechanism incorporated is unique and can be modified to either have single axis or dual axis tracking depending on the requirements. Keeping in mind the environment and cost, an attempt has been made to fabricate the product with higher energy conversion rate, at an affordable cost using the above techniques. Upon analysing the results, the conclusion could be drawn that there was an increase in conversion rate of up to twice the traditional setup.

Dinner @ Hotel Restaurant @ Ground Floor
<18:00-19:30>

SESSIONS

September 22nd, 2018

Session III

[Photovoltaic Systems and Power Generation Technologies]

13:00-15:30

Neuosier @ 1st floor

Chaired by Prof. Ryuji Matsuhashi

Graduate School of the University of Tokyo, 113-8656 Tokyo, Japan

Co-chaired by Prof. Wei Yu

Shanghai Polytechnic University, Shanghai, China

10 presentations—

ICP034, ICP054, ICP091, ICP1018, ICP086, ICP1005, ICP062, ICP005, ICP073, ICP1019

***Note**:

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

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

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

SESSIONS

ICP034 13:00-13:15	Quantifying the Influences on Probabilistic Wind Power Forecasts **Jens Schreiber** and Bernhard Sick Intelligent Embedded Systems Group, University of Kassel, Germany Abstract—In recent years, probabilistic forecasts techniques were proposed in research as well as in applications to integrate volatile renewable energy resources into the electrical grid. These techniques allow decision makers to take the uncertainty of the prediction into account and, therefore, to devise optimal decisions, e.g., related to costs and risks in the electrical grid. However, it was yet not studied how the input, such as numerical weather predictions, affects the model output of forecasting models in detail. Therefore, we examine the potential influences with techniques from the field of sensitivity analysis on three different black-box models to obtain insights into differences and similarities of these probabilistic models. The analysis shows a considerable number of potential influences in those models depending on, e.g., the predicted probability and the type of model. These effects motivate the need to take various influences into account when models are tested, analyzed, or compared. Nevertheless, results of the sensitivity analysis will allow us to select a model with advantages in the practical application.
ICP054 13:15-13:30	Methodology for Calculating the Potential Maritime Wind Park Area by Taking into Account the Needs of Shipping Sector **Astrida Rijkure** Scientific Institute of Economics and Management, University of Latvia, Latvia Abstract—Renewable energy sources (wind energy, solar energy, hydroelectricity, ocean energy, geothermal energy, biomass and biofuels) are alternatives to fossil fuel that help to reduce greenhouse gas emissions, diversify energy supplies and reduce dependency on markets of unsustainable and volatile fossil fuels, particularly oil and gas. Wind energy is one of the renewable energy sources and is considered to be self-renewable as it is the result of the Sun's activity. Using wind energy is a rapidly developing industry today, and more and more wind turbines are installed worldwide every year, land-based wind turbines being more widespread than offshore ones. In Latvia, spread of land-based wind parks is hampered by unsettled land ownership rights, while the deployment of wind parks in the sea is a new field for all Baltic States. The neighbouring countries Estonia and Lithuania have developed their own projects for offshore wind parks, therefore the topicality of the development of wind farms in the territorial waters of Latvia has also increased. Experts have proposed best options and their locations. When assessing possibilities for development of wind parks and their capacity, the following economic factors were evaluated: construction and connection costs, potential operational costs and energy prices. The aim of this study is to develop the methodology for calculating the area of a potential wind park by considering the safety distance to shipping routes and height of the wind turbines, as well as for calculating the potential capacity of a wind park.

SESSIONS

ICP091 13:30-13:45	Offline Photovoltaic Maximum Power Point Tracking **Fyali Jibji-Bukar** and Olimpo Anaya-Lara University of Strathclyde, United Kingdom Abstract—As more renewable energy sources are connected to the electrical grid, it has become important that these sources participate in providing system support. It has become needful for grid-connected solar photovoltaics to participate in support functions like frequency support. However, photovoltaic systems need to implement a maximum power tracking algorithm to operate at maximum power and a method for de-loading photovoltaic systems is necessary for participation in frequency support. Some conventional maximum power tracking techniques are implemented in real time and will not adjust their output fast enough to provide system support while other may respond fast but are not very efficient in tracking the maximum power point of a photovoltaic system. This paper presents an offline method to estimate the maximum power voltage and current based on the characteristics of the photovoltaics module available in the datasheet and using the estimated values to operate the photovoltaics at maximum power. The performance of this technique is compared to the conventional technique. This paper also describes how the photovoltaic system can be de-loaded.
ICP1018 13:45-14:00	Optimal Design of a Coproduction System of Electricity and Hydrogen to Manage Imbalances Resulting from Forecast Errors in Photovoltaic Outputs **Ryuji Matsuhashi** and Tsuyoshi Yoshioka Graduate School of the University of Tokyo, Japan Abstract—Renewable power sources are increasing mainly because of economic institutions such as renewable portfolio standard or feed-in tariff program. In Japan, the feed-in tariff program triggered explosive growth of photovoltaic systems because of its high tariff level. Although mass introduction of photovoltaic systems certainly contributes to reduce CO2 emissions, it causes instability issues in power systems. One of the most serious issues is management of imbalances resulting from forecast errors in photovoltaic outputs. On the other hand, power-to-gas technologies are attracting our attention, since these technologies could convert surplus of renewable energy to other energy carriers. In particular, hydrogen is efficiently produced from electricity using electrolysis. We could use hydrogen to manage the imbalances by the system, in which uncertain parts of photovoltaic outputs are used to produce hydrogen. In this paper, we propose a coproduction system of electricity and hydrogen to reduce the imbalances. For this purpose, a novel mathematical model is developed, in which we determine the structure of the coproduction system with a mixed integer linear programming method. Evaluated results indicated that the coproduction system is economical under appropriate capacity of the electrolyzer.

SESSIONS

ICP086 14:00-14:15	Parameter Identification and Effect of Partial Shading on a Photovoltaic System Amin Hajizadeh and **Jishnu Warrier Anil Kumar** Department of Energy Engineering, Aalborg University, Denmark Abstract--Partial shading cause significant losses to the performance of a photovoltaic (PV) system. So, it is imperative to study effects of partial shading; for that a two-diode model of the experimental setup made. Upon verifying the model with the experimental parameters, a Matlab/Simulink model is made based on this model. Various shading patterns, the effect of bypass diodes; the effect of overlapping bypass diode is studied on this MATLAB/Simulink model. It is found out that the reduction in power loss is depended on the location of the shaded cell but not the area of the shaded cell. Also, the over-lapping bypass diode configuration has a slight improvement in the PV performance compared to the non-overlapping bypass diode configuration. An experimental test is also conducted by applying different shading pattern and they proves the results are compatible with the simulated results.
ICP1005 14:15-14:30	Monitoring and Analysis of Power Quality in Photovoltaic Power Generation System **Cui Ji,** Siming Hua, Bingbing Zou, Hua Zhang, Chang Diao, Guofa Zhou and Bo Min Shanghai Puhai Qiushi Electric Power High Technology Co.,Ltd., China Abstract—Solar photovoltaic (PV) has been developed rapidly due to its clean and green renewable characteristics. The connection of photovoltaic power generation to the traditional grid system is bound to bring power quality problems. Based on above, this paper introduces the power quality testing method of photovoltaic grid-connected power grid in detail. And then takes the Shanghai Qingpu Nanrong distributed photovoltaic power generation for example, which is the largest single roof photovoltaic power station in Shanghai by far, to use the method to test its power quality. The power quality index include harmonic, voltage imbalance, and frequency deviation. The test and analysis provide a reference for the monitoring and analysis of power quality of photovoltaic grid-connected power grid.
ICP062 14:30-14:45	Prospects of Trilateral Flash Cycle (TFC) for Power Generation from Low Grade Heat Sources **Md Arbab Iqbal**, Sohel Rana, Mahdi Ahmadi, Thomas Close, Abhijit Date and Aliakbar Akbarzadeh School of Mechanical and Automotive engineering, RMIT University, Australia Abstract--Despite the current energy crisis, a large amount of low grade heat (below 100oC) is being wasted for the lack of cost effective energy conversion technology. In the case of the conventional Organic Rankine Cycle (ORC) based geothermal power stations, only about 20% of available heat can be utilised due to a technological limitation as there is a phase change in the working fluid involved during the addition of heat which decreases utilisation effectiveness of the system. Therefore, in this paper, a trilateral flash cycle (TFC) based system has been studied to find out its prospect for utilizing more power from the same heat resources as the ORC. The TFC is a thermodynamic cycle that heats the working fluid as a saturated liquid from which

	it starts its expansion stage. The flash expansion is achieved by feeding the saturated high-pressured liquid working fluid through a convergent-divergent nozzle at which point it undergoes a flash expansion in the low-pressure environment of the generator housing. The momentum of the working fluid is extracted via a Pelton wheel and the cycle is completed with working fluid condensation and pressurisation. The analytical comparative study between the ORC and TFC based system shows that the TFC has about 50% more power generation capability and almost zero contribution on global warming.
ICP005 14:45-15:00	Efficiency Rate Optimization of Osmotic Energy Power Plants L. Stibbe, **Antonin Giovanetti**, S. Khan and S. Fontaine ECE Paris School of Engineering, France Abstract—In a context of world energetic mix diversification and greenhouse effect reduction, attention is focusing on renewable and carbon free sources. Amongst them marine sources are attractive ones by their huge potential today globally evaluated at world scale as high as 120.000TWh/ year. They include osmotic energy one, which has been up-to-now left aside because of technological constraints and prohibitive exploitation cost. Reduction of their impact implies two possible actions : to operate the plants at a maximum efficiency rate, and to improve membrane technology in order to significantly lower exploitation costs. These two actions can be developed independently and it is proposed in the present study to concentrate on the first point to maximize theoretical osmotic plant efficiency rate. The output is a set of relations between system parameters defining the “optimized” line along which the system ought to be operated. This first study opens for a parallel study the technical feasibility of such optimally designed membranes to be installed in the plants.
ICP073 15:00-15:15	Power Generation from Low Grade Waste Heat Using Thermoelectric Generator **Sohel Rana**, Arbab Iqbal, Abhijit Date and Aliakbar Akbarzadeh Energy Conservation and Renewable Energy, School of Mechanical and Automotive Engineering, RMIT University, Bundoora East Campus-3083, Australia Abstract—Thermoelectric technology is thought to be a great solution in near future for producing electrical power and recovering low grade waste heat to cut the cost of power generation because of its consistency and eco-friendly affability. Though commercial accessibility of TEG is available currently but heat to electricity conversion efficiency is still low and cost of the module is reasonably high. It’s essential to use the modules competently which is strongly depends on suitable heat exchanger design and selection of proper operating conditions. In this work, TEG module has been selected from the commercially available modules with efficiency of 1.91% for the targeted low-grade waste heat temperature of T_h=90^{o}C and T_c=15^{o}C which validated by experiment. Mathematical model has been proposed to simulate TEG based power generation system; the model can predict maximum net power, choose optimum operating conditions and dimensions of heat exchanger. Lab scale design with channel length 1 m, width 0.08 m and gap size 9 mm which is suitable for

SESSIONS

	50 TEG module (4 mm x 4 mm) have been simulated using proposed mathematical model. For above temperature range, predicted optimum net power was 76.45 W with optimum flow rate 0.94 L/s (56.4 L/min). This lab scale setup will be used for experimental validation of the proposed mathematical model. The obtained results from experiments and simulation are closely matched.
ICP1019 15:15-15:30	Wake and Turbulence Analysis for Wind Turbine Layouts in an Island Amrender Singh Bachhal, Klaus Vogstad, **Mohan Lal Kolhe**, Abhijit Chougule and Hans George Beyer Faculty of Engineering and Science, University of Agder, Norway Abstract—There is a big wind energy potential in supplying the power in an island and most of the islands are off-grid. Due to the limited area in island(s), there is need to find appropriate layout / location for wind turbines suited to the local wind conditions. In this paper, we have considered the wind resources data of an island in Trøndelag region of the Northern Norway, situated on the coastal line. The wind resources data of this island have been analyzed for wake losses and turbulence on wind turbines for determining appropriate locations of wind turbines in this island. These analyses are very important for understanding the fatigue and mechanical stress on the wind turbines. In this work, semi empirical wake model has been used for wake losses analysis with wind speed and turbine spacings. The Jensen wake model has been used for the wake loss analysis due its high degree of accuracy and the Frandsen model for characterizing the turbulent loading. The variations of the losses in the wind energy production of the down-wind turbine relative to the up-wind turbine and, the down-stream turbulence have been analyzed for various turbine distances. The special emphasis has been taken for the case of wind turbine spacing, leading to the turbulence conditions for satisfying the IEC 61400-1 conditions to find the wind turbine layout in this island. The energy production of down-wind turbines has been decreased from 2 to 20% due to the lower wind speeds as they are located behind up-wind turbine, resulting in decreasing the overall energy production of the wind farm. Also, the higher wake losses have contributed to the effective turbulence, which has reduced the overall energy production from the wind farm. In this case study, the required distance for wind turbines have been changed to 6 rotor diameters for increasing the energy gain. From the results, it has been estimated that the marginal change in wake losses by moving the down-stream wind turbine by one rotor diameter distance has been in the range of 0.5 to 1% only and it is insignificant. In the full-length paper, the wake effects with wind speed variations and the wind turbine locations will be reported for reducing the wake losses on the down-stream wind turbine. The Frandsen model has been used for analyzing turbulence loading on the down-stream wind turbine as per IEC 61400-1 criteria. In larger wind farms, the high turbulence from the up-stream wind turbines increases the fatigues on the turbines of the wind farm. In this work, we have used the effective turbulence criteria at a certain distance between up-stream and down-stream turbines for minimizing the fatigue load level. The sensitivity analysis on wake and turbulence

	analysis will be reported in the full-length paper. Results from this work will be useful for finding wind farm layouts in an island for utilizing effectively the wind energy resources and electrification using wind power plants.

Coffee Break
<15:30-15:45>

SESSIONS

September 22nd, 2018

Session IV

[Energy Storage Technology and Energy Engineering]

15:45-17:30

Neuosier @ 1st floor

Chaired by Prof. Ashmore Mawire

North West University, South Africa

7 presentations—
ICP019, ICP025, ICP1004, ICP061, ICP088, ICP064, ICP048

***Note**:

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

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

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

SESSIONS

ICP019 15:45-16:00	Thermal Stratification Performance of a Packed Bed Latent Heat Storage System during Charging **Ashmore Mawire**, Katlego Lentswe, Robert Lugolole, Denis Okello and Karidewa Nyeinga North West University, South Africa Abstract—Experimental thermal stratification evaluation of a packed bed latent heat storage is done during charging cycles. The packed bed latent heat storage system consists of adipic acid encapsulated in aluminum spheres. Sunflower oil is used as the heat transfer fluid during charging cycles. Stratification number profiles are used to evaluate thermal stratification in the storage system. Charging experiments are carried out with three different flow-rates (4 ml/s, 8 ml/s and 12 ml/s). Charging experiments are also done using the same flow-rate (8 ml/s) with three different set heater temperatures (220 oC, 240 oC and 260 oC). The lowest charging flow-rate (4 ml/s) shows the best variation of the stratification number profile since it shows the least drop from the peak value and the shortest charging interval. Different set heater temperatures show almost identical stratification number profiles. The effect of the charging flow-rate is more significant than the effect of the charging set heater temperature when evaluating thermal stratification for this particular system.
ICP025 16:00-16:15	How Electrical Storage Heaters Can Reduce Wind Curtailment by Satisfying System Reserve Requirements **William D. Kerr**, David M. Laverty and Robert J.Best Queen's University Belfast, UK Abstract—This paper proposes how using electric storage heaters could provide a portion of the system reserve requirements which would otherwise have to be satisfied by conventional generation. With the upgrade and install of new advanced electrical storage heaters there is the potential to provide large system reserve capabilities when combined with a high-speed communications network. Together with these new more efficient heaters, not only will domestic emissions be reduced, the overall electrical grid CO2 intensity should experience an improvement due to the incorporation of the demand side management (DSM) aspect. The All-Ireland system has been used in this paper as an example of an electrical network which is undergoing a significant transition to high penetrations of renewables, while having a considerable population of potentially upgradeable electric heating sources for DSM control.
ICP1004 16:15-16:30	Composite Electrolytes for Enhancing Operating Voltage Window of Supercapacitors **Lia Kouchachvili** Canmet Energy, Natural Resources Canada, Ottawa, ON. Canada Abstract—Supercapacitors as energy storage devices are gaining increased interest as their energy storage capacity without compromising their high power density is increasing. Electrolytes play a very important role in performance of supercapacitors. One of the important defining factor for selecting suitable electrolytes, beside their

	ionic conductivity is their stability under high operating voltages. We investigated non-toxic, non-flammable solvent for inorganic salts to compose the electrolytes for use in supercapacitors. The supercapacitor cell with this electrolyte can easily operate up to 2.5V without any sign of degradation. The specific capacitance of the electrodes in this electrolyte reached 375F/g that is significantly higher than the specific capacitance (48F/g) of the electrodes in the aqueous Na2SO4 electrolyte in the same electrode-electrolyte interface.
ICP061 16:30-16:45	Techno-economic Evaluation of Energy Storage Systems Built from EV Batteries–Prospective Revenues in Different Stationary Applications **Tam Thanh Nguyen**, Maik Naumann, Cong Nam Truong and Andreas Jossen Institute for Electrical Energy Storage Technology at Technical University of Munich (TUM), Germany BMW Group, Petuelring 130, 80788 Munich, Germany Abstract—Battery energy storage systems (BESSs) are already being deployed for several stationary applications in a technically and economically feasible way. This paper focuses on the revenues of industrial BESSs built from electric vehicle lithium-ion batteries with varying states of health. For this analysis, a stationary BESS simulation model is used, that is parameterised with parameters of a 22-kWh automotive battery. The comprehensive model consists of several detailed sub-models, considering battery characteristics, ageing and operating strategies, which allow technical assessment through time series simulation. Therefore, capacity fade and energy losses are considered in this techno-economic evaluation. Potential economically feasible applications of new and second-life batteries, such as photovoltaic home storage, intraday trading and frequency regulation as well as their combined operation are compared. The investigation includes different electricity price scenarios. The combined operation, followed by frequency regulation, is found to have the highest economic viability for the specified electric vehicle battery.
ICP088 16:45-17:00	Electrochemical analysis of modified BCZY electrolyte for enhanced proton-conducting fuel cells **Sewook Lee**, Sangho Park and Dongwook Shin Hanyang University, Seoul, Republic of Korea Abstract—For years, many research groups have tried to solve the significant problem, high operating temperatures of solid oxide fuel cells. As an alternative, proton-conducting fuel cells have been attracted tremendous attentions thanks to their relatively low operating temperatures. Among the various materials in proton-conducting materials, BaCe0.5Zr0.35Y0.15 (BCZY) is a well compromised material between proper ionic conductivity of Y doped barium cerate (BCY) and good chemical stability of Y doped barium zirconate (BZY). However, some researchers have reported that BZY, in fact, has higher grain bulk (or grain interior) conductivity than BCY and the reason why BZY has unacceptably low total conductivity is the highly resistive grain boundary. Therefore, to reduce the total ohmic resistance,

	microstructure modification of the grain in BCZY materials is still a matter of debate. In this work, we study a possible way to reduce the total resistance with surface modification of starting from a grain interior with BZY to its grain boundary with BCY. The modified synthesis used the BCY solution and pre-crystallized BZY powders. The symmetrical cell with modified BCZY powders was prepared with Pt pastes as an electrode. Also, the single cell with modified-BCZY electrolyte was successfully fabricated with the electrostatic slurry spray deposition (ESSD) technique. Morphologies of single cell were observed by scanning electron microscope. Phase development of powders was identified by X-ray diffractometer and chemical stability was measured using the thermogravimetry analysis (~1400oC). Performance evaluation was carried out at temperatures of 550-700°C with humidified hydrogen (~3% H2O) and air used as the oxidant. Electrochemical properties of the symmetrical BCZY cells were studied by AC impedance spectroscopy in wet N2 atmosphere.
ICP064 17:00-17:15	Evaluation of Power Production from Different Scenarios Regarding Combustion of Sewage Sludge: A Waste and an Alternative Energy Source **Emin Calbay**, Ayşegül Aksoy and F. Dilek Sanin Middle East Technical University, Turkey Abstract—Climate change is a significant threat and its main contributor is the greenhouse gas emissions due to fossil fuel utilization in energy sector. Share of alternative non-fossil energy sources such as sewage sludge can be increased to substitute for fossil fuels to control this global threat. Although sewage sludge is problematic waste, it contains significant energy value. Besides, sludge is considered as biomass since Carbon content of sludge is non-fossil based. Therefore, sewage sludge is accepted as an alternative energy source due to being renewable and local. There have been a worldwide progress regarding the technologies on energy generation from sewage sludge. Due to the legislative limitations and efforts on reducing environmental impacts, sewage sludge disposal approaches are being shifted from dumping to recovering the energy. In recent years, studies on sludge management focus on comparing various management approaches as thermal processes that produce power or environmentally risky land application or landfilling, etc. Thermal processes such as combustion, pyrolysis, gasification, etc… have advantage of converting sludge into energy. Transition from environmentally risky management methods to innovative thermal processes is crucial. The only problem is, pyrolysis and gasification technologies are still in progress and not commercialized to be common. Until these innovative technologies are proven to be robust and efficient, combustion is evaluated as the transition technology in sludge management. Existence of sufficient data and ease in operation make combustion an available and applicable energy production process from sewage sludge. Besides, electricity generation by sludge has potential to avoid fossil based carbon dioxide (CO2) emissions. A critical issue regarding energy generation is; high water content of in sludge has adverse effects in energy balance. Therefore, drying is required. This study evaluates three

	different scenarios including power generation from sludge combustion by a calculation tool developed. Scenarios are; power production by, (1) dewatered sludge incineration, (2) partially dried sludge incineration without energy recovery for drying and (3) partially dried sludge incineration with energy recovery for dryer. Six different sludges having different heating values are assessed in scenarios. Evaluation criteria are; fossil fuel consumptions, electric consumptions and electricity generations. In result, Scenarios 1 and 3 are advantageous regarding the evaluation criteria. Scenario 2, on the other hand, do not show any advantage for any of the evaluation criteria.
ICP048 17:15-17:30	Coordination Assessment of Distribution System Protection in Presence of Photovoltaic Sources and Introducing a Novel Solution to Overcome Protection Interference **Rahman Dashti**, Hasan Karimi and Ehsan Gord Electrical Engineering Department, Persian Gulf University, Iran Abstract—in recent year's great attention has been paid to distributed generation units in distribution systems. Installing distributed generation units in distribution networks has posed new challenges to the grid maintenance and protection. These problems depend on grid characteristics and the type of the distributed generation units. In most cases these problems require a basic change in protection. In this paper, the relation between photovoltaic distributed generation units and their upstream and downstream networks as well as adjacent feeders are investigated. Besides the calculation and implementation of the protection settings and their challenges are discussed. Short circuit current of photovoltaic distributed generation units is less than twice the nominal current. It is examined whether maximum injected current of these sources in different operating conditions can affect the protection and the protection coordination of the grid or not. Moreover, protection assessment is done through simulating the protection challenges resulted from photovoltaic sources and comparing their results to other distributed generation units. Conditions where overcurrent relays either cannot operate properly or they may lead to lack of coordination between main and support relays are determined. The mentioned conditions are simulated in MATLAB's Simulink environment.

Dinner @ Hotel Restaurant @ Ground Floor
<18:00-19:30>

SESSIONS

September 23rd, 2018

Session V

[Electrical Engineering and Mechatronics]

09:30-12:00

Berlin-Ceres @ Ground floor

Chaired by Assoc. Prof. Yueh-Ru Yang

Ming Chi University of Technology, Taiwan

9 presentations—

ICP027, ICP105, ICP040, ICP041, ICP023, ICP107, ICP014, ICP049, ICP112

***Note**:

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

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

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

SESSIONS

ICP027 09:30-09:45	Electrical Heating Emissions on The Island of Ireland **William D. Kerr**, David M. Laverty and Robert J.Best Queen's University Belfast, UK Abstract—This paper shows the effect on household greenhouse gas emissions if standalone or supplementary electric heating was to replace conventional heating methods, based on the present day electrical grid. While having the capability to improve future grid effectiveness and dynamic stability through the potential incorporation of demand side management (DSM). The All-Ireland system has been used in this paper as an example of a network which has been experiencing a significant increase in renewable generation. To show the potential of the electric heating methods the characteristics of existing domestic heating systems will be discussed, in terms of their heat output against their exhaust emissions (gCO2e/kWh). This will then be compared to that of the grid CO2 Intensity, showing the frequency and duration of the possible emission savings involved when using electricity as a main or supplementary heating source.
ICP105 09:45-10:00	Analysis and Design of Filament Power Supply with Voltage-Fed Single-Switch ZVS Inverter **Yueh-Ru Yang** Ming Chi University of Technology, New Taipei City, Taiwan Abstract—In this paper, an off-line voltage-fed single-switch zero-voltage-switching (ZVS) inverter is analyzed and designed for the filament power supply of cooker magnetrons. Due to the low resistance of cathode filament, an isolation transformer with large turn ratio is used. To obtain the ZVS operation, a parallel-resonant capacitor is connected to the primary of transformer. The capacitor, transformer and filament constitute a parallel resonant tank. Both the transformer leakage inductance and the transistor output capacitance are merged into the resonant tank. The resonant energy provides the ZVS operation of the inverter switch, and the secondary voltage drives the cathode filament. To verify the analysis, a prototype inverter is built and tested. Experimental results validate the circuit design.
ICP040 10:00-10:15	Control Tension of an Autonomous Distributed Generator by Multi Resonant Controllers Abdelhakim Saim, **Rabah Mellah** and Azzedine Houari University Mouloud Mammeri of Tizi-Ouzou, Algeria Abstract—The distributed or decentralized generation electricity constitutes the central stone of various recent energy models, such as for example the intelligent electrical supply networks, and the electric networks. The quality of energy in this type of structure depends primarily on the strategy ofcontrol adopted, in order to guarantee an operation in adequacy with the international standards. The strategy of control proposed in this paper uses two loops of control. An internal loop of audit aims at deadening the phenomena of resonance while ensuring dynamics necessary for a fast rejection of the disturbances. As for the external loop of control a controller

SESSIONS

	multi resonant compound with a stabilizing feedback of complete state uses, in order to ensure an asymptotic follow-up of the reference voltage standard with a weak rate of harmonic distortion. Finally, experimental results are presented to show the performances and feasibility of the proposed control strategy before finishing with a general conclusion.
ICP041 10:15-10:30	FEM Based Prototype of Moving-Coil Coreless Linear-Generator (MCCLG) for Wave Energy Extraction **Raed Althomali** and Mohammed Alsumiri Yanbu Industrial College, Saudi Arabia Abstract—Linear generators are one of the most efficient sea wave's energy extraction setup. In the linear generator setup the energy is taken out by the vertical movement of waves. In most of the energy conversion systems, the energy is extracted by rotating motion by using the rotary generators. This paper is based on the prototype design of moving coil linear generator. The analysis of the prototype is done using the Maxwell finite element software. Finite-Element-Method (FEM) is used to analytically calculate the induced voltage and cogging forces. In this research, the FEM model of a coreless moving coil P.M linear generator has been outlined with an air cored stator. The main aim of the prototype is to convert marine energy directly without conversion from one form of motion to another, in regions the wave height is around 50 cm. A detail machine design formula is derived for the bases of initial prototype design. Prototype is modelled using Maxwell 2D FEM analysis. Hardware setup results were discussed to confirm the design, and to explore the working of the prototype as a generator. The movement of coils is accomplished by buoyancy mechanism of sea waves. The EMF generated is 6 Vp-p according to finite element simulation software. The prototype is able to generate EMF of about 2.5 Vp-p.
ICP023 10:30-11:00	The Innovative Process in the Interruption of Wind Power in Portugal **António Brito and Luís Neves** EDP Serviço Universal SA, Portuguese Last Resort Supplier, Portugal Abstract—The production of energy under a special regime of renewable origin has had a sustainable evolution in Portugal. Since the 1990s, the percentage of renewables has been growing steadily, with special emphasis being given to wind, photovoltaic, mini-hydro, biogas and high-efficiency cogeneration [1]. More recently there has been a strong push in promoting small scale production and self-consumption [2]. There are several periods of time when the country's electricity load is 100% supplied by renewable energy. There are also periods when surplus renewable energy is exported to Spain. However, there are some periods when production exceeds consumption and it is then necessary to reduce wind power production. In Portugal there is an innovative process underway to carry out this reduction, which was systematized by the General Department of Energy and Geology in Order No. 8810/2015, of August 10. Thus, in the case of wind power plants that receive power reduction orders, the remuneration equivalent to that which is lost is paid by the other

SESSIONS

	producers, through the Last Resort Supplier. Those power plants that have not been interrupted pay a percentage of their power produce to the Last Resort Supplier, to compensate those that have been interrupted. The total of the payments made to the producers whose power plants were interrupted must equal the receipts from those plants that continued to produce energy. This new concept is exemplified in this paper by the wind power cut that occurred on March 12 and 13, 2017 in Portugal. An explanation of what occurred on that day is presented, to understand why this cut was made, having been reached the limits of energy exports to Spain. To implement this new interruptible compensation model it was necessary to develop a mathematical algorithm and include it in the computer application named GPCE - Producers' Management and Energy Purchase, that belongs to the Last Resort Supplier. When the interruption occurred in March 2017, the computer system worked correctly. The sum of the payments made equaled the sum of the receipts. It should be noted that there was a high degree of discipline shown by the producers.
ICP107 11:00-11:15	Numerical Studies on a NACA0018 Airfoil Blade HAWT with Trailing Edge Jet Flow **Uzu-Kuei Hsu**, Cheng-Hsien Tai, Chia-Wei HSU and Jiun-Jih Miau Air Force Institute of Technology, Taiwan Abstract—This study analyzed an airfoil blade for a horizontal-axis wind turbine (HAWT) with a trailing-edge jet flow design. This design was realized by drilling a hole in the trailing edge of an NACA0018 blade of a conventional HAWT to serve as a pressure injection nozzle. Five inflow wind speeds and three trailing-edge jet flow conditions were examined in the test. The results revealed the efficiency differences between a HAWT with the new jet flow design and conventional HAWTs. The experimental methods employed involved a wind tunnel experiment and a computational fluid dynamics (CFD) simulation. The results revealed that when the inflow wind speed was low, the trailing-edge jet flow accelerated the initiation phase and increased the rotating speed of the HAWT; however, when the inflow wind speed was high, damping occurred and the rotating speed of the turbine blades decreased.
ICP014 11:15-11:30	Life cycle Energy and Carbon Footprint Analysis of Large MW Scale Rrid Connected Wind Power Systems in India **Jani Das** and Rangan Banerjee Indian Institute of Technology Bombay, India Abstract—The centralized grid is the main electrical supply to the country. About 80% of the installed generation capacity is fossil fuel fired power plants, though there is increase in share of renewable generation over the years. India has significant wind potential, and a major share in the renewable generation of the country. The energy and carbon footprint sustainability of wind power systems in Indian conditions is the focus of this research. This paper presents a study of large grid connected wind storage systems with reference to the cradle to grave primary energy requirements and carbon emissions in an Indian scenario

SESSIONS

ICP049 11:30-11:45	Transient Analysis of Tidal Power Plant Connected To Network When Faced with Symmetrical & Unsymmetrical Faults **Rahman Dashti**, Gholam Reza Ghanbari and Ehsan Gord Persian Gulf University, Iran Abstract—The growing need for electricity and the discussion of environmental pollution and also high cost of fossil fuels have attracted the attention of electrical engineers towards the use renewable energy more than before. Tidal energy is a type of sea power which is cleaner, more accessible and predictable than other renewable energies. This type of energy can help generate large amounts of electricity in the country. Now, the connection of these units to the power grid at distribution and transmission level in terms of stability and instability at the moment of connection and fault is an important case. In this paper, the behavior of a tidal power plant connected to the grid when faced with different types of short circuits and in any case the speed behavior and productive active and reactive power changes are analyzed. Also, the effect of water rip on the stability of tidal power plants is studied.
ICP112 11:45-12:00	Thermodynamic Analysis of an Organic Rankine Cycle for Waste Heat Recovery from IGT 25 **Mostafa Mostafavi Sani**, Hadi Alami, Alireza Noorpoor, Bagher Shahbazi and Hiwa Khaledi Islamic Azad University, Iran Abstract—The organic Rankine cycle (ORC) is attractive in power generation field since it is the best applicable technology for heat recovery and power generation using heat sources at temperatures of 200– 400 ˚C. Combined gas turbine with ORC is thermo-economically studied. For this purpose, comprehensive thermodynamic modeling, including energy, exergy, and economic analyses is conducted. In addition, the model is performed for different working fluids including R123, R134a and water. The ambient temperature is a significant performance parameter in a combine cycle. Raising this parameter can decrease power output up to 40%. The parametric investigations show that the gas turbine inlet temperature and the partial load significantly affect the exergy efficiency and total annual cost of the cogeneration system. Also, increasing the partial load and ambient temperature increases the total annual cost.

Lunch @ Hotel Restaurant @ Ground Floor
<12:00-13:30>

SESSIONS

September 23rd, 2018

Session VI

[Power System and Energy]

13:30-15:45

Berlin-Ceres @ Ground floor

Chaired by Assoc. Prof. Giedrė Streckienė

Vilnius Gediminas Technical University, Vilnius, Lithuania

9 presentations—

ICP035, ICP028, ICP1009, ICP069, ICP029, ICP092, ICP037, ICP010, ICP038

***Note**:

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

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

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

SESSIONS

ICP035 13:30-13:45	Experimental Evaluation of Turbine Ventilators Performance under Different Test Conditions **Dovydas Rimdžius**, Juozas Bielskus, Vytautas Martinaitis, Violeta Motuzienė and Giedrė Streckienė Vilnius Gediminas Technical University, Vilnius, Lithuania Abstract—One of the most popular wind driven ventilation devices is a turbine ventilator. Its main construction components usually are air suction duct and impeller. However, there are many different configurations of such devices – different shape of vanes and ratios between main dimensions. In order to develop turbine ventilators there is demand for deeper fundamental researches. Major part of previous experimental investigations compares turbine ventilators performance. The aim of presented experimental investigation is to understand key parameters affecting wind driven ventilators performance. For this purpose, straight and curved vane devices under 4 different test conditions are tested. All tests are performed in modified wind tunnel based on the following methodology: 1) testing devices under normal operation conditions; 2) testing without impeller; 3) testing while impeller is stopped; 4) testing while air suction duct is sealed. Experimental results have shown that the biggest part of extracted air flow rate is impacted due to ejection of wind and air suction duct interaction process. A slight increase in performance of turbine ventilators compared to open duct column has been confirmed. Experiments also revealed differences between tested turbine ventilators rotational speed trends. Presented empirical equations of experiments could be used for design of turbine ventilators or other researches purposes.
ICP028 13:45-14:00	Simulation of Annual Functionality of Roof Turbine Ventilator **Giedrė Streckienė**, Violeta Motuzienė, Dovydas Rimdžius, Vytautas Martinaitis and Juozas Bielskus Vilnius Gediminas Technical University, Lithuania Abstract—Ventilation systems using renewable energy enable to reduce electricity demand. However, their operation directly depends on the stability of the renewable energy source. In this study, the wind driven roof turbine ventilator (RTV) is analysed. As a rule, this equipment is selected based only on the average annual wind speed and there exists a lack of date related to functionality of RTV. The case study presented in the paper seeks to assess functional operation of the RTV within the whole year. Simulations, performed with TRNSYS software, are based on the empirical equation for the ventilation flow rate extracted by the tested turbine ventilator. Results provide the number of RTV operational hours and share (%) of the time, when the RTV operates. The results show that for 6 different cities in Europe RTV is below the required functionality from 15.9% to 48.9% of the time of the year. Most of the time RTV operates at partial required load, however, there are periods when air flow rates are excessive and this should be considered as storage potential. The presented results could help to determine more accurately functional operation of RTV in the selected

	room/building and estimate demand for additional ventilation solutions as well energy storage potential.
ICP1009 14:00-14:15	Case Study on Nest's "Smart Home Energy" Business Model: Based on Strategic Choices for Connected Product **Minzheong Song** Hansei University, South-Korea Abstract—The aim of this study is to research Nest's business strategy. Nest's functionality is a seamless integration of device, platforms, and services. "Works with Nest" generates an ecosystem fulfilling the 3rd parties' needs. Nest gives a seamless user experience and introduces open APIs to connect smart devices to the IoT and open to "If This Then That (IFTTT)." In regards smart home energy (SHE), Nest products are designed to work each other. Nest application controls them. Nest has partnered with more than 30 energy providers who provide energy from renewable and non-renewable energy sources. Nest has direct and indirect sales route and expands to industries like AirBnB helping users be more energy-efficient at home.
ICP069 14:15-14:30	Industrial Energetic Districts: Impact Analysis on the Global Energy Efficiency and Business Competitiveness **Lesme Corredor**, Robert Bello, Álvaro Redondo, José Avendaño and José Calle,Jesús Viloria Colombia Universidad del Norte, Colombia Abstract—Process industries located in emerging economies have relative low levels of production to similar ones located in developed countries, this fact influences the implementation feasibility of cogeneration and/or tri-generation systems that allow a substantial increase in the plant global energy efficiency. In this paper, an energy and economic analysis of several alternatives of cogeneration was done for a company located in Barranquilla (Colombia, South America) that produces vegetable oils and derivatives and its energy matrix is approximately 90% thermal and 10% electric. In this investigation two type of analysis were done, both supported by process simulation software, these are: 1) Taking the plant as the control volume and evaluating the entire electrical demand supply with natural gas engine and turbine –generator, plus exhaust gases heat recovery for refrigeration and/or preheating of thermal oil or water in boilers. 2) As an energy-industrial district, where the company takes advantage of the residual heat of a gas turbine and sells the excess of electrical power to nearby plants, a concept introduced by the authors as Sustainable Energetic Industrial District in Emerging Economies (SEIDEE). The input variable considered for this analysis was electric demand which restricts the technology implementation. It was found that the investment return period is notably lengthy when the thermal machine supplies the electric power demanded by the industrial plant. This period is considerably reduced when the SEIDEE concept is implemented, this period reduction is between 57% and 65%.

SESSIONS

ICP029 14:30-14:45	Characterization and Classification of Daily Electricity Consumption Profiles: Shape Factors and k-means Clustering Technique **Milton Mora-Alvarez**, Pedro Contreras-Ortiz, Xavier Serrano-Guerrero and Guillermo Escrivá-Escriva Universidad Politécnica Salesiana, Ecuador Abstract—This paper exposes a method to classify the electric consumption profiles of different types of consumers, based on patterns given. The direct characteristics method is used in this paper, this method is also known as shape factors deduction (SFs) to easily define consumption profiles by using the load patterns resulting from measurements in the time domain, considering weekdays and time ranges. After the characterization of load profiles, k-means clustering technique is applied to SFs. The SFs are segmented in such a way that, in each group similar SFs are gathered. The characterization and classification of electric profiles has important applications, such as the application of specific tariffs according the consumer type, determination of optimal location of generation resources in electrical distribution systems, detection of anomalies in transmission and distribution of electricity or classify geographical areas according to electricity consumption and perform an optimum balance of feeders in electrical substations.
ICP092 14:45-15:00	Power Scheduling for Renewable Energy Connected to the Grid **Ismail El kafazi**, Rachid Bannari, Abdellah Lassioui and My Othman Aboutafai Ibn Tofail University Kenitra, Morocco Abstract—In this work, a scheduling strategy considering an Energy Storage System (ESS) is proposed to manage the distributed energy resources (DERs) optimally in a grid-connected hybrid PV-wind-microgrid. In order to increase the use of the renewable energy sources and ensure a full charge in the battery for the next day. The optimization problem of this study is addressed through a linear mathematical model, to minimize the cost of energy bought from the utility grid and maximize the income for selling electricity generated by hybrid PV-wind. The optimization model is tested by using a simulation of the model. The achieved results confirm the effectiveness of the proposed scheduling strategy.
ICP037 15:00-15:15	Overcurrent Protections in MV Grid with Local Energy Sources Józef Lorenc,Bartosz Olejnik M. and **Aleksandra Schött** Politechnika Poznańska, Poland Abstract—The article presents typical methods of connecting various types of local power sources to a medium voltage network. Describes the advantages and disadvantages of individual solutions. The authors focus particularly on the issues of power system protection, with particular emphasis on overcurrent protection (ANSI 50 and 67). The key part of the article is the presentation of the selection methodology, along with examples, of setting this type of protection for a frequently encountered case - connecting local energy sources with busbars with a line with receipts.

SESSIONS

ICP010 15:15-15:30	Particle Swarm Optimized–Support Vector Regression Hybrid Model for Daily Horizon Electricity Demand Forecasting Using Climate Dataset **Mohanad S AL-Musaylh**, Ravinesh C Deo and Yan Li School of Agricultural, Computational and Environmental Sciences,University of Southern Queensland, Australia Management Technical College, Southern Technical University, Iraq Abstract—This paper has adopted six daily climate variables for the eleven major locations, and heavily populated areas in Queensland, Australia obtained from Scientific Information for Land Owners (SILO) to forecast the daily electricity demand (G) obtained from the Australian Energy Market Operator (AEMO). Optimal data-driven technique based on a support vector regression (SVR) model was applied in this study for the G forecasting, where the model's parameters were selected using a particle swarm optimization (PSO) algorithm. The performance of PSO–SVR was compared with multivariate adaptive regression spline (MARS) and the traditional model of SVR. The results showed that the PSO–SVR model outperformed MARS and SVR.
ICP038 15:30-15:45	Outlier Detection Methods for Uncovering of Critical Events in Historical Phasor Measurement Records **André Kummerow**, Steffen Nicolai and Peter Bretschneider Advanced System Technology (AST) Branch of Fraunhofer IOSB, Germany Abstract—The scope of this survey is the uncovering of potential critical events from mixed PMU data sets. An unsupervised procedure is introduced with the use of different outlier detection methods. For that, different techniques for signal analysis are used to generate features in time and frequency domain as well as linear and non-linear dimension reduction techniques. That approach enables the exploration of critical grid dynamics in power systems without prior knowledge about existing failure patterns. Furthermore new failure patterns can be extracted for the creation of training data sets used for online detection algorithms.

Coffee Break
<15:45-16:15>

POSTERS

ICP102	Inductance Extraction of Press-Pack IGBT by Considering Displacement Current Jinyuan Li, Zhongyuan Chen, Lei Zhang, Chouwei NI and Zhibin Zhao State Key Laboratory of Advanced Power Transmission Technology (Global Energy Interconnection Research Institute of State Grid Corporation of China), China State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources (North China Electric Power University), China Abstract—Taking the displacement current generated by charges accumulation into consideration, this paper presents a inductance extraction method for press-pack IGBT where conductor might not form a closed loop in simulation. Charge accumulating on ends of conductor is considered and then Ampere's circuital law (ACL) could be meet. Vector potential A also could be affected by displacement current, which leads to a different formulation of partial inductance. A simplified model based on practical structure are used in numerical experiment for comparison between existing method and proposed method.
ICP051	The Load Distribution of the Main Shaft Bearing Considering Combined Load and Misalignment in a Floating Direct-drive Wind Turbine Jingyang Zheng, Jinchen Ji, Shan Yin and Van Canh Tong School of MME, University of Technology Sydney, Australia State Key Laboratory of ADMVB, Hunan University, China Department of UPMS, Korea Institute of Machinery and Materials, Republic of Korea Abstract—The main shaft tapered double-inner ring bearing (TDIRB) of floating direct-drive wind turbine system (FDDWT) is one of the most critical components in FDDWT, and its failure accounts for a large proportion of wind turbine malfunctions and faults. Over the past decades, a significant number of methods have been proposed to calculate the contact load distribution along the roller length in TDIRB, since the contact load distribution of roller is the key factor of fatigue life of TDIRB. Most of methods, however, neglected the misalignment of inner ring with respect to outer ring and friction force. In this paper, with the help of comprehensive and accurate quasi-static mathematical method, the contact load distribution of internal loads in TDIRB are analysed by considering the effects of combined loads, angular misalignment and friction force at different wind speeds for FDDWT. The simulation results show that the amount of combined load has an apparent effect on the contact load distribution along the TDIRB raceways and flanges in both rows. Furthermore, the slight change of tilted misalignment has a great influence on the contact load distribution. In addition, the slight angular misalignment easily produces noncontact zone for the bearing raceway in both rows, which is significantly disadvantage for the external load uniform transmitting to each roller.
ICP080	Analysis of Passive Interference on Radio Station from AC UHV Power Zheyuan Gan, Jiangong Zhang, Jun Zhao and Ying Lu China Electric Power Research Institute, China North China Electric Power University, China

POSTERS

	Abstract—The problems of Electromagnetic Interference in Airborne Intelligence Radar Stations near the AC UHV Transmission Lines is researched in this paper, which is mainly passive interference. And then analyzed the passive interference of AC UHV lines. It mainly studied the influence of the tower and line on the distance detection performance of the air-to-air intelligence radar of the UHV transmission lines. and integrated the influence of the surface reflection surface, the shadowing effect and the secondary radiation echo interference, Proposed a passive interference protection distance for UHV transmission lines and airborne intelligence radar stations
ICP097	Influence of the DC Offset on the DFT-based Frequency Estimation for Noised Multifrequency Signals in PV Systems with a DSP Processor Dariusz Kania and Józef Borkowski Wrocław University of Science and Technology, Chair of Electronic and Photonic Metrology, Poland Abstract—Digital signal processing is present in many areas of industry and science. One of them is analyzing multifrequency signals, e.g. in photovoltaic systems. This paper focuses on the frequency estimation of pure signals and signals distorted by AWGN noise in the presence of a DC voltage offset. The used IpDFT estimation method is based on the FFT procedure, I class Rife-Vincent time windows and three points of the spectrum taken to calculations. Measurement time was limited only up to two cycles of a tested signal and the method is very accurate even below one cycle. Obtained results show that additional DC component negatively affect the accuracy. The paper can be very useful because it shows properties of the method in real measurement conditions for various values of parameters.
ICP082	Analysis on the Influence of Transmission Lines Span on Passive Interference in Shortwave Ying Lu, Zhao Zhibin Zhang Jian gong and Gan Zheyuan College of Electrical and Electronical, North China Electric Power University, China China Electric Power Research Institute, China Abstract—The passive interference of transmission lines to nearby radio stations may affect the effective reception and transmission of radio station signals. Therefore, the accurate calculation of the electromagnetic scattering of transmission lines under the condition of external electromagnetic waves is the basis for determining the reasonable avoidance spacing of the two. For passive stations operating in short-wave frequencies, passive interference is mainly generated by the tower, and span is one of the most significant factors affecting passive interference. This paper uses the method of moments to carry out the passive interference calculations under normal circumstances, expounds the method of calculating the electromagnetic field of transmission line at the same time . And elaborates the method for calculating the electromagnetic field of the transmission line, obtains the space electric field intensity of the transmission line at the same working frequency and space location of the plane wave. Applying the approximate formula to calculate the formula for the span and

POSTERS

	critical distance between the observation point and the transmission line.
ICP099	A Research based on Testing Method for the Whole Substation Cascaded in Digital Substation Yuekang Wu, Shuheng Chen, Shi Jing and Xueting Shi Sichuang Provincial Key Lab of Power System Wide-Area Measurement and Control, School of Mechanical and Electrical Engineering, University of Electronic Science and Technology of China (UESTC), China Abstract—Substation as an important component of the power grid, its safe and steady operation is crucial to the power grid. After building new substation or renovating the old ones, they needs to be tested to ensure its safe operation. The method, using relay protection tester to test the substation equipment nowadays, is not available to the whole cascade related connecting equipment, and the test work need a lot of manpower and material resources. To make up for all kinds of shortcomings when testing, this paper proposes a digital substation-oriented testing method for whole station concatenation, and established a testing software to test the whole cascaded substation, especially the method can realize closed-loop simulation test for whole station. In this method, the potential faults of digital substations can be predicted by using electromagnetic transient simulation to simulate various faults of substations, and the state of primary equipment can also be tested. The testing time can be shorten and the accuracy of testing can be improved, as well as, the safe and steady operation of substation equipment can be ensured by using the method proposed in this paper.
ICP084	Influence of Transmission Line Pitch on Passive Interference Ying Lu, Zhang Jian gong, Gan Zheyuan and Zhao Zhibin College of Electrical and Electronical, North China Electric University, China Wuhan Branch of China Electric Power Research Institute, State Key Laboratory for Environmental Protection of Power Grid, China Abstract—Passive interference of transmission lines to neighboring radio stations may affect the effective reception and transmission of radio station signals. Therefore, it is the basis to accurately calculate the electromagnetic scattering of transmission lines including overhead wires and towers under the circumstance of electromagnetic waves from outside. Wherein for radio stations, the overhead conductor is the main factor that affects the radar detection because of the working mode of the radar and other factors. In this paper, in the general case of the application of moment method to carry out passive interference calculations, the overhead lines are assumed to be all the actual wire. The space electric field strength and RCS of the different pitch at different operating frequencies and spaces are obtained. The influence of pitch on passive interference of overhead conductors was analyzed. Thus providing a basis for modeling to save energy and reduce the effects of passive interference provides the modeling basis.

POSTERS

ICP101	Impact of df/dt Inertia Control on Doubly Fed Induction Generator Type Wind Turbine Hua Huang, Xin Tao, Xu Tian and Fei Peng Huazhong University of Science and Technology, China State Grid Qinghai Electric Power Company, China Abstract—The supplemental df/dt control is the common method for wind power generation to support system inertial response. This paper investigates the impact of the df/dt inertia controller on doubly fed induction generator (DFIG) type wind turbine. The controller is usually a high pass filter. Two parameters which are the gain and the time constant are considered. By constructing the linearized model of DFIG, the impacts of the two parameters of the controller are discussed. It shows that with different phase locked loop (PLL) parameters and current control parameters, different time constants and gains are required to ensure the DFIG stability. The time domain simulation validates the result.
ICP100	A Novel Submodule Applied in HVDC Hybrid DC Breaker Topology Junmin Wu, Xizi Zhang, Cui Li , Jun Zhang and Zhibin Zhao State Key Laboratory of Advanced Power Transmission Technology (Global Energy Interconnection Research Institute of State Grid Corporation of China), China State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University, China Abstract—In recent years, with the vigorous development of power electronic technology, renewable energy sources such as wind power and solar energy utilization efficiency continuing to improve, and the application scale expanding unceasingly,DC power grid technology and the development of multiterminal HVDC has become a key link of transmission technology in our country.As the key equipment of biulding DC system,The direct current breaker need to be optimized on the aspect of topology,to promote the development of dc transmission.This article puts forward a new type of submodule which can be applicatedin hybrid DC breaker.After a brief review of DC circuit breaker research status,the paper will give the topology structure, and analyzes its working principle.Then, verification and electrical stress calculation will be done in Saber Sketch simulation. Based on this, two other present scheme will be introduced,and finally a comparison will be made between the diffent scheme.As is concluded,the novel submodule can save the power elctronic device cost effectively.
ICP085	Electromagnetic Field Analysis of Operation Space of the Switch in the Substation Based on the Time Domain Integration Method Jian-gong Zhang, Zhao Jun, Zheyuan Gan, Yemao Zhang and Ying Lu China Electric Power Research Institute, China North China Electric Power University, China Abstract—In this paper, the approximate calculation formula is used to calculate the horizontal electric field from lightning which has arbitrary current, with the help of time domain integral equation method solving the lightning induced over voltages on overhead lines. In this paper, the time domain integral equations of horizontal electric

POSTERS

	field is established. Taking the conductor axis current as the variable, the pulse function is used as the basis function, and the discretization equation is used in space and time. Using time stepping algorithm to solve the resulting linear equations. The calculation process of this method is simple, and it is proved that the method is consistent with the conclusion of the relevant literature
ICP1016	Research on Power Knowledge Model Based on Group Wisdom Yu Yang, Ji Youlang, Zhu Jun, Zhao Hongying and Gu Jingjing Electric Research Institute, Jiangsu Electric Power Company, China State Grid, Jiangsu electric power company, Jurong power supply company Abstract—This study described the plan of knowledge management and crowd innovation for Jiangsu electric company based on literature analysis on crowd innovation research and investigation of the company's innovation state as well as its electric service. A knowledge management system was designed for all the experts in electric field, all the workers and the customers in order to achieve crowd innovation. This system was designed based on the consideration of innovation process, evaluation and motivation, and it is implemented with the Web 2.0 technology.
ICP081	Analysis of Active Interference on Radio Station from AC UHV Power Jiangong Zhang, Zheyuan Gan, Jun Zhao and Ying Lu China Electric Power Research Institute, China North China Electric Power University, China Abstract—The problems of Electromagnetic Interference in Airborne Intelligence Radar Stations near the AC UHV Transmission Lines are researched in this paper, which is mainly active interference. The calculation method for the interferences is analysed, and then the proper protection distances of the AC UHV transmission line to the radar station are given. The paper analyzed the active interference of AC UHV transmission lines, and focuses on the active interference caused by the line corona on the active radar of nearby airborne intelligence when the transmission line is under normal operation. In the end, this paper proposes the recommended values of active interference protection distance for 1000kV AC UHV transmission lines and airborne intelligence radar stations.
ICP1012	Study on Reliability Evaluation Method Based on Improved Monte Carlo Method Liu Jun, Yang Fan and Ren Lijia State Grid Shanghai Electric Power Research Institute, China Shanghai University of Engineering Science, China Abstract—The advancement in science and technology comes with continuously expanding power system scale, increasingly complex system operation condition and higher requirements for accuracy and speed of power system reliability evaluation, but actual calculation methods cannot meet the needs. Therefore, there is need to improve the reliability of conventional power distribution network so that requirements of calculation speed and calculation accuracy can be met. In this paper, reliability of the power distribution network will be evaluated using improved Monte

POSTERS

	Carlo method with uniform sampling. The average value is obtained through calculation of state of multiple sub-intervals and test functions, which effectively improves calculation accuracy, and further increases the utilization of random numbers. By improving the uniform sampling method, the Monte Carlo simulation variance is reduced, and evaluation and calculation efficiency is improved. At the same time, unqualified power grid is selected for analysis. Based on the simulation results, qualified power distribution networks are compared to point out where the requirements are not met. Also, comparative analysis is made on the effect of power distribution network grid structure etc. on the user's power supply. Finally, suggestions for improving power distribution network reliability are given from equipment reliability, grid structure.
ICP083	Analysis on the Influence of the Height of Tower on Passive Interference in shortwave Ying Lu, Zhibin Zhao, Jian gong Zhang and Zheyuan Gan College of Electrical and Electronical, North China Electric Power University, China China Electric Power Research Institute, China Abstract—The passive interference of transmission lines to nearby radio stations may affect the effective reception and transmission of radio station signals. Therefore, the accurate calculation of the electromagnetic scattering of transmission lines under the condition of external electromagnetic waves is the basis for determining the reasonable avoidance spacing of the two. For passive stations operating in short-wave frequencies, passive interference is mainly generated by the tower. This paper uses the method of moments to perform passive interference calculations under normal circumstances, And elaborates the method for calculating the electromagnetic field of the transmission line, obtains the space electric field intensity of the transmission line at the same working frequency and space location of the plane wave. Uses the approximate formula to inductive the formula for calculating height of tower and the protective distance.
ICP1011	Optimal Reconstruction of Power Distribution Network based on Reliability and Economy Zhang Kaiyu, Feng Yuyao, Ren Lijia and Yuan Quanning State Grid Shanghai Electric Power Research Institute, China Shanghai Puhai Qiushi Electric Power High, Technology Co.,Ltd., China Abstract—Great significance shall be attached to the research on how to improve reliability of user-end power supply with limited expense by coordinating reliability and economic efficiency of power grid, so that to meet the increasing demand on reliability of electric power, and achieve considerable economic effectiveness. In this paper, process of power distribution network reliability calculation based on minimum-path failure mode and effect analysis mode is expounded, and a demonstration on calculation of power distribution network reliability is provided. Furthermore, cost-benefit analysis, which includes calculations of cost and benefit of reliability, is introduced to reflect reliability efficiency through power interruption

POSTERS

	cost calculation. At the end of this paper the cost-benefit Analyses is applied on the optimal reconstructed power distribution network.
ICP104	Electrical Field Analysis of Press-Pack IGBTs Xinling Tang, Yan Pan, Yanfang Chen, Pengyu Fu and Zhibin Zhao State Key Laboratory of Advanced Power Transmission Technology (Global Energy Interconnection Research Institute of State Grid Corporation of China), China State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources (North China Electric Power University), China Abstract—The passive interference of transmission lines to nearby radio stations may affect the effective reception and transmission of radio station signals. Therefore, the accurate calculation of the electromagnetic scattering of transmission lines under the condition of external electromagnetic waves is the basis for determining the reasonable avoidance spacing of the two. For passive stations operating in short-wave frequencies, passive interference is mainly generated by the tower. This paper uses the method of moments to perform passive interference calculations under normal circumstances, And elaborates the method for calculating the electromagnetic field of the transmission line, obtains the space electric field intensity of the transmission line at the same working frequency and space location of the plane wave. Uses the approximate formula to inductive the formula for calculating height of tower and the protective distance.
ICP1017	Innovation of Price Adjustment Mechanisms to Support Investment in Solar Power in Germany Do Thi Hiep and Clemens Hoffmann University of Kassel, Germany Abstract—It has been widely agreed that to incentivize renewables integration into the power system, not only pricing mechanisms, but price adjustment mechanisms have played a vital role, and it has been true for the German Energiewende. This study is to carry out a detailed analysis of investment results influenced by innovative price adjustment mechanisms from an auto degression rate to a feedback system. Employing linear regression models for the historical data of investment in small-scale rooftop PV projects in Germany, we have found out a better correlation between PV system price and feed-in tariff (92.09%) under quarter feedback and monthly adjustment mechanism compared to an annual feedback system. However, the underinvestment in recent years reveals that a feedback mechanism without specific mathematical shapes was not effective enough in term of meeting the targeted volume. Therefore, further researches are to design mathematical images of feedback mechanism in order to find out the trajectory of electricity price in the future which at the same time satisfies the target of investment and economic effectiveness.
ICP103	Influence on Silicon Carbide MOSFET Switching Performance Jinyuan Li,Meiting Cui, Yujie Du, Junji Ke and Zhibin Zhao State Key Laboratory of Advanced Power Transmission Technology (Global Energy

POSTERS

	Interconnection Research Institute of State Grid Corporation of China), China State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University, China Abstract—Compared to the silicon power devices, silicon carbide device has shorter switch time, so parasitic parameters influence on switching transient will be more serious. This paper gives an experimental study of parasitic inductance influence on Silicon Carbide (SiC) MOSFET switching characteristics. The most significance parameters include gate driver loop and power switching loop, namely SiC MOSFET package parasitic inductance, Interconnect inductance and the parasitic inductance of dc link on PCB. Then, Comparing and analysis different parasitic parameters under various operation in terms of their effect on overvoltage, overcurrent, switching power loss.
ICP072	Power Distribution Design of MicroSat Power Control Unit Elegant Bread Board (EBB) Che Cheng Huang and Jia Jing Yeh National Space organization, Taiwan Abstract—The Power Control Unit (PCU) in Micro-satellites program proposed to develop by NSPO, acts as the satellite power control and distribution center. One of the modules in the PCU, named the Power Distribution (PD), the main function provides the rated voltage and current of each power outlet for the satellite subsystem. When overload or short-circuit happens and persists for a time period, PD will limit the load current in a pre-designed value, and shut off the load to avoid damage on essential devices. In this paper, we will introduce the PCU EBB function and circuit design of PD.
ICP113	Performance Analysis of a Hybrid Micro-Energy System for SA Data Centers Sempe Thom Leholo, Pius Adewale Owolawi and Kayode Timothy Akindeji Tshwane University of Technology, South Africa Abstract—The integration of hybridized renewable energy sources (RES) with AC/DC converters has become the focus of the 21st century for green Information Communication Technology (ICT) applications such as the data center. As the data traffic grows exponentially, the corresponding demand for energy to drive the growth becomes a great challenge and considering the environmental impact, a hybrid renewable energy system is favored for eco-sustainability and economic reasons. This is especially true for data centers which represent a dominant share of the total power in cellular networks. This paper evaluates the actual performance of a fuel cell in a renewable energy hybrid system considering the hybridization of photovoltaic (PV), Wind, Fuel Cell, and battery storage system with a choice of a half-grid mode. The reduction and the absence of available PV power by shading and rainy conditions will be easily reduced by the compensation of the other renewable sources. The modeling and simulations are performed using HOMER software. The results show the effectiveness of the proposed system as the energy supply is less intermittent and more stable.

POSTERS

ICP106	Conversion of a Thermal Waste Disposal Plant into Power Producing Waste-to-Energy Plant by Different Improvement Alternatives Gökmen Kidik, Emin Calbay, Ceren Özbay and Metin Çallı Coskunoz Holding, Turkey Abstract—Besides conventional energy sources, there is a significant progress related to waste-to-energy investments in many countries. In this study, alternative improvements are assessed to convert a thermal waste disposal plant located in Turkey into a power producing Waste-to-Energy plant. Thermochemical process of this plant is combustion at 850 C operation temperature. Utilized waste is 100 ton/day wastewater sludge (an alternative energy source having 4300 kcal/kg-dry higher heating value), which is generated from the wastewater treatment plant in same location with abovementioned disposal plant. Mainly, water content (around 74 % by weight) of sludge negatively affects the combustion. Therefore, around 160 Sm3/h natural gas is utilized in plant as additional energy source. Gross saturated steam production from the boiler is 5.3 ton/hour at 12 bar and 187 C. In order to produce electricity and/or minimize natural gas demand, three alternative improvements are evaluated. First of all, addition of superheaters to boiler (for 20 bar 400 C superheated steam generation) and addition of steam turbine is assessed in alternative 1. All other alternatives have same improvements regarding boiler and turbine. Secondly, alternative 2 includes same improvements on boiler and turbine with first alternative, additionally an air pre-heater (through recovered energy prior to boiler) to minimize natural gas demand. Finally, alternative 3 is same with alternative 1 except, besides natural gas, an external dry sludge from another wastewater treatment plant is utilized to achieve desired combustion temperatures. These alternatives are evaluated based on natural gas consumptions and electricity generation capacities. All in all, alternative 1 consumes high amount of natural gas but also produces high amount of electricity. Alternative 2 and 3 have zero natural gas demand but since air is pre-heated by recovered energy, steam production and electricity generation capacities are low in alternative 2 with respect to the other alternatives. Alternative 3 seems more advantageous due to high electricity production without natural gas consumption. The reason is increase of combusted sludge amount by adding external dry sludge into the combustion chamber and achieving desired combustion

MEMOS